

**FORM 1**

designer's electronic signature	auditor's electronic signature
---------------------------------	--------------------------------

INVESTOR<sup>1</sup> Western Balkan Six Chamber Investment Forum  
Plazza della Borsa nr. 14 34121 Trieste Italy

OBJECT<sup>2</sup> HIGH SCHOOL OF ELECTRICAL ENGINEERING "VASO ALIGRUDIĆ",  
Podgorica, Montenegro

LOCATION<sup>3</sup> c.p. 1193 cadastral district Podgorica I  
Municipality Podgorica

TYPE OF TECHNICAL DOCUMENTATION<sup>4</sup> ADAPTATION PROJECT OF PARTS OF THE FACILITY

DESIGNER<sup>5</sup> DECOM MONTENEGRO D.O.O. PODGORICA  
Licence no. UPI 107/7-705/8 od 26.07.2023

RESPONSIBLE PERSON<sup>6</sup> Goran Mijajlović, C.Eng

MAIN ENGINEER<sup>7</sup> Zagorka Božović Pejanović, Spec.Sci  
Licence no. UPI 107/7-717/2 od 15.05.2018

---

<sup>1</sup> Investor's name

<sup>2</sup> The name of the object

<sup>3</sup> Construction site, planning document, urban plot, cadastral plot

<sup>4</sup> Conceptual solution, conceptual project, main project, i.e. the project of the finished object project (if it is the cover page of the entire technical documentation)

<sup>5</sup> The name of the company, legal entity, or entrepreneur who created the technical documentation

<sup>6</sup> The name of the responsible person in the company, legal entity, that is, the name and surname of the entrepreneur

<sup>7</sup> Name and surname of the main engineer.

designer's electronic signature	electronic signature of the auditor
---------------------------------	-------------------------------------

INVESTOR <sup>1</sup> :	Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy
OBJECAT <sup>2</sup> :	"VASO ALIGRUDIĆ" HIGH SCHOOL OF ELECTRICAL ENGINEERING
LOCATION <sup>3</sup> :	kp 1193, KO Podgorica I, Municipality of Podgorica
PART OF THE TECHNICAL DOCUMENTS <sup>4</sup> :	ADAPTATION OBJECT – GENERAL DOCUMENTATION INSTALLATION OF LOW VOLTAGE
DESIGNER <sup>5</sup> :	"Enproing" doo Bul. Vojvode Stanko Radonjić no. 47, lamela 1, apartment 43., Podgorica
RESPONSIBLE PERSON <sup>6</sup> :	Slobodan Markovic, Bachelor of Electrical Engineering
RESPONSIBLE ENGINEER <sup>7</sup> :	Slobodan Markovic, Bachelor of Electrical Engineering No. face UPI 107/7-1164/2
PROJECT ASSOCIATES <sup>8</sup> :	Danilo Mijanović, spec.sci.el.

<sup>1</sup> Name of the investor

<sup>2</sup> Name of the projected object

<sup>3</sup> Construction site, planning document, urban plot, cadastral plot

<sup>4</sup> Architectural project, construction project, electrotechnical project, i.e. mechanical project (if it is the cover page of the part of the technical documentation)

<sup>5</sup> The name of the company, legal entity, or entrepreneur that created part of the technical documentation

<sup>6</sup> The name of the responsible person in the company, legal entity, that is, the name and surname of the entrepreneur

<sup>7</sup> Name and surname of the chief engineer

<sup>8</sup> Name and surname of collaborators on the preparation of part of the technical documentation

**THE CONTENT:**

<b>1</b>	<b>TECHNICAL DESCRIPTION FOR WORKING .....</b>	<b>6</b>
1.1	INTRODUCTION .....	6
1.2	LOW -VOLTAGE ELECTRICAL INSTALLATIONS - TECHNICAL DESCRIPTION .....	7
1.2.1	LOW VOLTAGE CABLE CONECTION .....	7
1.2.2	DISTRIBUTION BOARDS AND POWER LINES .....	7
1.2.3	ELECTRICAL INSTALLATION OF GENERAL CONSUMPTION AND HEATING .....	7
1.2.4	ELECTRICAL LIGHTING INSTALLATION .....	8
1.2.5	EMERGENCY LIGHTING INSTALLATION .....	8
1.2.6	INSTALLATION OF POTENTIAL EQUALIZATION .....	8
1.2.7	LIGHTNING PROTECTION INSTALLATION AND GROUNDING .....	8
<b>2</b>	<b>TECHNICAL REQUIREMENTS FOR PERFORMING LOW VOLTAGE .....</b>	<b>9</b>
2.1	OVERVIEW OF TECHNICAL SOLUTIONS FOR IMPLEMENTATION OF HEALTH AND SAFETY MEASURES .....	9
2.2	GENERAL AND TECHNICAL REQUIREMENTS FOR EXECUTING WORKS .....	10
2.2.1	GENERAL PROVISIONS .....	10
2.2.2	WIRING .....	11
2.2.3	DISTRIBUTION BOARD .....	12
2.2.4	INSPECTION AND TESTING .....	13
2.2.5	GENERAL NOTES AND OBLIGATIONS .....	13
2.2.6	INSTRUCTIONS FOR THE MANAGEMENT OF CONSTRUCTION WASTE, OR HAZARDOUS WASTE GENERATED DURING THE CONSTRUCTION, USE OR REMOVAL OF THE BUILDING, IN ACCORDANCE WITH A SPECIAL REGULATION .....	13
<b>3</b>	<b>LOW VOLTAFGE QUALITY CONTROL AND ASSURANCE PROGRAM .....</b>	<b>15</b>
3.1	GENERAL CONDITIONS .....	15
3.2	PERIODIC INSPECTIONS AND TESTING OF CERTAIN MEANS OF OPERATION .....	15
3.3	INSPECTIONS AND TESTS OF ELECTRICAL INSTALLATIONS .....	16
3.4	INSPECTIONS AND TESTING OF MEANS AND EQUIPMENT FOR PERSONAL PROTECTION AT WORK .....	17
3.5	PERIODIC TESTING OF THE WORKING ENVIRONMENT .....	17
<b>4</b>	<b>CALCULATION .....</b>	<b>21</b>
4.1	BALANCE LOAD .....	21
4.2	ELECTRICAL CALCULATION .....	21
4.2.1	PROTECTION AGAINST INDIRECT CONTACT VOLTAGE .....	22
4.3	PHOTOMETRIC CALCULATION .....	24
<b>5</b>	<b>MATERIAL SPECIFICATION .....</b>	<b>106</b>

<b>6 BILL OF QUANTITIES OF MATERIALS AND WORKS .....</b>	<b>113</b>
<b><u>III GRAPHIC DOCUMENTATION .....</u></b>	<b><u>123</u></b>
7.1 ABOUT FLOOR PLAN - ABOUT CONSUMPTION .....	124
7.2 BASE OF THE FLOOR - LIGHTING .....	125
7.3 SINGLE - POLE DIAGRAM OF THE EQUIPMENT TO BE INSTALLED IN THE MAIN DISTRIBUTION CABINET GRO .....	126
7.4 SINGLE- POLE SCHEME OF THE DISTRIBUTION CABINET R0-1 .....	127
7.5 SINGLE- POLE SCHEME OF THE DISTRIBUTION BOARD RT-2 .....	129
7.6 INSTALLATION ZONES .....	131



## **I TEXTUAL DOCUMENTATION**

## **1 TECHNICAL DESCRIPTION FOR WORKING**

### **1.1 Introduction**

The subject of this investment-technical documentation is the electrotechnical installations of high current of the High School of Electrical Engineering "Vaso Aligrudić", which is located at the location: kp 1193, KO Podgorica I, Municipality of Podgorica .

The documentation provides technical solutions at the level of General documentation - Adaptation object – installation of high current in accordance with the project task.

According to the architectural and construction solution, the existing premises of the part of the Machine block (on the first floor) of the Vaso Aligrudić electrical engineering school are being adapted for the needs of multifunctional cabinets, a multifunctional hall, a kitchenette and toilets. The building was built with a skeleton system of brick products, P+1 floors, and the clear height of the rooms is 3.25m.

The building is a combined reinforced concrete structure.

The project provides for:

- general consumption installations,
- lighting installations,
- installation of potential equalization.

During the development of this project, the appropriate legal provisions, special regulations, technical norms, quality norms, standards and professional recommendations were complied with .

The electrical installation project foresees new electrical installations in the designated areas: corridor, multifunctional cabinets, multifunctional hall, toilet and kitchenette, which are fully adapted to the requirements of new equipment and current standards.

In the part of the room that is located under the stairs, there is the existing main distribution cabinet GRO in which the existing equipment and the existing measurement are located and they are retained and are not the subject of this project. The measurement is planned for the subject part of the building - part of the Mechanical Block of the Electrical Engineering School. According to the received information about the measuring point, subscriber/prepaid number: 1986240/1918546; meter number: 13N9M5C2516602134; approved power: 34.5kW; consumption profile - Type 3, for consumption group: 0.4kV Other consumption without power measurement, two-tariff measurement.

With GRO, it is powered by the newly designed distribution cabinet RO-1, which is located in the corridor. The existing GRO is currently retained, and the project foresees a part of the equipment that needs to be installed.

The distribution board RT-2, located in the kitchenette, is laid with RO-1

All newly designed installations are with halogen-free insulation. Power cables to switch cabinets and switchboards are of appropriate cross-section with halogen-free insulation. The power cable is laid along the route shown in the graphic attachment, where the plan of the works foresees chipping and trimming for the needs of installing the cable, as well as restoring the surfaces to their original state.

In the premises, it is planned to replace worn-out and non-functional lamps with energy-efficient lighting. All newly designed lamps are with an LED light source, adapted to the purpose and installation conditions, according to the legend on the installation plans. The provided lamps correspond to the purpose and location of the rooms and have the appropriate degree of protection. Newly designed lamps provide lighting in the appropriate lx value on work surfaces, which is given in the attached photometric calculation .

## 1.2 Low -voltage electrical installations - technical description

### 1.2.1 LOW VOLTAGE CABLE CONECTION

With this part of the documentation, the electrical installations are processed from the main distribution cabinet GRO located in the technical room under the stairs, from which it is necessary to bring the power cable type N2XH-J 4x25+1x16mm<sup>2</sup> to the distribution cabinet in question, marked RO-1 on the drawing.

RO-1 is positioned in the corridor, next to the toilet marked - T.

From RO-1, the distribution board RT-2, which is located in the kitchenette, is also powered. For the power supply of the distribution board RT-2, the power cable N2XH-J 5x16mm<sup>2</sup> is laid .

The power cable must be laid on the wall and ceiling under the plaster. The conductors are laid in the wall with the creation of slits and the repair of damaged surfaces, as well as bringing the damaged surfaces to their original state. The scope of this project also includes the appropriate equipment, as well as the work required for their installation inside the existing main distribution cabinet.

### 1.2.2 DISTRIBUTION BOARDS AND POWER LINES

The point of electricity transmission in the subject part of the building is the distribution cabinet RO-1, which is fed from the existing distribution cabinet GRO with a power cable type N2XH-J 4x25+1x16mm<sup>2</sup> located in the room under the stairs. With RO-1, the distribution board RT-2 in the kitchenette is powered with a power cable type N2XH-J 5x16mm<sup>2</sup>.

Switchboards are installed in the position marked on the general consumption installation plan.

The RO-1 distribution cabinet and the RT-2 distribution board are intended for built-in installation, suitable dimensions, protection degree IP40, with the introduction of cables from the lower and upper sides for housing and interconnection of equipment.

Part of the consumers located in the premises: toilets, part of the corridor, M6, M1, M3 and M2 are supplied with RO-1, while consumers in the premises: part of the corridor, MPS, M5 and M4 are supplied with RT-2.

Switchboards and cabinets of part of the building consist of a field of automatic switches (fuses) appropriately dimensioned. Switchboards and cabinets should be made and equipped in everything according to single-pole schemes and material measurements.

Power cables are laid partly on the wall and ceiling under the plaster (type C distribution), according to the attached drawing.

In the front part of the project, there is a selection and verification of the cross-section of the power cables to the switchboard of the facility, as well as from the switchboard to the end consumers. In the rooms: M1, M2, M3, M4, M5, M6, MPS and the kitchenette, the floors are changed, and the distribution of cables can be done through halogen-free installation hoses of the appropriate diameter, under the concrete floor covering.

### 1.2.3 ELECTRICAL INSTALLATION OF GENERAL CONSUMPTION AND HEATING

For the needs of general consumption, according to the purpose of this building, the required number of single-phase sockets and connectors is provided, as indicated on the electrical installation plans.

**IT SHOULD BE NOTED THAT THE LAYOUT OF THE CONNECTORS IS GIVEN IN ACCORDANCE WITH THE GIVEN LAYOUT OF THE EQUIPMENT. IN THE EVENT THAT THERE IS A CHANGE IN THE LAYOUT OF THE EQUIPMENT, ALIGN THE POSITION OF THE CONNECTION POINTS WITH THE SAME.**

Within the subject part of the building, the installation of general consumption should be carried out with cables of type N2XH-j 5x2.5mm<sup>2</sup>; N2XH-j 3x2.5mm<sup>2</sup> laid partly on the wall and ceiling under the plaster, and partly through the installation halogen free pipes under the concrete floor screed.

On the electrical installation plans, the required installation heights of the sockets are marked (along with the number of the circuit).

Protection against indirect contact voltage is provided by the TN-CS protection system as well as by differential current protection devices.

#### 1.2.4 ELECTRICAL LIGHTING INSTALLATION

In the subject part of the building, an appropriate lighting installation is provided, adapted to the purpose and installation conditions, according to the legend on the installation plans. The provided lamps correspond to the purpose and location of the rooms and have the appropriate degree of protection.

Lighting control within the subject part of the building is provided via ordinary switches, and in the corridor and toilet room it is controlled via motion sensors (detectors).

The switches are mounted at a height of 1.2 meters from the finished floor.

The installation inside the building should be carried out with conductors type N2XH-J 3x1.5 mm<sup>2</sup> laid partly on the wall and ceiling under the plaster.

#### 1.2.5 EMERGENCY LIGHTING INSTALLATION

Taking into account the purpose of the subject part of the building, safety (necessary) lighting was also designed in the subject part of the building (dental office and corridor), and for this purpose, the installation of lamps for necessary lighting is planned, as indicated on the installation plan.

The provided lamps provide the necessary lighting for 3 hours in the event of a power failure. The installation should be carried out on a separate circuit, conductors type N2XH-j 3x1.5mm<sup>2</sup> laid partly on the wall and ceiling under the plaster, whereby the mentioned lamps are connected directly, via the fuse located in the distribution board.

Construction, method of execution, method of mounting, insulation class of electrical equipment and materials correspond to the nominal network voltages and environmental conditions.

#### 1.2.6 INSTALLATION OF POTENTIAL EQUALIZATION

In accordance with the Technical Regulations for the execution of electrical installations, an installation for equalization of potential is provided.

Connect all metal masses to protective busbars inside the associated RT with 1x6 mm<sup>2</sup> conductors with halogen-free insulation.

#### 1.2.7 LIGHTNING PROTECTION INSTALLATION AND GROUNDING

As it is about the adaptation of part of the building, the lightning protection installation and grounding are included in the basic project and as such are not the subject of this project.

## 2 TECHNICAL REQUIREMENTS FOR PERFORMING LOW VOLTAGE

### 2.1 Overview of technical solutions for implementation of health and safety

#### measures

#### **A. Electricity hazards**

High current electrical installations, under certain conditions, can cause dangers and damages as a result:

- short circuit currents
- overload currents
- illegal voltage drop
- accidentally touching live parts
- occurrences of high touch voltage
- the influence of moisture, water and dust on electrical equipment
- the effect of the installation on the occurrence of fire and explosion

In order to prevent the aforementioned phenomena, the project envisages the following protection measures:

1. The entire installation is protected against short circuits and overloading of the corresponding fuses.
  2. The entire installation is dimensioned in such a way that the voltage drops, under normal conditions, do not exceed the permitted values. In emergency conditions, the protection will shut down the corresponding circuit.
  3. All equipment is selected in such a way that it is impossible to accidentally touch live parts, and to protect against the occurrence of too high contact voltage in the installation, a protective grounding system with a special protective water, the TNS system, has been applied. take measurements:
    - loop resistance
    - efficiency of potential equalization (the resistance between the protective contact of the electrical installation and metal parts of other installations must not exceed the value of  $2\Omega$  in any room of the facility).
    - grounding resistance
- During exploitation, periodically, and at the latest every second year, check loop resistance, potential equalization efficiency and grounding resistance.
4. Electrical installations are protected from the influence of moisture and dust by the correct selection of cables and equipment in accordance with the conditions prevailing at the installation site.
  5. The object is protected from fire or explosion, which could occur due to the effect of electrical installations, by the correct selection and dimensioning of fuses, switches and other equipment.

#### **B. Supervision**

1. If necessary, the supervisory service can make minor changes to the project, otherwise the consent of the Investor and the designer is required
2. All changes to the approved project must be made by the Contractor in the project, which will be handed over to the Investor after the completion of the works.
3. The warranty period for the performed works will be determined by the Performance Agreement.

#### **C. Testing requirements**

1. The results of measuring the resistance of the loop between the conductors, as well as between the conductors and the earth, must be entered in the construction diary.
2. The fault current in each individual measured part of the installation in dry and wet rooms must not exceed 1mA, i.e. the resistance must be at least 1000 Ohms for each volt of the nominal voltage (for a voltage of 380/220V, the resistance is 380/220 k $\Omega$  -a)
3. The project includes the delivery of complete materials, transport, assembly and preparatory finishing works.
4. The Investor's consent is required for the performance of unforeseen or planned works.
5. Commissioning of installations can only be done after the technical acceptance and obtaining the work permit.

## **2.2 General and technical requirements for executing works**

These conditions are an integral part of the Project and as such oblige the Investor and the Contractor to adhere to these conditions, among other things, when making the designed installations, because they contain many elements that are not mentioned in the technical description and the rest of the text, and are important for the execution works. Therefore, when creating the designed installations, it is necessary to adhere to the following.

1. The entire electrical installation must be carried out according to the attached plans, these conditions and valid JUS regulations for the execution of electrical installations of high and low current, i.e. the Rulebook on technical norms for low-voltage electrical installations ("Official Gazette of SFRY" No. 53/88, 54/88 and 29/95).
2. Before starting the works, the Contractor is obliged to familiarize himself with the Elaborate in detail and to submit all his objections, if any, in a timely manner to the Investor, i.e. to the supervisory authority.
3. The investor is obliged to provide professional supervision over the execution of the works during the entire construction of the building.
4. Before the start of the works, the contractor is obliged to familiarize himself with the object on site, and if he finds that certain changes are necessary, due to construction changes, he must inform the supervisory authority about this and obtain the necessary consent from him for possible changes.
5. If, during construction, a justified need arises for certain deviations or minor changes in the Project, the Contractor is obliged to obtain the approval of the supervisory authority for any such deviation or changes. If necessary, the supervisory authority will inform the designer of the proposed change and ask for his consent.
6. Based on the given Elaboration, the Contractor will only start work after the review and approval by the Supervisory Authority.
7. All installation material and equipment that will be used to perform these installations must meet the standards and be of first-class quality. Material that does not meet these conditions must not be used.
8. When performing these works, care must be taken to damage the already performed works and existing structures as little as possible. In the same way, work coordination should be carried out, in order to avoid mutual interference during the work of different phases.
9. During the execution of the works, the Contractor is obliged to keep a correct construction diary, with all the data that such a diary provides, and all requests and announcements, both by the Supervisory Body and by the Contractor, must be communicated through the construction diary.
10. For the correctness of the performed works, the Contractor guarantees for 2 years, counting from the date of technical acceptance of the object. All breakdowns and malfunctions, which would appear during that period, either due to the use of bad materials or unsound workmanship, must be removed by the Contractor without any compensation.
11. Upon completion of the works, the Contractor should perform the necessary tests of the installations and obtain the appropriate certificates.

### **2.2.1 GENERAL PROVISIONS**

1. Devices and equipment for electrical installations must be suitable for the operation of the installation at the rated voltage of the electrical installation.  
Electrical equipment must withstand the currents that flow during normal operation as well as in emergency circumstances, during the time allowed by the characteristics of the protection device.

Electrical equipment, when switched on and off, must not adversely affect other equipment. Equipment, including conductors and cables, must be located so that it can be easily inspected, maintained and its connections accessed and handled. The above also applies to equipment installed in the housing.

2. Labels and other identification means must be placed on switchgear to indicate their purpose. Control elements and signaling elements must be placed in easily accessible and visible places.

3. Insulated conductors and cables must be laid and marked so that they can be easily identified during testing, repair or replacement. Protective conductor (PE) or protective-neutral conductor (PEN) is marked with a combination of green and yellow colors, and neutral (N) with light blue color. These colors may not be used for any other marking. Marking can also be done at the end of the conductor near the joint, especially when the conductors are not insulated.

4. The protection device must be placed and marked so that their associated circuit can be easily recognized. The protection device must be placed in the switching block /distribution panel/.

5. Schemes, diagrams or tables of low-voltage electrical installations must be placed in places where there are multiple circuits, so that they indicate the nature and composition of the circuits and the characteristics for distinguishing devices for protection, switching on and off, as well as the place of their installation and isolation.

6. In the switching block/panel/, the electric must be placed and grouped. equipment of the same type of current and voltage so that there can be no mutual harmful effects.

### 2.2.2 WIRING

1. The connection of conductors and other electrical equipment must be made in such a way that it is safe and placed in such a way as to allow the possibility of constant checking. The joint must be secured by means appropriate to the material of the conductor and its cross-section. The joint must be accessible after removing the cover or partition with a tool, and access must have a degree of protection of at least IP 2X, according to JUS N.A5.070.

2. Insulated conductors and cables must not be continued in installation pipes and installation channels. They can only be connected in installation boxes, cable connectors or switching blocks, and the connection points must be insulated with the degree of insulation that corresponds to the type of electrical distribution. Exceptionally, in walls that are assembled from elements poured from concrete, the connection can also be made in wall socket boxes, provided that the depth of those boxes allows the placement of connections of the same circuit.

3. The mutual connection of the electrical installation or the connection of the electrical distribution with the electrical equipment must be made so that the electrical distribution is not exposed to pulling or twisting forces. If the effect of forces cannot be avoided, a relief system must be provided.

4. The connection must be made so that there is no reduction in cross-section or damage to the conductor and insulation. Permanent sealing must be performed at the ends of the electrical distribution, especially at the entrances and exits, as well as at the points where the electrical distribution penetrates through walls and electrical equipment.

5. If there are other non-electrical installations near the electrical outlet, such a distance must be provided between them that the maintenance of one installation does not endanger other installations. The minimum permitted distance is 30 mm. If there are heating installations, hot air pipes or a chimney near the electrical distribution, the electrical distribution must be insulated with thermal insulation or screens or it must be placed away from thermal influences.

6. The electrical distribution must not be placed under a non-electrical installation on which condensation of water or other liquids is possible. The electric distribution must not be installed in the same installation channel, pipe or similar, with other non-electrical installations, and if this cannot be avoided, protection against indirect contact

must be ensured by automatically disconnecting the power supply or applying insulation for class II equipment and must install appropriate protection against dangerous influences of other installations. The metal parts of the electrical distribution that are exposed to condensation must be protected from corrosion from the outside and inside and must have a condensate drain provided.

7. If the electrical distribution is installed on the wall, the minimum permissible voltage between the elements of the electrical distribution and the wall is 5 mm. The electrical distribution of a lower voltage must not be installed in the same casing or pipe, nor near the electrical distribution whose voltage is higher, unless there is an insulating partition between the two distributions that withstands the test voltage of the electrical distribution of a higher voltage. In the same installation pipe or inst. conductors of only one circuit can be installed in the channel, except for the conductors of control and auxiliary circuits.

8. El. the distribution must be placed so that in the event of a malfunction it does not endanger the environment. Distribution boxes for cables or conductors that are laid under plaster must be made of insulating material or of metal with insulating lining and inlets made of insulating material. For attaching el. means of separation can be used and procedures that do not cause deformation or damage to the insulation can be used, such as: plastering, clips made of insulating material adapted to the shape and cross-section of the cable, gluing or riveting with nails with supporting plates made of insulating material.

9. Cables laid directly under the mortar and in the wall must be covered with mortar of min. 4 mm thickness along their entire length. Exceptionally, they do not have to be covered with plaster if they are laid in the cavities of ceilings and walls made of concrete or a similar material that does not burn or helps burn.

10. Cables and installation conductors laid in installation pipes in the wall or cables laid directly in the plaster and under the plaster must be guided vertically and/or horizontally so that they are parallel to the edges of the room. When laying them horizontally, they are placed at a distance of 30 cm to 110 cm from the floor and 200 cm from the floor to the ceiling. When laying cables and conductors vertically, the distance from the edges of windows and doors must be at least 15 cm. Routes of cables feeding fixed water heaters must coincide with the axis of the heater. Slanted laying of cables and installation conductors is allowed in ceilings, but not in walls.

11. Laying cables on the wall is allowed if the cable has insulation from thermoplastic materials with filling and sheath, if they are laid on clips on the wall and if it is additionally mechanically protected from the floor up to a height of 2 m from the floor. Junction boxes and other accessories that are placed on the wall along with the laying of cables must have sealing inlets and a degree of protection, at least IP 5X determined for wet rooms, that is, an appropriate degree of protection determined for other rooms.

12. Cables without filling, such as PP/R type, may be laid only in dry rooms, under plaster, and in ceiling cavities and concrete walls, etc. non-combustible material and without covering with plaster. The specified cables must not be laid in a bundle, placed in installation channels or under plasterboard panels, regardless of the way they are attached, and they must not be laid on combustible materials or when covered with plaster.

### 2.2.3 DISTRIBUTION BOARD

1. Switchboards of the closed or hermetic type are installed at 1.7 m from the floor, and open boards at 2.5 m from the floor. Distribution cabinets in installations must meet the following conditions:

- the external appearance of the wardrobe must not violate the idea of the interior designer;
- they must be mounted either in the wall, or freestanding on the wall;
- meters must be separated from other built-in equipment;
- the door must have a lock with a key;
- all clamps on the built-in equipment must be accessible from the front. In normal operation, all terminals and parts of the equipment that are under voltage must be protected against contact.

2. Live parts of the control or distribution block must be 20 mm away from the housing, and a smaller distance is allowed only if insulated partitions are used .



#### 2.2.4 INSPECTION AND TESTING

Each electrical installation must be inspected and tested during installation or when it is finished, but before handing over to the user. When checking and testing, measures must be taken for personal safety and protection against electrical damage and other equipment. If the electrical installation is changed, it must also be checked and examined whether the electrical installation is in accordance with the provisions of the Rulebook.

#### 2.2.5 GENERAL NOTES AND OBLIGATIONS

1. During the development of this project, all requirements of valid technical regulations, Yugoslav standards, as well as the Law on Occupational Safety ("Official Gazette of SRCG" No. 79/04) were respected.
2. Electrical equipment and materials foreseen by this project must correspond to the corresponding JUS.
3. The work organization is obliged to inform the competent authority about the start of the work 8 days before the start of the work.
4. The labor organization is obliged to implement all prescribed normative acts in the field of occupational safety and to familiarize workers with working conditions and sources of harm and danger, as well as protection measures.
5. RO is obliged to determine jobs with special working conditions, if such positions exist.
6. Everywhere, where the regulations require it, it is necessary to place visibly marked inscriptions with warnings about:
  - voltage height,
  - purpose of certain equipment, i
  - other important notifications.
7. During interventions in TS, RT and installations, the professional person is obliged to apply protective equipment and means.

#### 2.2.6 INSTRUCTIONS FOR THE MANAGEMENT OF CONSTRUCTION WASTE, OR HAZARDOUS WASTE GENERATED DURING THE CONSTRUCTION, USE OR REMOVAL OF THE BUILDING, IN ACCORDANCE WITH A SPECIAL REGULATION

The waste generated during the construction of high-current electrical installations belongs to non-hazardous solid waste and does not have the characteristics of hazardous waste. The phases of managing this waste are the transport and disposal of solid waste, which includes the collection of waste in the vehicle and transport to the designated disposal location where the vehicle is unloaded. Waste collection is the activity of systematic collection, sorting and/or mixing of waste for transport. The works provided for in this project are exclusively of the prescribed nature of the classic execution of construction works. Take the excavated material to the landfill. Parts of the installation material will be brought to the construction site and installed. The resulting waste, material during preparatory work, the remains of the packaging of individual elements that are installed, etc., must be carefully picked up and taken to the designated landfill. After the completion of the works, arrange the entire used belt of the construction site and restore it to its original condition, return the excess material to the warehouse.

##### *Environmental protection measures*

Environmental protection measures consist, first of all, in the selection of quality materials, their proper installation, and regular monitoring and maintenance of the planned buildings. In addition, the rehabilitation of the construction site will refer to the arrangement of the environment after the completion of construction.

##### *Fire protection measures*

When applying fire protection measures, comply with the Law on Protection and Rescue (Official Gazette of the Republic of Croatia 13/07, 32/11 and 54/16).

During the execution of the designed works, it is necessary to accurately determine the position of the existing electrical installations. Pay special attention to easily flammable materials that can cause a fire on the construction site (oil, boards, beams, slats, etc.). Such materials should be kept away from heat sources and stored in appropriate fireproof areas.

*Rehabilitation of the environment*

After the completion of the works, the entire used belt of the construction site should be arranged and restored to its original condition, the excess material should be returned to the warehouse, and the waste material from the construction site should be taken to the appropriate landfill. Road and pedestrian surfaces should be repaired, grass areas should be planned and sown with grass, and road canals should be cleaned. When carrying out the works, all planned excavations in the vicinity of existing installations should be carried out manually, taking care not to damage existing installations and to damage the roots as little as possible.

### **3 LOW VOLTAGE QUALITY CONTROL AND ASSURANCE PROGRAM**

#### **3.1 General conditions**

This rulebook regulates the procedure and determines the deadlines for carrying out periodic inspections and tests of work equipment, equipment and personal protection at work and working environment conditions.

Means of work, in terms of this rulebook, are:

- means of work with increased dangers to the life and health of employees (hereinafter: certain means of work) who work with them and come into contact during work, namely: presses, scissors, cranes and other means of internal transport, construction machines, machines for processing and processing metals and similar materials, machines for processing and processing wood and similar materials, baths with nitrate salts, acetylene developers and acetylene stations, pressure vessels and pipe network, mobile closed pressure vessels and associated installation, compressors and compressor stations as well as electric power, i.e. electrical and lightning protection installations and
- means of work that do not pose an increased danger to the life and health of employees (hereinafter: other means of work).

#### **3.2 Periodic inspections and testing of certain means of operation**

Periodic inspections and tests of certain means of work are carried out in accordance with the regulations on occupational safety, standards, technical regulations, manufacturer's instructions and the provisions of this rulebook, in order to determine whether safe work is ensured by the measures applied, and especially whether:

- instructions for work, assembly and disassembly methods, as well as for handling and maintenance have been prepared,
- the place where a certain work tool is placed corresponds to the regulations, especially with regard to free areas and passages, the operator's position, etc.,
- the foundations were made in accordance with the regulations and manufacturer's instructions,
- signs with prescribed data that are important for employees have been placed,
- are measuring, regulating, safety or control devices installed and whether their correctness is ensured,
- are devices and devices for switching on and off, signal devices and signal management devices installed in accordance with the designer's requirements, technical regulations, manufacturer's instructions, standards and regulations on occupational safety, whether they work reliably, whether they are secured against unintentional inclusion, whether there are signs of the direction of movement and action, inclusion and exclusion, as well as whether the movements and actions of certain means of work or their parts are carried out according to the signs that are located and show the way of their use,
- devices for protection against moving parts, physical, chemical, biological harm and microclimate have been installed or installed and whether their effective functioning is ensured,
- measures to prevent the occurrence of noise, vibrations, harmful and dangerous substances, dust, steam, etc. have been applied to certain means of work. and whether a concentration above the maximum allowed in the working environment is created,
- due to use or transport, there have been changes that can lead to phenomena (breakage, weakening of materials due to fatigue, etc.) that threaten the safety and health protection of employees,
- are certain means of work that are interconnected into a functional unit, and which are used constantly or occasionally in the work process, are safe for work as a functional unit and
- the electrical installations are carried out in accordance with the regulations, especially with regard to ensuring the effectiveness of protection against dangerous contact voltage (proper connection, measurement of the distance between conductors, selection and adjustment of control devices, selection of equipment and protection measures against external influences, etc.).

Periodic inspections and tests of certain work equipment are carried out while they are at rest and in operation (static and dynamic tests).

Through periodic inspection and testing from the point of view, the functionality of their parts is checked, as well as measurements with instruments and equipment, while they are unloaded and at the highest permissible load, according to the order of use that is determined technologically and structurally, with the use of all devices and tools that are used on a certain means of work. Periodic inspections and tests of certain means of work are carried out in such a way that when defects are found in some part, inspections and tests may not be continued in other parts, if they are functionally related, until the identified defects are removed. During the inspection and testing of certain work equipment, safety measures at work must be applied, especially with regard to the installation of protective devices and the safe way of working of the person performing the inspection and testing.

### 3.3 Inspections and tests of electrical installations

Inspections and tests of explosion-proof devices and electrical installations are carried out in order to select appropriate explosion-proof protection and implement appropriate protection measures, such as ensuring:

- reports on individual inspections and tests of explosion-proof devices from domestic suppliers of devices with appropriate explosion protection marks,
- certificate of the authorized commission for imported devices in anti-explosion protection with anti-explosion protection marks,
- bridging of metal masses in order to equalize the potential and prevent the appearance of electrostatic charges,
- marking the borders of danger zones according to the project,
- floors of rooms made of non-sparking material (for rooms where mixtures of explosive gases are developed that are ignited with low energy),
- a warning plate about the danger of introducing an open flame as well as sparking tools,
- appropriate schemes and inscriptions (on the type of protection against touch voltage, on current circuits, distribution batteries, cabinets, etc.),
- properly selected thermal protection of electric motors and other devices connected to the electrical installation,
- the appropriate choice of protection against electric shock,
- conductors correctly laid and mechanically protected in places at risk from mechanical damage,
- correct connection of conductors,
- identifying neutral and protective conductors and
- free space for access to the installation for maintenance.

In order to determine the correctness of the explosion-proof electrical installation, the following inspections and tests are performed:

- checking the continuity of the protective conductor and the conductor for potential equalization,
- measuring the resistance of the grounding device in accordance with the standard jus N.B2.762,
- measuring the impedance of the fault loop in accordance with the jus N.B2.763 standard,
- checking the operation of the differential current protective device in accordance with the standard jus N.B2.764,
- measurement of conductor insulation resistance,
- checking protection by electrical separation,
- checking the resistance of the floors in accordance with the standard jus N.B2.761,
- checking permanently installed explosive concentration meters i
- checking of permanently installed humidity meters in the room where a certain percentage of humidity is maintained as a protective measure against static electricity.

Periodic inspections and tests of explosion-proof devices and electrical installations are carried out:

- before commissioning,
- after reconstruction or adaptation,
- after cessation of use for more than six months i
- within 24 months of the previous examination and examination.

Inspections and tests on the electrical installation that is not in explosion protection are carried out in order to prove whether the electrical installation was carried out in accordance with the regulations on occupational safety, standards and other regulations from the electrical industry.

The inspection checks the electrical installation in a de-energized state, and in particular:

- whether the electrical installation was done in accordance with the project, i.e. with a single-pole scheme,
- whether the choice of equipment and protection was carried out according to external influences and the JUS standard. NB2. 730,
  - is the neutral and protective conductor distinguished,
  - is the presence of schemes and warning plates and other similar information ensured,
  - whether the conductors and devices are installed in the prescribed manner, ensuring the identification of fuse circuits, clamps, etc.,
  - method of connecting conductors i
  - accessibility for operation and maintenance.

In the case of earthing installations and lightning protection installations, special attention must be paid to common bias voltages between low voltage power installations and communication lines that supply the devices.

Testing of electrical installations checks, in particular:

- insulation resistance (low-voltage and high-voltage installations and insulation resistance of power transformers),
- loop resistance of protected circuits (JUS. NB2. 730) i
- grounding resistance.

Periodic inspections and tests of electrical installations are carried out:

- before commissioning,
- after reconstruction or adaptation,
- after cessation of use for more than six months i
- within 36 months of the previous examination and examination.

### **3.4 Inspections and testing of means and equipment for personal protection at**

#### **work**

Periodic inspections and tests of means and equipment of personal protection at work are carried out in order to determine:

- whether they are made in accordance with the regulations on occupational health and safety,
- whether they were made and whether the means were accompanied by instructions for their purpose and method of testing, maintenance and use,
- are the means and equipment of personal protection at work adapted to the purpose in relation to the means for work and the working environment,
- whether the means and equipment of personal protection at work have the following information clearly displayed: type, type, series, purpose, serial number and
- do they have certificates on the quality of the materials from which they are made.

Inspections and tests of the means referred to in paragraph 1 of this article are carried out in the manner, according to the procedure and within the deadlines established by the regulations on occupational safety, standards, technical regulations and manufacturer's instructions.

### **3.5 Periodic testing of the working environment**

In accordance with occupational safety regulations, standards and other regulations, work rooms and workspaces in which the following occur or are created due to technical-technological and other work processes are subjected to periodic testing of the working environment.

1. physical damage,
2. chemical damage,
3. biological damage,
4. harmful radiation i
5. unfavorable microclimatic conditions.

Examinations from paragraph 1 of this article determine whether the working environment meets conditions that will not lead to occupational diseases and occupational diseases.

**During the development of the project, the following technical regulations, standards and literature were applied:**

Rulebook on technical norms for low-voltage electrical installations

("SL. list SFRJ" no. 53/88),

- Requirements for security JUS N.B2.741/1989
- Rulebook on technical standards for the protection of buildings against atmospheric discharge ("Sl. list SFRJ" no. 11/96),
- Yugoslav standards - lightning protection installations - general conditions JUS IEC 1024 -1/1996
- Law on fire protection ("Official Gazette of the Republic of Croatia" no. 79/04),
- Law on Health and Safety at Work ("Official Gazette of SRCG" No. 34/14),
- Law on space planning and construction of buildings "Official Gazette of Montenegro" no. 064/17 from 06.10.2017.
- Technical recommendation - Typification of measuring points (EPCG - Podgorica 2009) TP2ED
- Technical recommendation - for consumer connections to the low-voltage network (TP-2 amended edition-Podgorica 2008)
- General conditions for the delivery of electricity ("Official Gazette of the Republic of Croatia" No. 1/90)
- Rulebook on the supply of electricity (Official Gazette of the Republic of Croatia No. 13/05)
- MEST HD 60364-4-41:2011 - Low-voltage electrical installations - Part 4-41: Safety protection – Protection against electric shock
- MEST HD 60364-4-42:2011 - Low-voltage electrical installations - Part 4-42: Safety protection – Protection against electric shock
- MEST HD 60364-4-43:2011 - Low-voltage electrical installations - Part 4-43: Safety protection - Overcurrent protection
- MEST HD 60364-5-51:2011 - Electrical installations on buildings - Part 5-51: Selection and installation of electrical equipment - General rules
- MEST HD 60364-5-52: 2011 - Electrical installations on buildings - Part 5-52: Selection and installation of electrical equipment - Wiring systems
- MEST HD 60364-5-534:2011 - Low-voltage electrical installations - Part 5-534: Selection and installation of electrical equipment - Isolation, disconnection and control - Clause 534: Surge protection devices.
- MEST HD 60364-5-54:2011 - Electrical installations on buildings - Part 5-54: Selection and installation of electrical equipment - Earthing methods, protective conductors and connecting protective conductors
- MEST HD 60364-7-701:2011 - Low-voltage electrical installations - Part 7-701: Requirements for special installations or locations - Locations where bathtubs or shower cubicles are located
- MEST EN 50274: 2010 - Low-voltage switchgear - Protection against electric shock - Protection against accidental direct contact with dangerous active parts
- MEST EN 61543: 2009 - Residual current protective devices (RCDs) for household and similar use - Electromagnetic compatibility
- MEST EN 50525-2-31:2011 - Electric cables - Low-voltage power cables of nominal voltages up to and including 450/750 V (U0/U) - Part 2-31: Cables for general purposes - Unshielded single-core cables with thermoplastic PVC insulation
- MEST EN 61140:2010 - Protection against electric shock - Common aspects for installation and equipment

- MEST EN 1838:2011 - Application of lighting - Lighting in emergencies
- MEST EN 60529:2010 - Degrees of protection provided by enclosures (IP code)
- MEST EN 50368:2008 - Cable fasteners for electrical installations
- MEST EN 50425:2009 - Switches for household and similar permanent installations
- MEST EN 60269-1:2010 - Low-voltage fuses - Part 1: General requirements
- MEST EN 60269-1:2010/A1:2010 - Low-voltage fuses - Part 1: General requirements
- MEST EN 60320-1:2008 - Plug-in accessories for household and similar general purpose appliances - Part 1: General requirements
- MEST EN 60320-2-2:2008 - Plug-in accessories for household and similar general purpose appliances - Part 2-2: Inter-plug (connector) accessories for household and similar equipment
- MEST EN 60670-1:2010 - Boxes and enclosures for household electrical appliances and similar fixed electrical installations - Part 1: General requirements
- MEST EN 60670-22:2010 - Boxes and enclosures for household electrical appliances and similar fixed electrical installations - Part 22: Particular requirements for junction boxes and enclosures
- MEST EN 60730-2-14:2009 - Electrical appliances for automatic control in household and similar use - Part 2-14: Particular requirements for electrical actuators
- MEST EN 60898-1:2010 - Electrical accessories - Circuit breakers for overcurrent protection for household and similar installations - Part 1: Circuit breakers for alternating current (ac)

## **II NUMERICAL DOCUMENTATION**



## 4 CALCULATION

### 4.1 BALANCE LOAD

The simultaneous load of a part of the object is taken from the single-pole schemes, and the total load of the part of the object is obtained by multiplying with the simultaneity factor (determined by experience).

**Peak load at the level of the newly designed part of the building (GRO):**

$$P_{\Sigma} = P_{\Sigma} \times k_j = ( (44.14 \times 0.78) + 1.0 ) \times 0.97 = ( (34.42 + 1.0) \times 0.98 ) = (35.42 \times 0.97) = 34.5 \text{ kW}$$

**Total power at the level of the newly designed part of the building:**

$$P_{\Sigma} = P_{\Sigma} / \cos \varphi = 34.5 / 0.95 = 36.315 \text{ kVA}$$

Estimation of electricity consumption. energy at the level of one year for the facility:

$$P_{GP} = 52,000 \text{ kWh}$$

As it is a project of adaptation of the existing classrooms and offices, i.e. replacement of the existing sockets and lamps in the relevant part of the building, while no larger consumers were added, we can conclude that there was no increase in simultaneous power and therefore the existing power cables and metering are retained.

### 4.2 ELECTRICAL CALCULATION

The electrical calculation is tabulated in two parts:

- Selection of lines and conductors for permanently permitted currents, according to JUS N.B2.752 with verification of protection against overload, according to JUS N.B2.743 (table 5.)
- Check for voltage drop (table 6.)

The simultaneous (peak) current of the cable, on the basis of which the cross-section of the cable will be checked, will be calculated according to the formula:

$$I_b = \frac{P_{\Sigma}}{\sqrt{3} \times U_n \times \cos \varphi} \quad A \quad (2.12)$$

wherein:

- $\cos \varphi$  - power factor
- $P_{\Sigma}$  - transmission power of the cable
- $U_n = 400 \text{ V}$  - nominal voltage

The cross-section of the cables selected in this way will also be checked on the criterion of the permitted voltage drop from the PMO to the point of connection. The check will be carried out according to the form:

$$u\% = \frac{10^5 \sum P_{vn} \times l}{k \times U_n^2 \times S} (\%) \quad (2.13)$$

wherein :

- $P_{vn}$  - peak power
- $l$  (m) - the length of the cable on the calculated section
- $U_n = 400$  V - nominal voltage
- $k = 53.3$  cm/mm<sup>2</sup>

#### 4.2.1 Protection against indirect contact voltage

The project envisages a protection system against indirect contact voltage TN-CS, i.e. from the TS to the "PMO" TN-C connection-measuring cabinet, and the TN-S system in the installation.

The Fe/Zn 25x4 mm strip laid in the cable trench is connected to the grounding of the facility with the protective busbar and single-potential busbars in the PMO. This fulfills the condition of connecting all masses (exposed visible parts) to the grounded point of the system. From the TS to the PMO cabinet, the function of the protective conductor is taken over by the neutral conductor (PEN conductor), given that the selected sections meet the requirements of the JUS N.B2.754 standard. and that in the PMO of the building it is planned to connect the neutral bus with a strip of Fe/Zn 25x4 mm to the grounding of the building.

The basic condition of protection in the applied system of protection against indirect contact by automatic shutdown of the power supply, in the time provided according to JUS N.B2. 741 for the TN-CS protection system, is satisfied if the condition is met:

$$Z_k \times I_a \leq U_0 \quad (2.25)$$

where is:

- $U_0$  - nominal voltage to earth (V),
- $Z_k$  - the impedance of the fault loop that includes the source, the phase conductor to the fault point and the protective conductor between the fault point and the source (  $\Omega$  ),
- $I_a$  - the current that ensures the operation of the protective device for automatic shutdown in time (for 220 V - 0.4 sec.) or 5 sec for power supply circuits.

At the same time, this system effectively protects the cables themselves from the occurrence of a short circuit.

In the next part of the project (Table 4, Table 5) the check of automatic disconnection is presented in a tabular manner, where the most critical case in the installation of the facility is assumed, that is, for the section with the highest impedance of the fault loop.

**Table 5:** Selection of conductors for permanently permitted currents according to JUS N.B2. 752 with overload protection check according to JUS N.B2. 743

Relation		Installed power P (W)	Factor once-minority	Pvt (W)	Ib (A)	Type and section cable (mm <sup>2</sup> )	Type divorce according to	Permanently permission current Id (A)	Correction. groups current circles K1	factor temp Surroundings K2	Permanently bearable current From (A)	More-a doublet nominal electricity K	Adopted fuse In (A)	1.45xIz/K	Comment: How is it: Ib=<In<=Iz i In<=1.45xIz/K that selected cable cross-section
							according to JUS N. B2. 752						N.E5.206		
FROM TO															
GRO	RO-1	44140	0.78	34,429.20	49.69	N2XH-J 4x25	C	119	0.7	1	83.3	1.45	63	83.3	satisfies
RO-1	RT-2	27370	0.75	20,527.50	29.63	N2XH-J 5x16	C	96	0.7	1	67.2	1.45	40	67.2	satisfies
GRO	p. circle no. 0	100	1.00 am	100.00	0.14	N2XH-J 5x2.5	C	30	0.7	1	21	1.45	16	21.0	satisfies
RT-2	pp. circle no. 1	2000	1.00 am	2,000.00	8.70	N2XH-J 3x2.5	C	33	0.7	1	23.1	1.45	16	23.1	satisfies
RT-2	pp. circle no. 27	310	1.00 am	310.00	1.35	N2XH-J 3x1.5	C	24	0.7	1	16.8	1.45	10	16.8	satisfies

**Table 6:** Checking the section of the selected conductor for voltage drop according to JUS N.B2. 752

Relation		Installed power P (W)	Factor one-time minority	Length l (m)	k (cm/mm <sup>2</sup> )	Cross section conductor (mm <sup>2</sup> )	Stress (C)	P overvoltage			Comment allowable drop voltage according to Article 20 of the Rules
								to the relationship %	in a relationship %	total %	
FROM TO											
GRO	RO-1	44140	0.78	26	53.6	N2XH-J 4x25	400	1,000	0.418	1.418	satisfies
RO-1	RT-2	27370	0.75	29	53.6	N2XH-J 5x16	400	1.418	0.434	1.851	satisfies
GRO	p. circle no. 0	100	1.00 am	15	53.6	N2XH-J 5x2.5	400	1,000	0.007	1.007	satisfies
RT-2	pp. circle no. 1	2000	1.00 am	11	53.6	N2XH-J 3x2.5	230	1.851	0.310	2.162	satisfies
RT-2	pp. circle no. 27	310	1.00 am	28	53.6	N2XH-J 3x1.5	230	1.851	0.204	2.055	satisfies

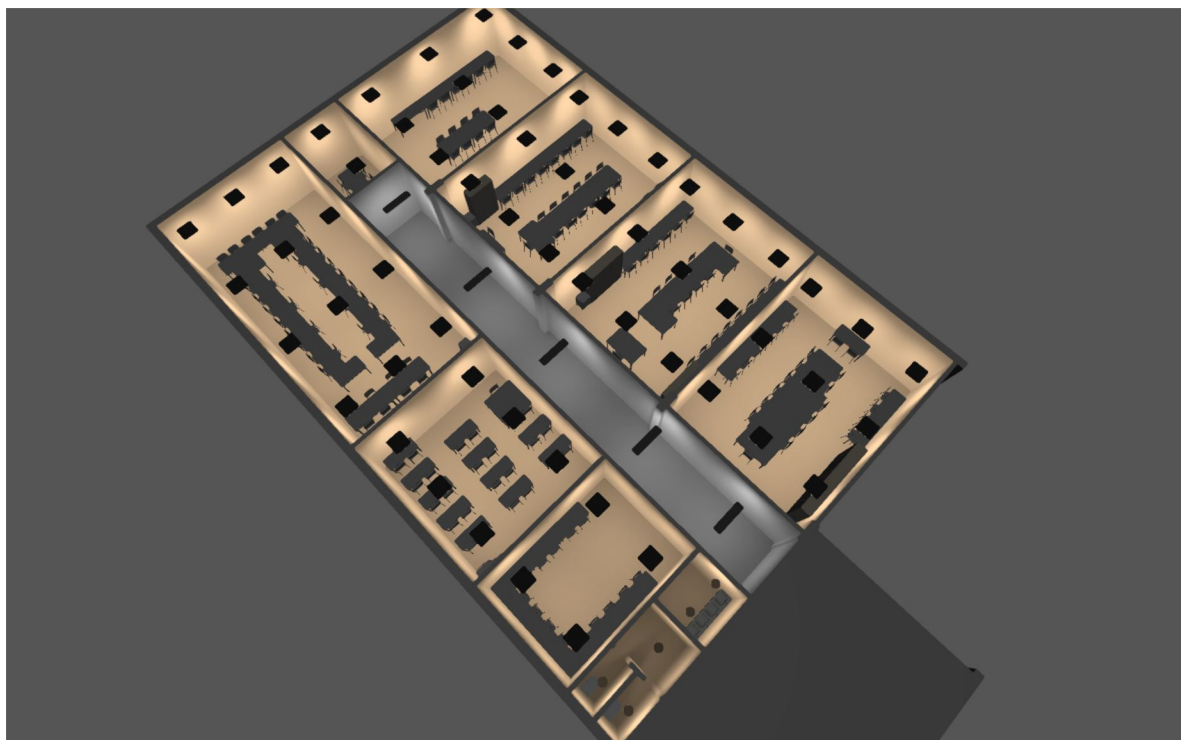
**Responsible engineer:**
**Slobodan Marković, dipl.inž.el.**

#### **4.3 PHOTOMETRIC CALCULATION**

The photometric calculation was performed in the photometric program DIALux and was made for the selected type of lamps. Based on the photometric calculation, the number and arrangement of lamps in the space was determined. In the front part of the project, a calculation is attached, which shows that the international recommendations for the mean value of illumination are met.

Responsible engineer:

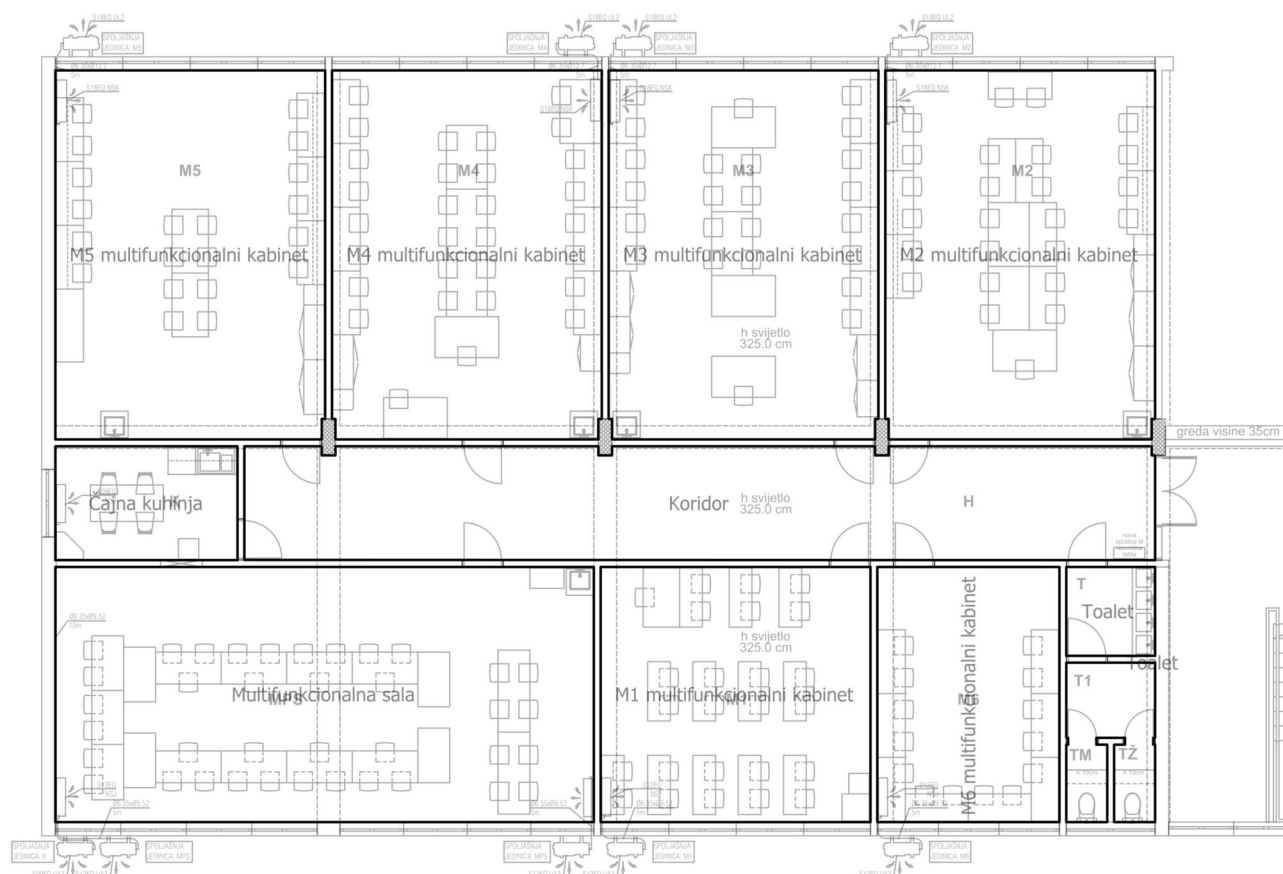
**Slobodan Marković, dipl. inž. el.**



## Fotometrijski proračun

Building 1 · Sprat (Light scene 1)

## Room list



Building 1 · Sprat (Light scene 1)

## Calculation objects



Building 1 · Sprat (Light scene 1)

**Calculation objects**

## Working planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M1 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	500 lx ( $\geq 500$ lx) ✓	316 lx	616 lx	0.63 ( $\geq 0.60$ ) ✓	0.51	WP1
Working plane (M2 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	541 lx ( $\geq 500$ lx) ✓	326 lx	642 lx	0.60 ( $\geq 0.60$ ) ✓	0.51	WP2
Working plane (M3 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	544 lx ( $\geq 500$ lx) ✓	345 lx	653 lx	0.63 ( $\geq 0.60$ ) ✓	0.53	WP3
Working plane (M4 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	542 lx ( $\geq 500$ lx) ✓	347 lx	655 lx	0.64 ( $\geq 0.60$ ) ✓	0.53	WP4
Working plane (M5 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	536 lx ( $\geq 500$ lx) ✓	350 lx	647 lx	0.65 ( $\geq 0.60$ ) ✓	0.54	WP5
Working plane (M6 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	449 lx ( $\geq 400$ lx) ✓	291 lx	538 lx	0.65 ( $\geq 0.60$ ) ✓	0.54	WP6
Working plane (Multifunkcionalna sala) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	534 lx ( $\geq 500$ lx) ✓	348 lx	656 lx	0.65 ( $\geq 0.60$ ) ✓	0.53	WP7
Working plane (Koridor) Perpendicular illuminance (adaptive) Height: 0.000 m, Wall zone: 0.000 m	203 lx ( $\geq 100$ lx) ✓	113 lx	259 lx	0.56 ( $\geq 0.40$ ) ✓	0.44	WP8
Working plane (Čajna kuhinja) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	420 lx ( $\geq 200$ lx) ✓	276 lx	517 lx	0.66 ( $\geq 0.40$ ) ✓	0.53	WP9
Working plane (Toalet ) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	243 lx ( $\geq 100$ lx) ✓	186 lx	284 lx	0.77 ( $\geq 0.40$ ) ✓	0.65	WP10



Building 1 · Sprat (Light scene 1)

Calculation objects

Working plane (Toalet )	176 lx	132 lx	215 lx	0.75	0.61	WP11
Perpendicular illuminance (adaptive)	(≥ 100 lx)			(≥ 0.40)		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Notes on planning:  
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

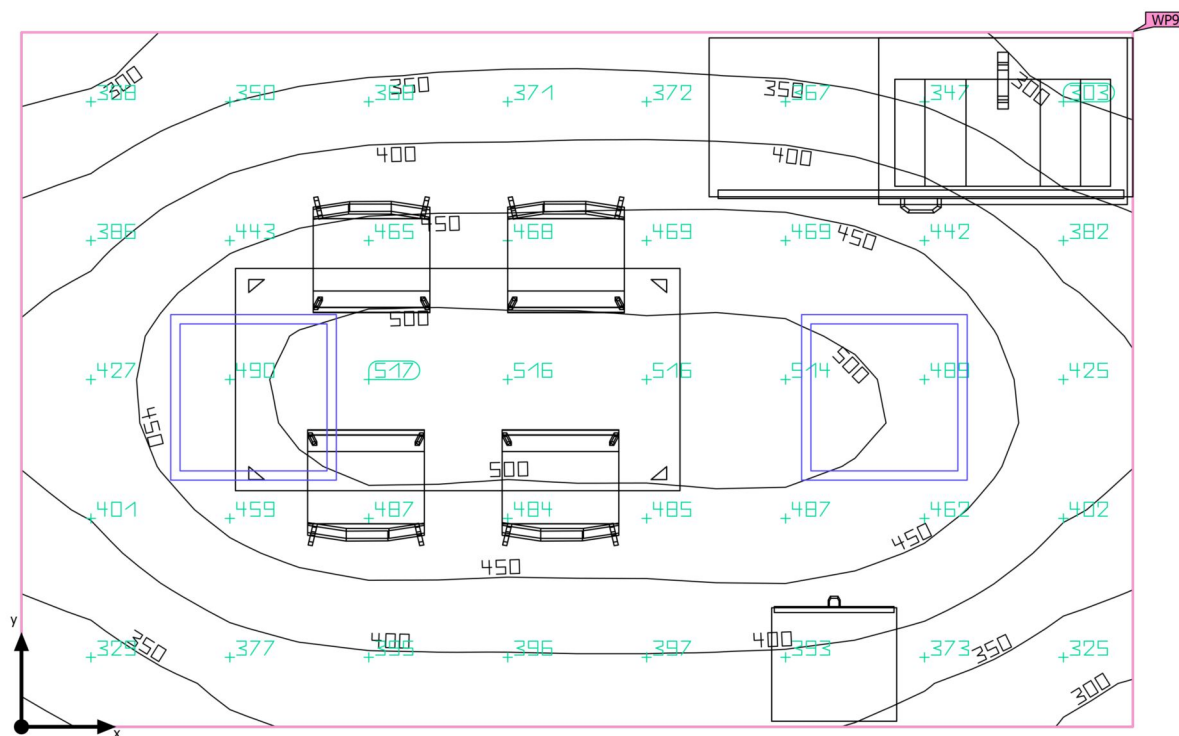


Building 1 · Sprat · Čajna kuhinja

## Description

Building 1 · Sprat · Čajna kuhinja (Light scene 1)

## Summary



Ground area	10.00 m²	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · Čajna kuhinja (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	420 lx	$\geq 200$ lx	✓	WP9
	$g_1$	0.66	$\geq 0.40$	✓	WP9
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	16	$\leq 22$	✓	
Energy estimation <sup>(2)</sup>	Consumption	186 kWh/a	max. 400 kWh/a	✓	
Room	Lighting power density	6.80 W/m <sup>2</sup>	–		
		1.62 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 2.500 m x 4.000 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

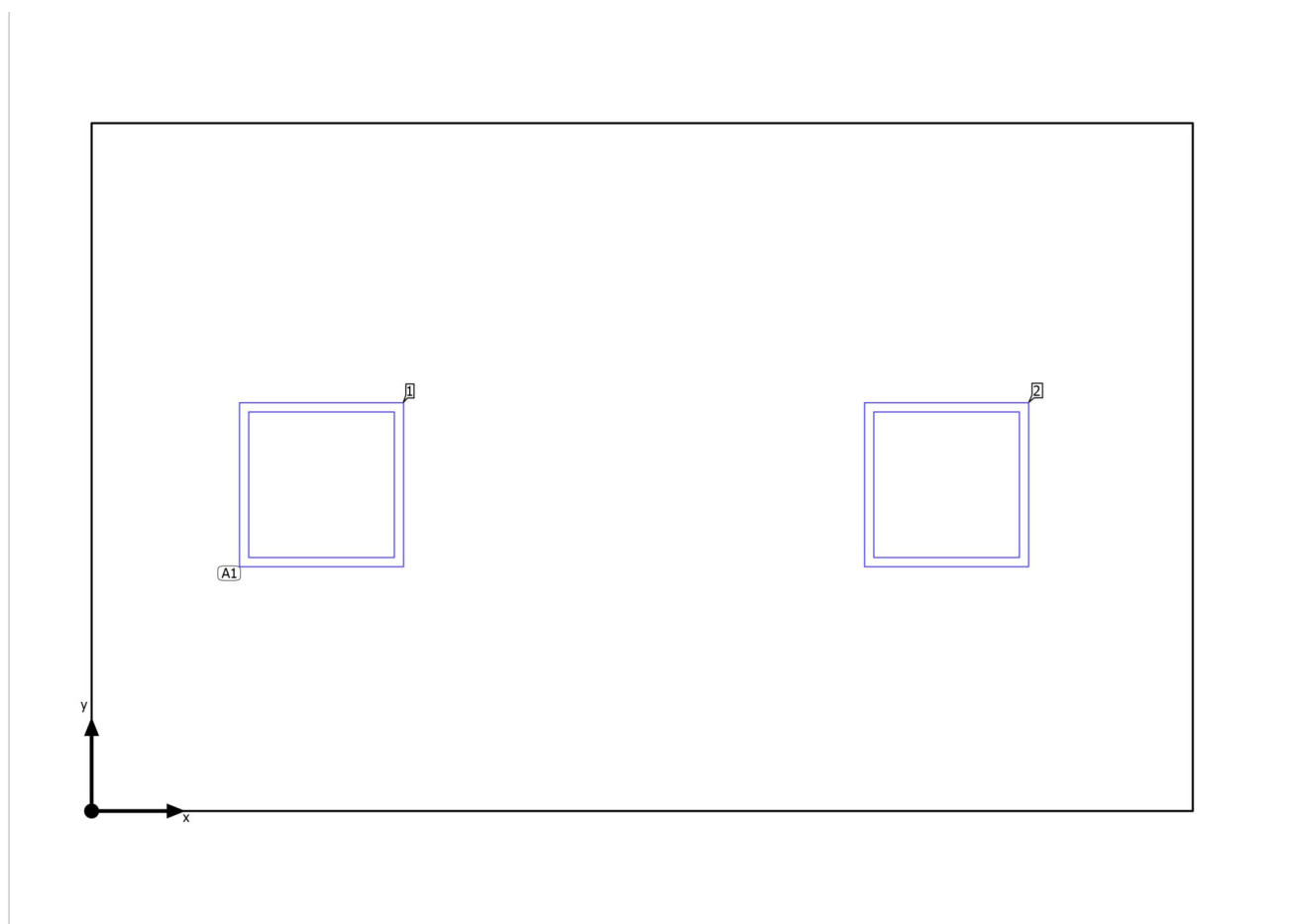
Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.1 Canteens, pantries)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

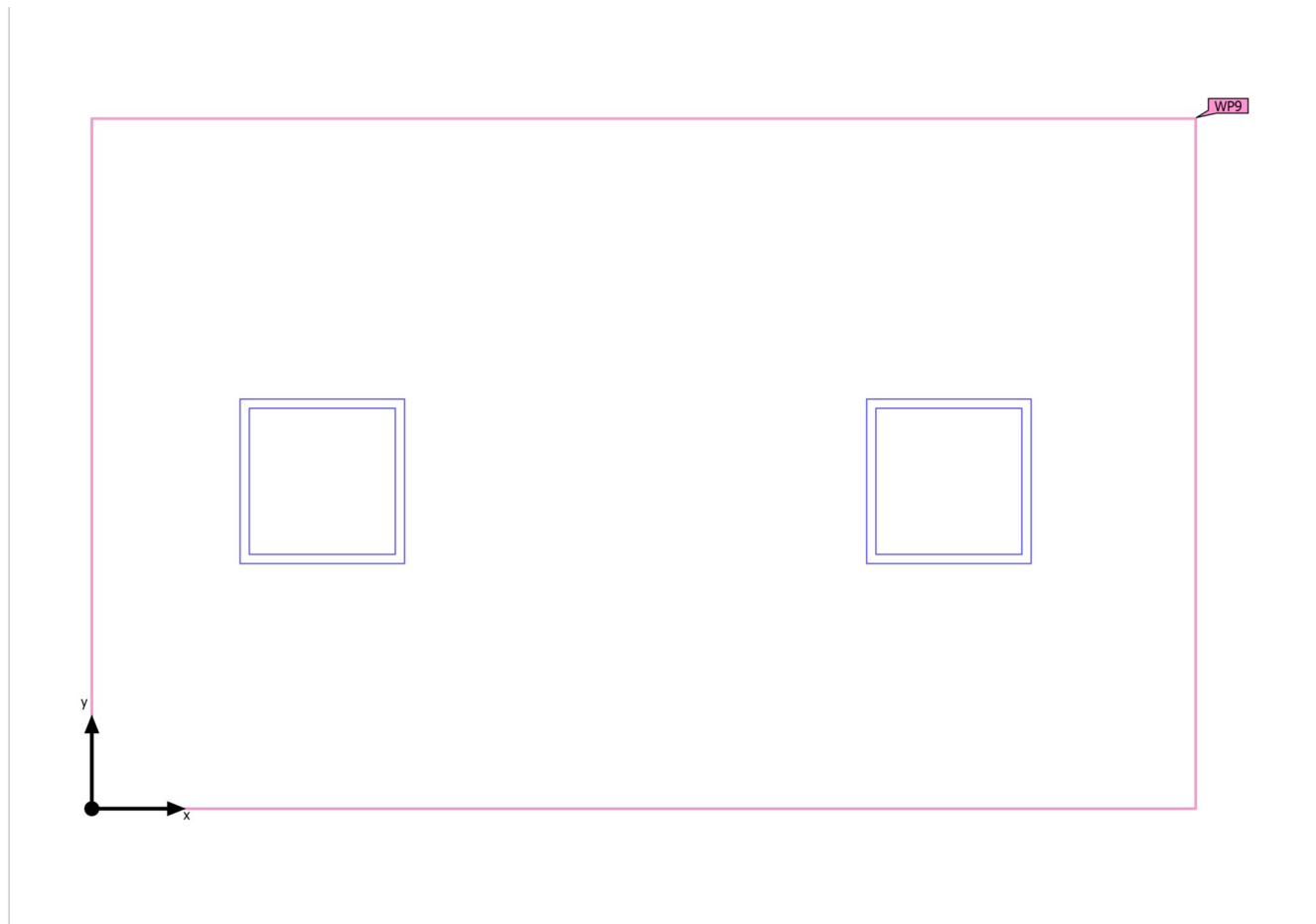
Building 1 · Sprat · Čajna kuhinja

## Luminaire layout plan



Building 1 · Sprat · Čajna kuhinja (Light scene 1)

## Calculation objects



Building 1 · Sprat · Čajna kuhinja (Light scene 1)

**Calculation objects**

## Working planes

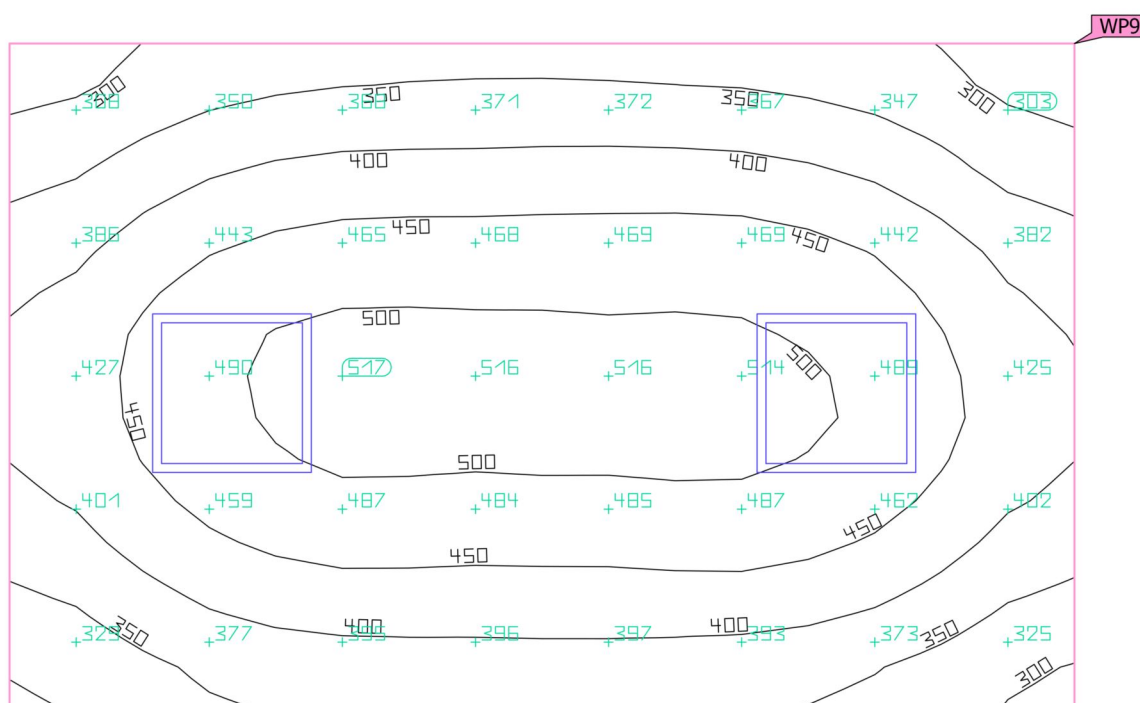
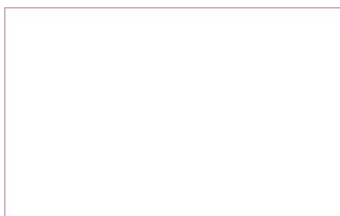
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Čajna kuhinja) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	420 lx ( $\geq 200$ lx) ✓	276 lx	517 lx	0.66 ( $\geq 0.40$ ) ✓	0.53	WP9

Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.1 Canteens, pantries)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Čajna kuhinja (Light scene 1)

**Working plane (Čajna kuhinja)**

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Čajna kuhinja)	420 lx	276 lx	517 lx	0.66	0.53	WP9
Perpendicular illuminance (adaptive)	(≥ 200 lx)			(≥ 0.40)		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.1 Canteens, pantries)

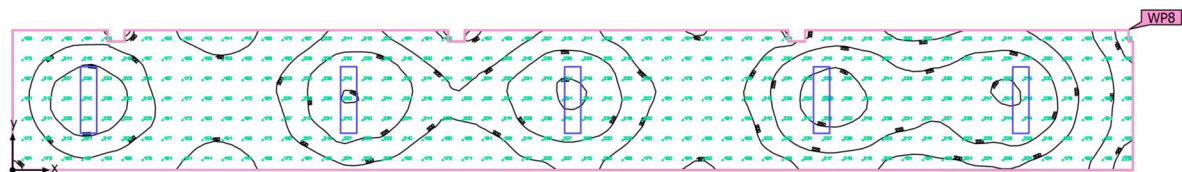
Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



Building 1 · Sprat · Koridor (Light scene 1)

Summary



Ground area	49.75 m <sup>2</sup>
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %
Maintenance factor	0.80 (fixed)

Clearance height	3.200 m
Mounting height	3.200 m
Height <sub>Working plane</sub>	0.000 m
Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · Koridor (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	203 lx	$\geq 100 \text{ lx}$	✓	WP8
	$g_1$	0.56	$\geq 0.40$	✓	WP8
Energy estimation <sup>(2)</sup>	Consumption	198 kWh/a	max. 1750 kWh/a	✓	
Room	Lighting power density	3.62 W/m <sup>2</sup>	–		
		1.79 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 2.500 m x 20.000 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

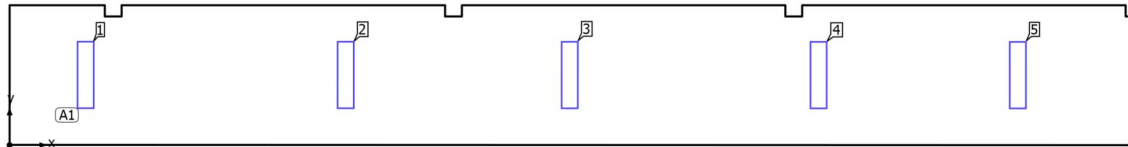
Utilisation profile: Traffic zones inside buildings (9.1 Circulation areas and corridors)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

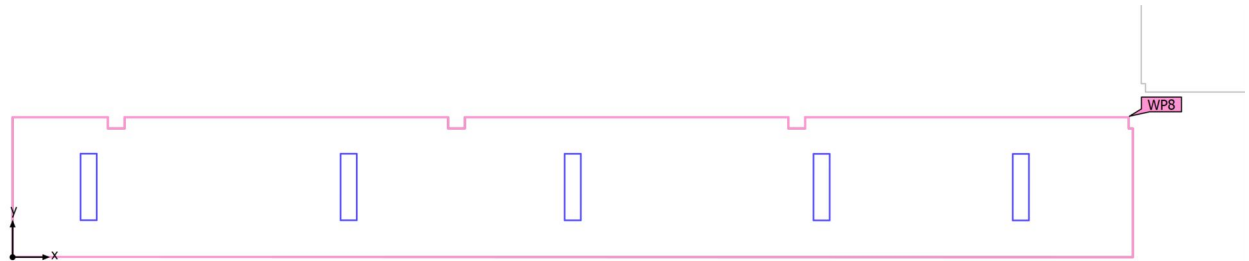
Building 1 · Sprat · Koridor

## Luminaire layout plan



Building 1 · Sprat · Koridor (Light scene 1)

## Calculation objects



Building 1 · Sprat · Koridor (Light scene 1)

**Calculation objects**

## Working planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Koridor)	203 lx	113 lx	259 lx	0.56	0.44	WP8
Perpendicular illuminance (adaptive)	( $\geq 100$ lx)			( $\geq 0.40$ )		
Height: 0.000 m, Wall zone: 0.000 m	✓			✓		

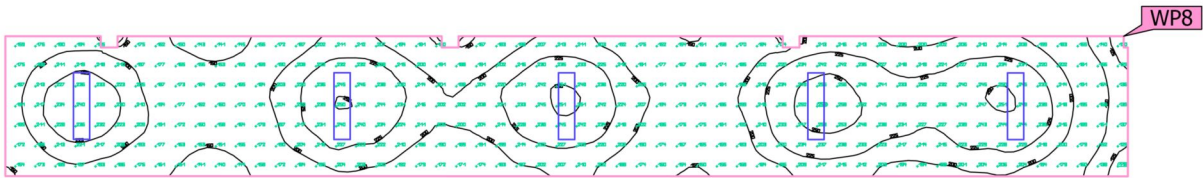
Utilisation profile: Traffic zones inside buildings (9.1 Circulation areas and corridors)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Koridor (Light scene 1)

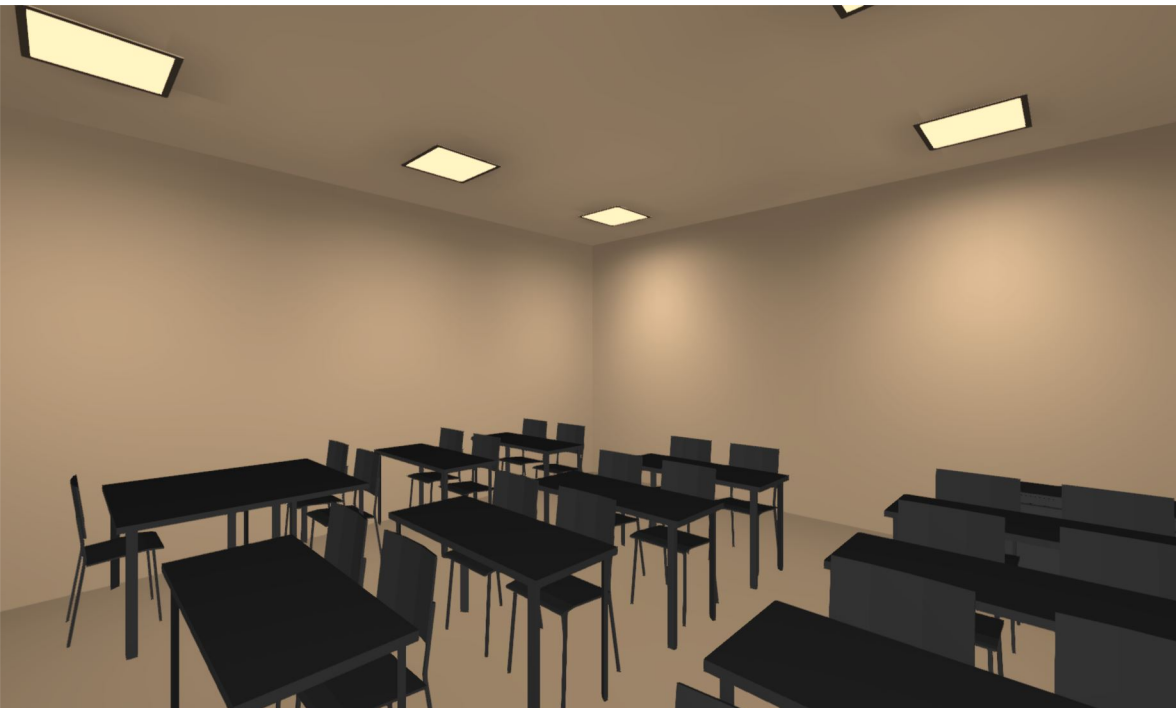
Working plane (Koridor)



Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Koridor) Perpendicular illuminance (adaptive) Height: 0.000 m, Wall zone: 0.000 m	203 lx (≥ 100 lx) ✓	113 lx	259 lx	0.56 (≥ 0.40) ✓	0.44	WP8

Utilisation profile: Traffic zones inside buildings (9.1 Circulation areas and corridors)

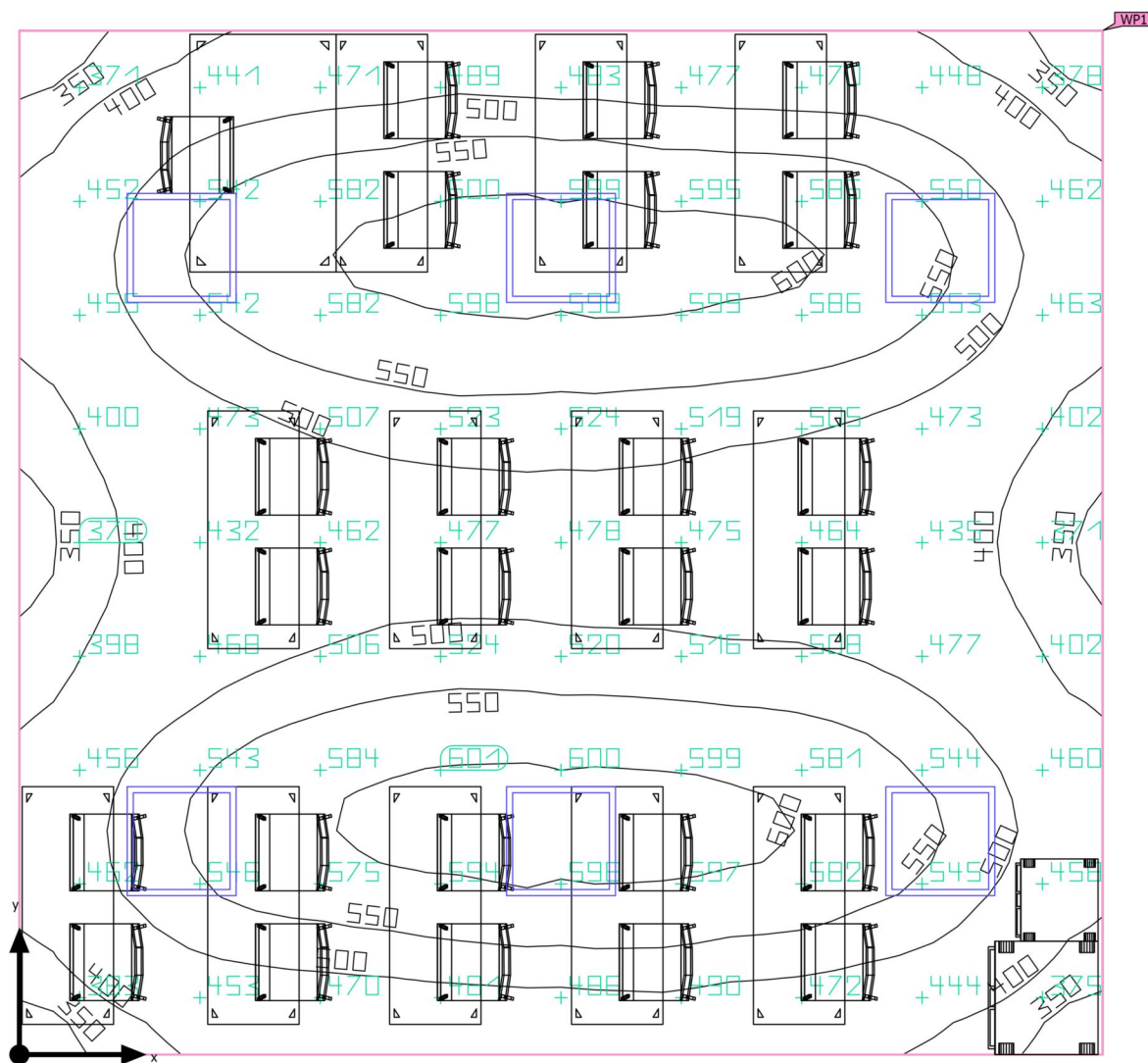
Notes on planning:  
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



Building 1 · Sprat · M1 multifunkcionalni kabinet

## Description

Building 1 · Sprat · M1 multifunkcionalni kabinet (Light scene 1)

**Summary**Ground area 33.18 m<sup>2</sup>Reflection factors  
Ceiling: 70.0 %,  
Walls: 50.0 %,  
Floor: 20.0 %

Maintenance factor 0.80 (fixed)

Clearance height 3.200 m

Mounting height 3.227 m

Height<sub>Working plane</sub> 0.800 mWall zone<sub>Working plane</sub> 0.000 m



Building 1 · Sprat · M1 multifunkcionalni kabinet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	500 lx	$\geq 500$ lx	✓	WP1
	$g_1$	0.63	$\geq 0.60$	✓	WP1
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	16	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	505 kWh/a	max. 1200 kWh/a	✓	
Room	Lighting power density	6.15 W/m <sup>2</sup>	–		
		1.23 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 5.925 m x 5.600 m and SHR of 0.25.

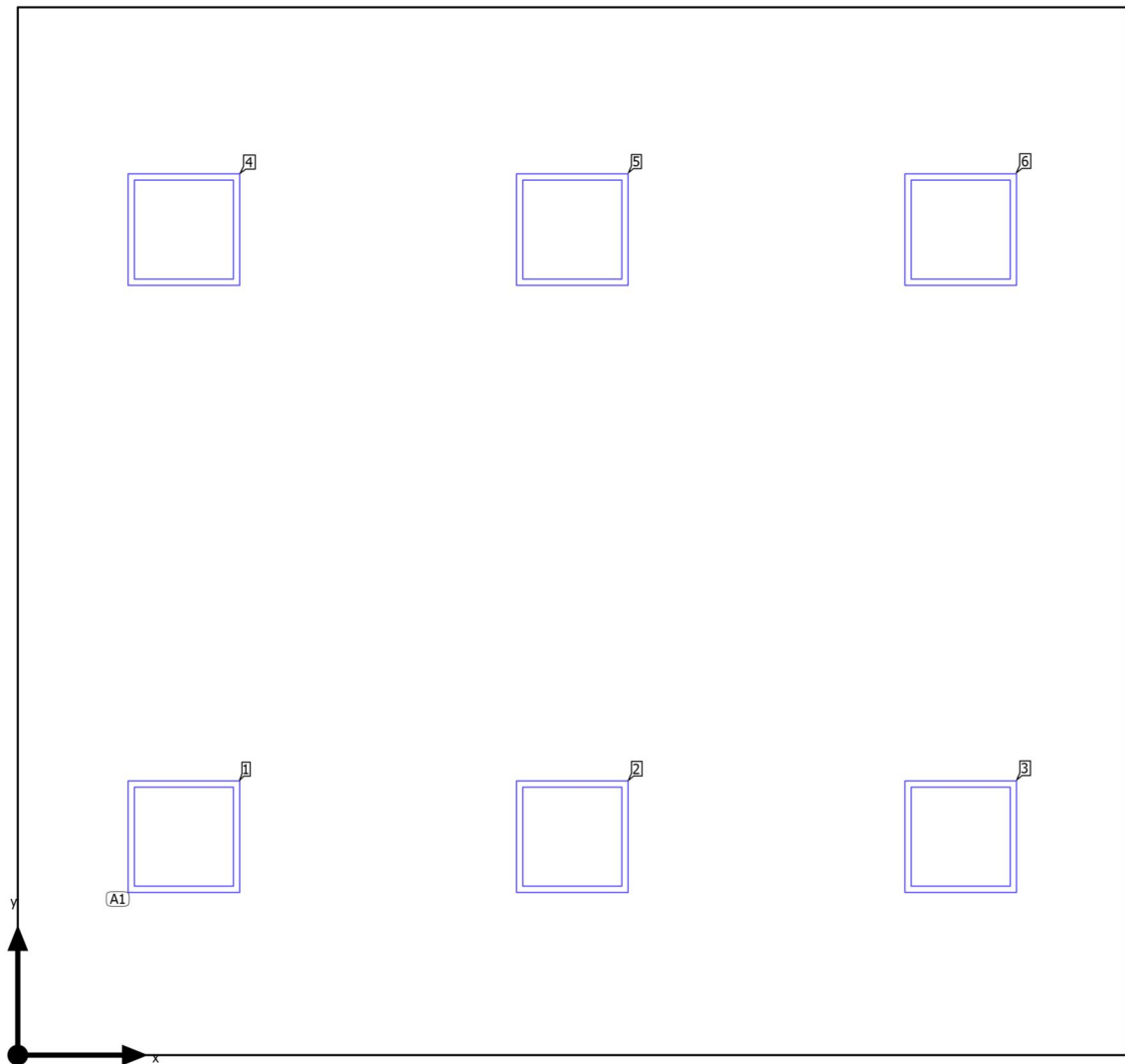
(2) Calculated using DIN:18599-4.

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

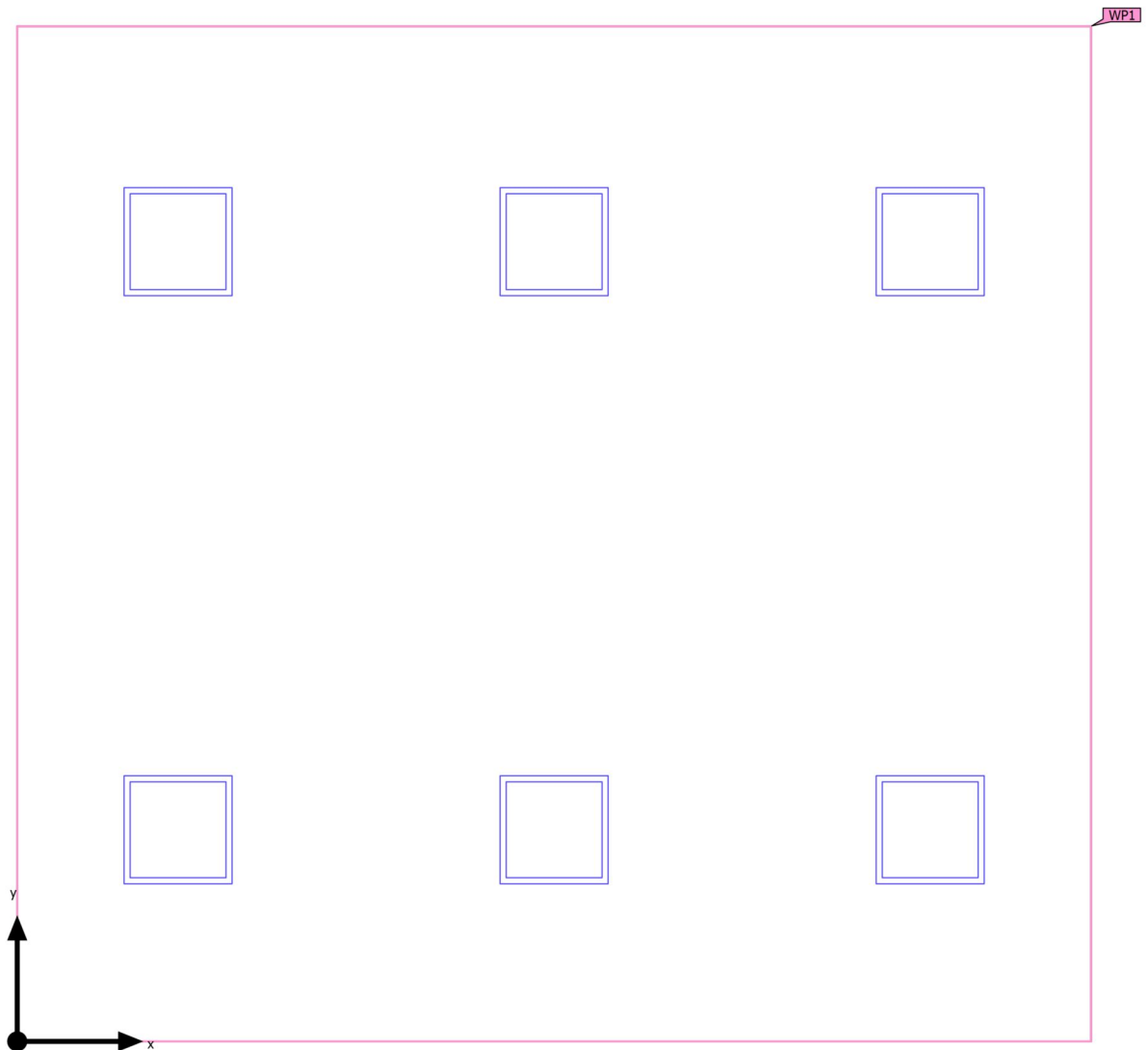
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M1 multifunkcionalni kabinet

**Luminaire layout plan**

Building 1 · Sprat · M1 multifunkcionalni kabinet (Light scene 1)

## Calculation objects



Building 1 · Sprat · M1 multifunkcionalni kabinet (Light scene 1)

**Calculation objects**

## Working planes

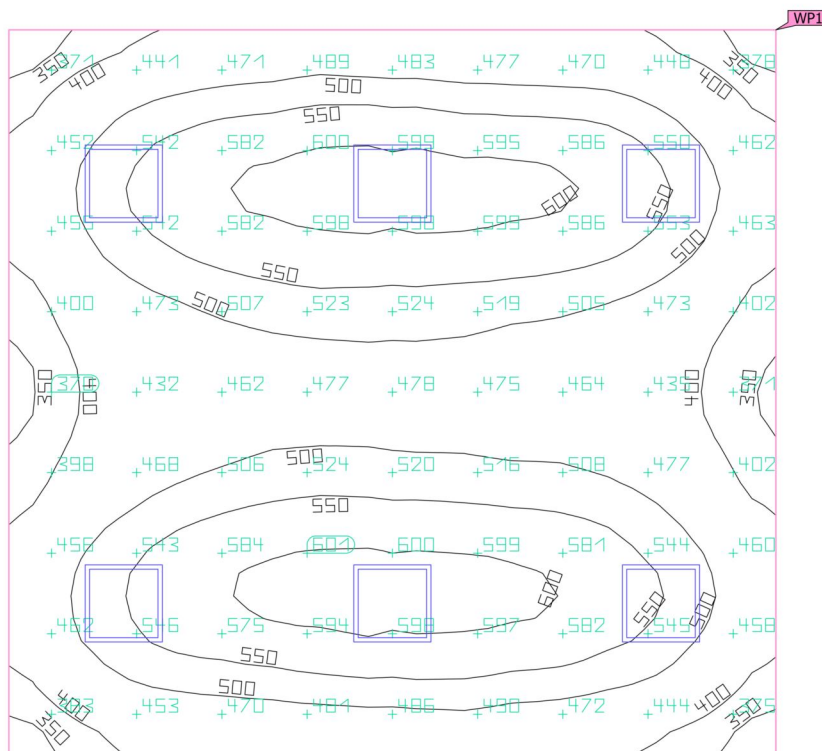
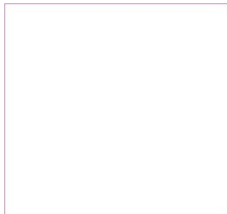
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M1 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	500 lx ( $\geq 500$ lx) ✓	316 lx	616 lx	0.63 ( $\geq 0.60$ ) ✓	0.51	WP1

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M1 multifunkcionalni kabinet (Light scene 1)

**Working plane (M1 multifunkcionalni kabinet)**

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M1 multifunkcionalni kabinet)	500 lx	316 lx	616 lx	0.63	0.51	WP1
Perpendicular illuminance (adaptive)	(≥ 500 lx)			(≥ 0.60)		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

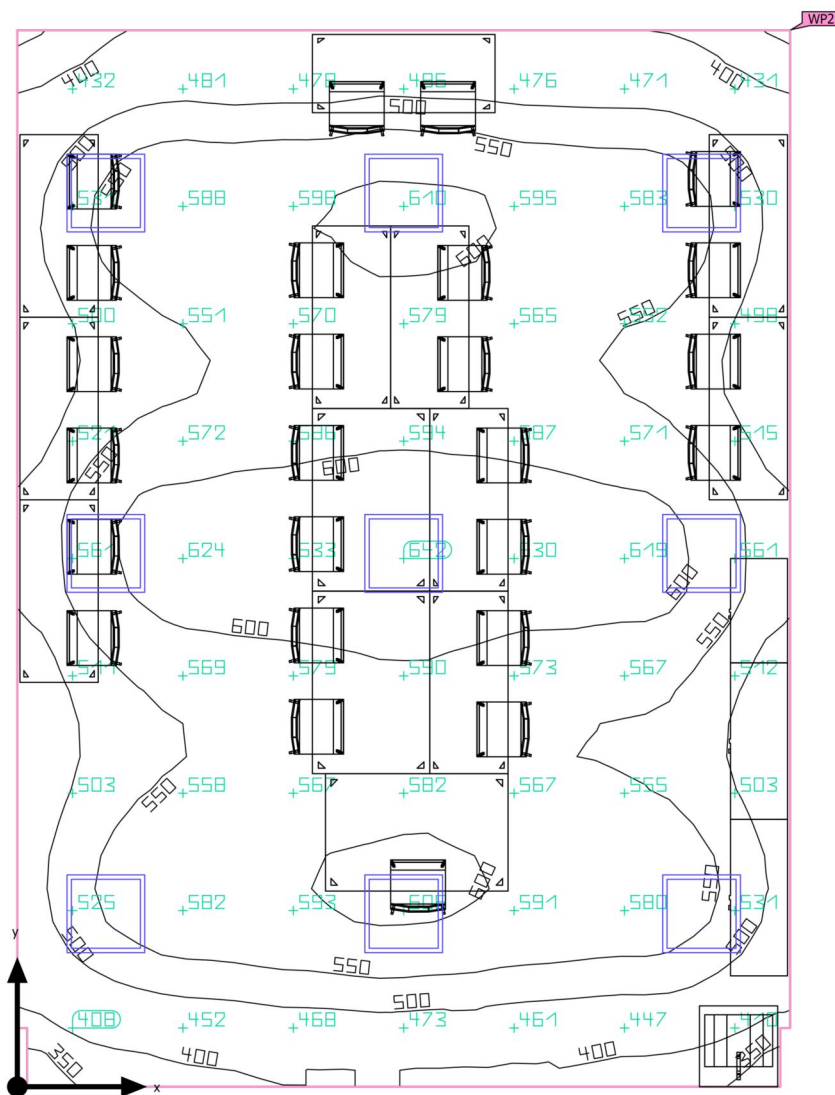
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



Building 1 · Sprat · M2 multifunkcionalni kabinet

## Description

Building 1 · Sprat · M2 multifunkcionalni kabinet (Light scene 1)

**Summary**

Ground area	47.92 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · M2 multifunkcionalni kabinet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	541 lx	$\geq 500$ lx	✓	WP2
	$g_1$	0.60	$\geq 0.60$	✓	WP2
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	17	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	757 kWh/a	max. 1700 kWh/a	✓	
Room	Lighting power density	6.38 W/m <sup>2</sup>	–		
		1.18 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 5.925 m x 8.100 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

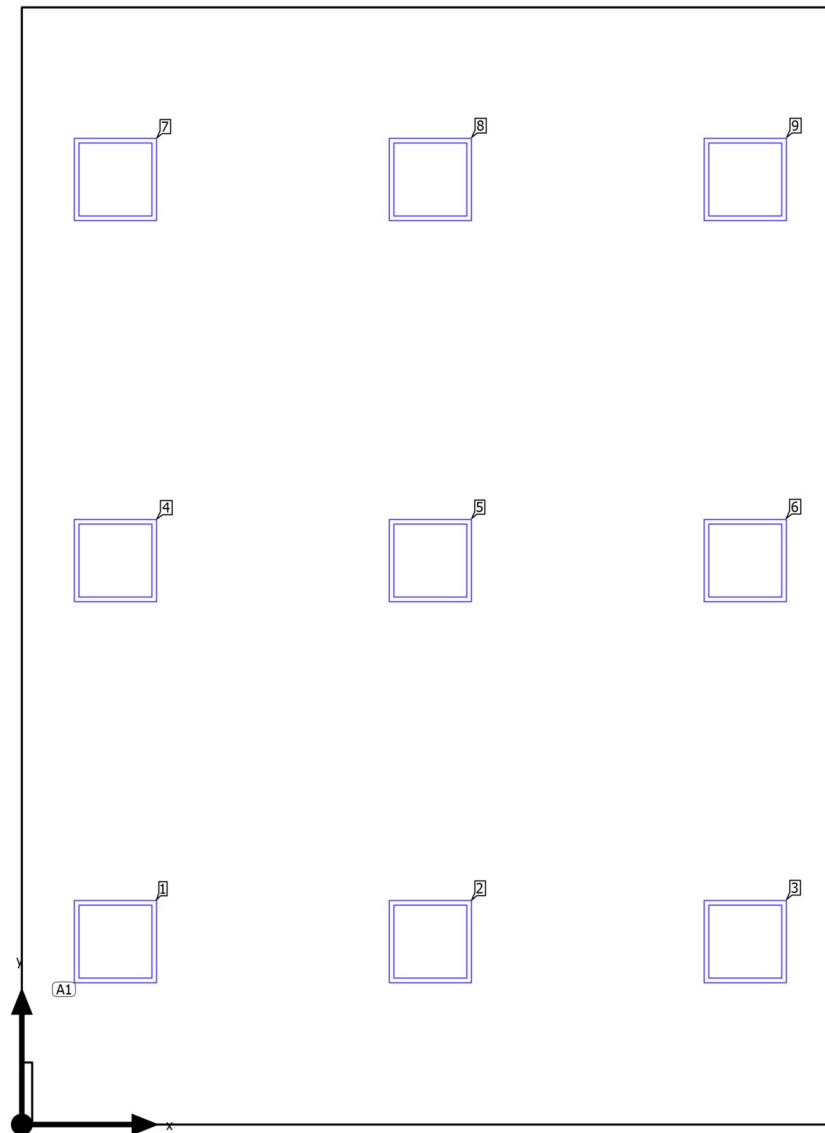
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

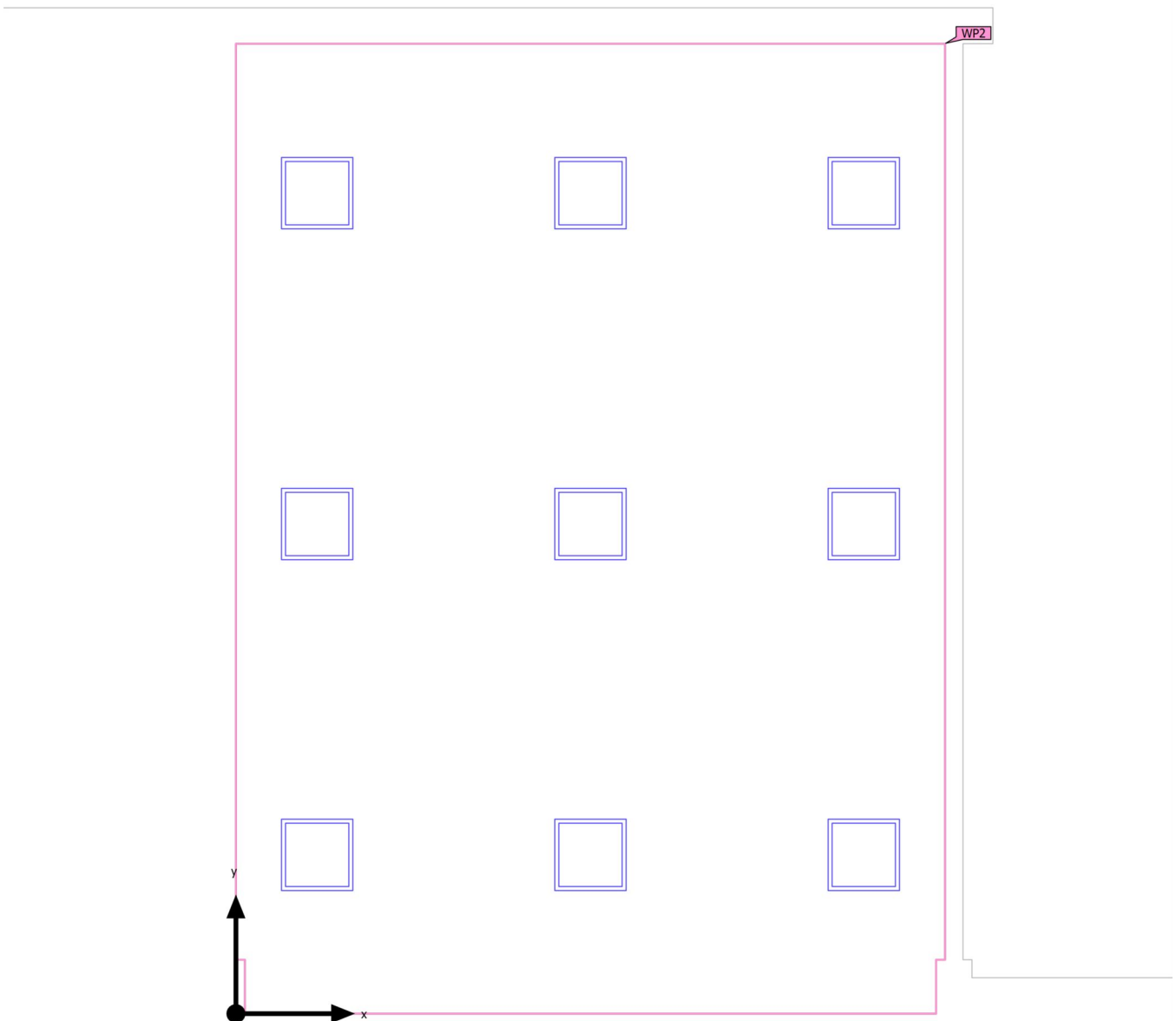


Building 1 · Sprat · M2 multifunkcionalni kabinet

**Luminaire layout plan**

Building 1 · Sprat · M2 multifunkcionalni kabinet (Light scene 1)

## Calculation objects



Building 1 · Sprat · M2 multifunkcionalni kabinet (Light scene 1)

**Calculation objects**

## Working planes

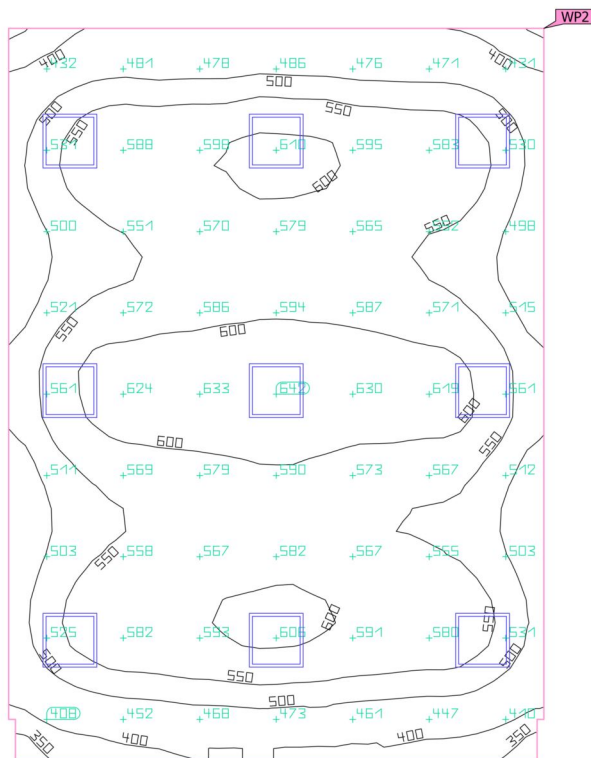
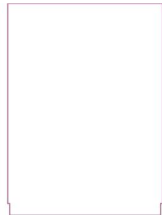
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M2 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	541 lx ( $\geq 500$ lx) ✓	326 lx	642 lx	0.60 ( $\geq 0.60$ ) ✓	0.51	WP2

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M2 multifunkcionalni kabinet (Light scene 1)

**Working plane (M2 multifunkcionalni kabinet)**

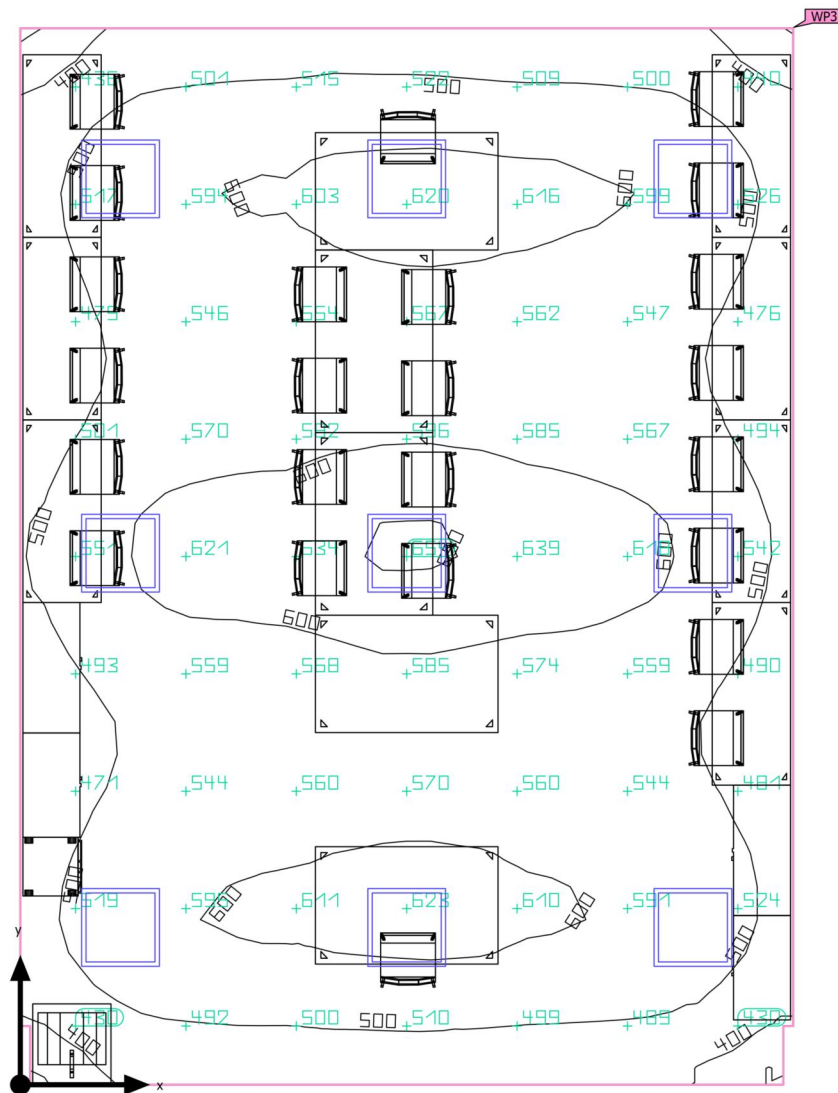
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M2 multifunkcionalni kabinet)	541 lx	326 lx	642 lx	0.60	0.51	WP2
Perpendicular illuminance (adaptive)	( $\geq 500$ lx)			( $\geq 0.60$ )		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M3 multifunkcionalni kabinet (Light scene 1)

**Summary**

Ground area	47.92 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · M3 multifunkcionalni kabinet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	544 lx	$\geq 500$ lx	✓	WP3
	$g_1$	0.63	$\geq 0.60$	✓	WP3
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	17	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	757 kWh/a	max. 1700 kWh/a	✓	
Room	Lighting power density	6.38 W/m <sup>2</sup>	–		
		1.17 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 5.925 m x 8.100 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

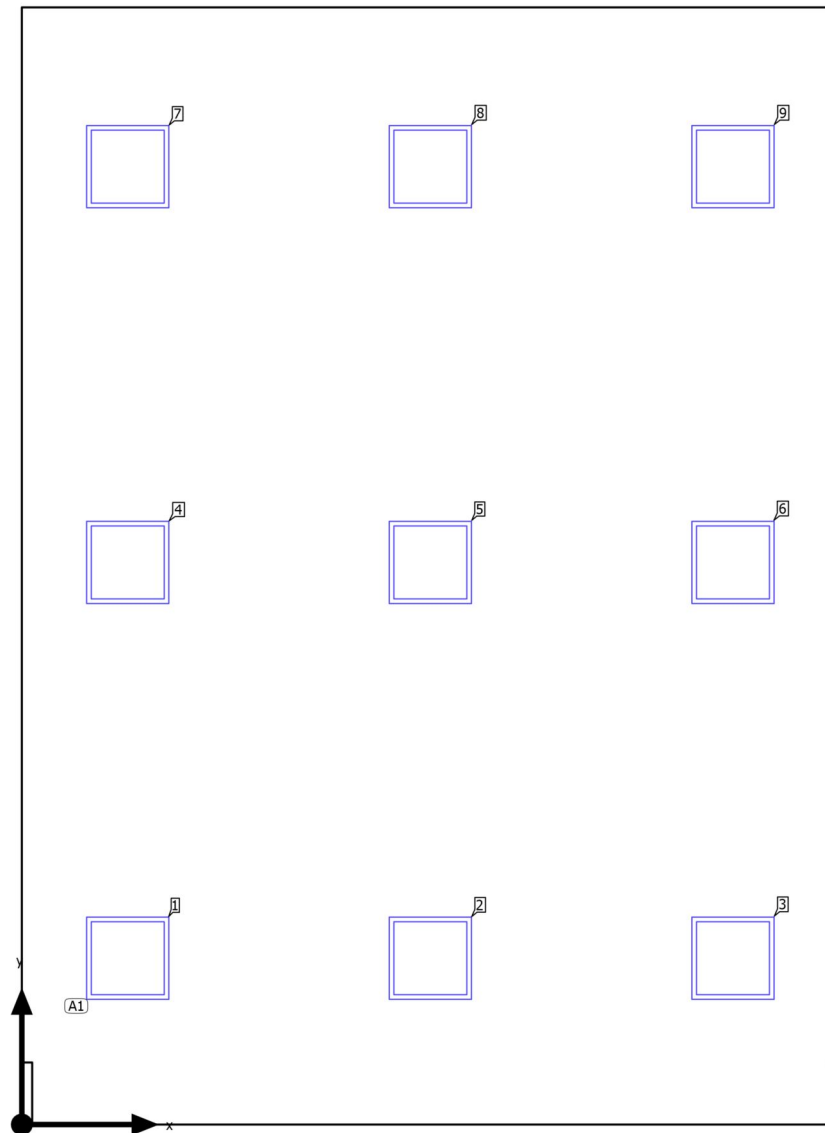
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

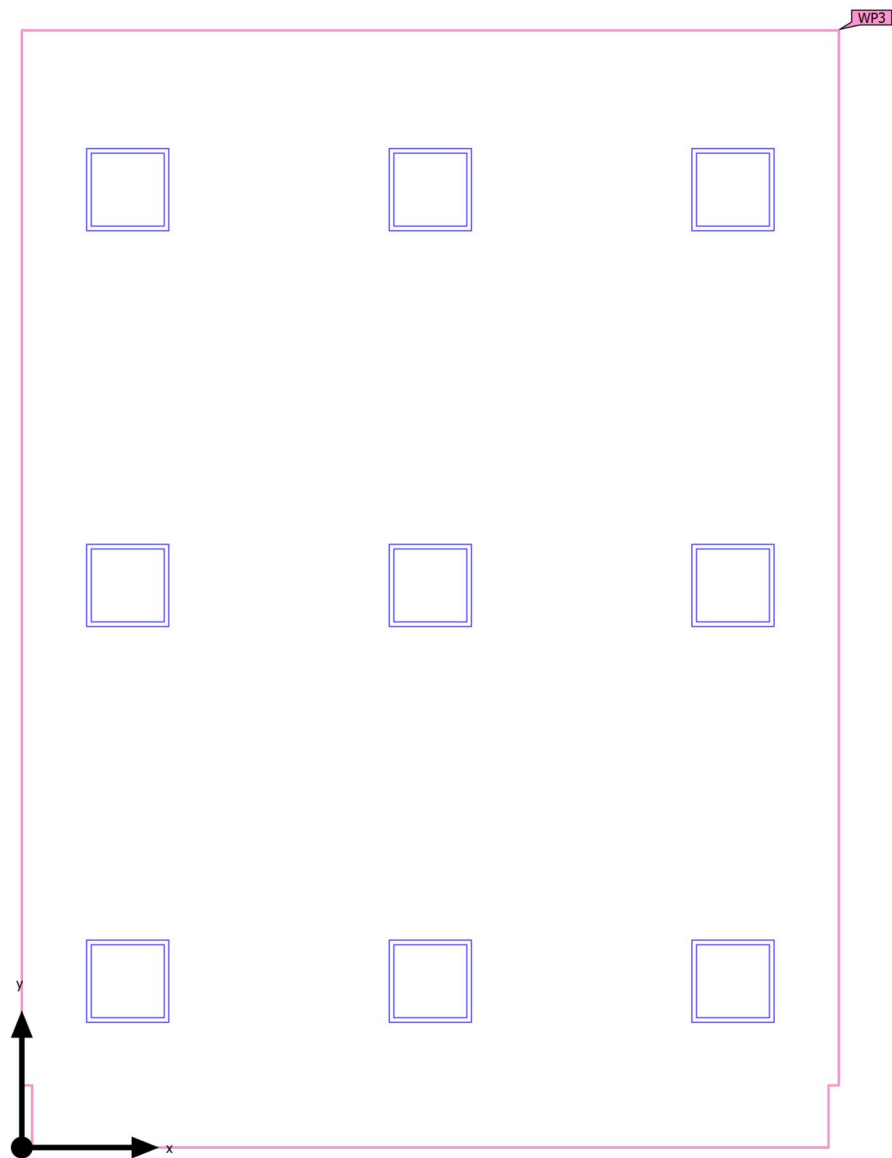
Building 1 · Sprat · M3 multifunkcionalni kabinet

## Luminaire layout plan



Building 1 · Sprat · M3 multifunkcionalni kabinet (Light scene 1)

## Calculation objects





Building 1 · Sprat · M3 multifunkcionalni kabinet (Light scene 1)

**Calculation objects**

## Working planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M3 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	544 lx ( $\geq 500$ lx) ✓	345 lx	653 lx	0.63 ( $\geq 0.60$ ) ✓	0.53	WP3

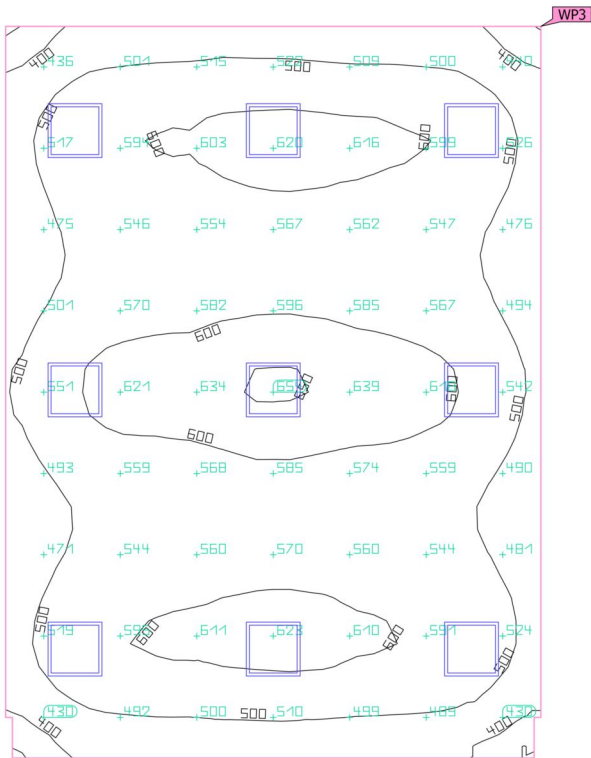
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M3 multifunkcionalni kabinet (Light scene 1)

Working plane (M3 multifunkcionalni kabinet)

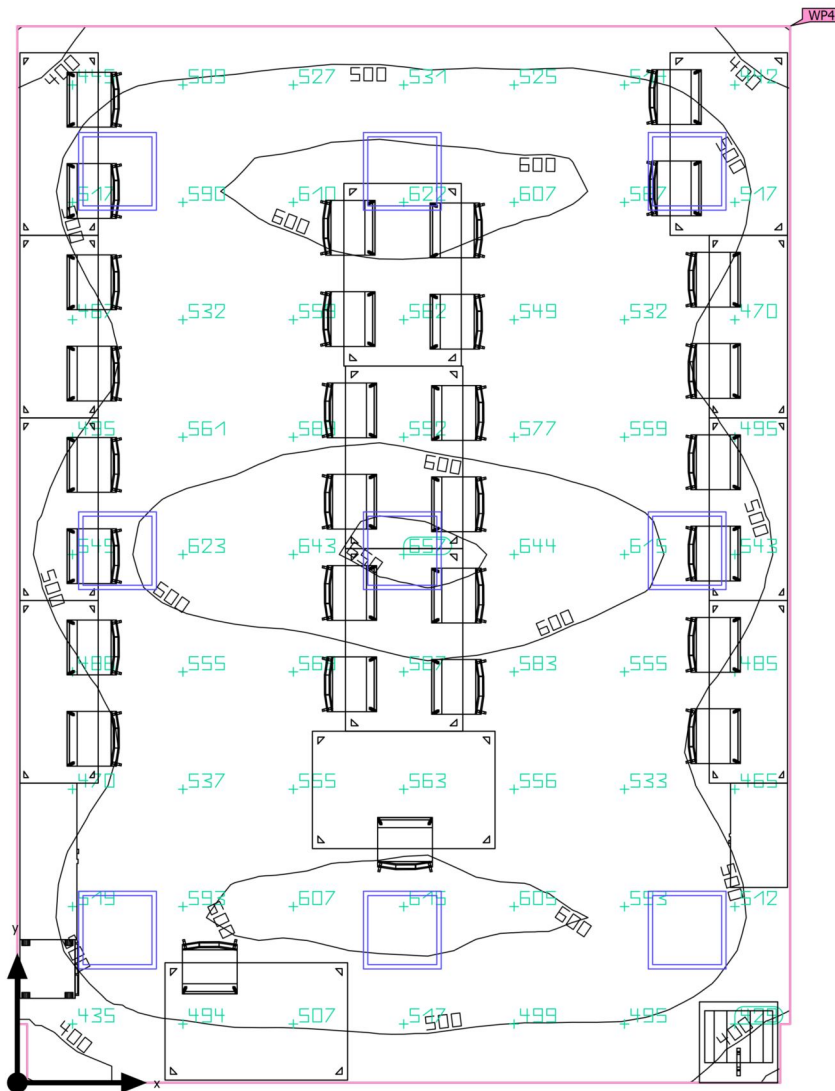


Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M3 multifunkcionalni kabinet)	544 lx	345 lx	653 lx	0.63	0.53	WP3
Perpendicular illuminance (adaptive)	(≥ 500 lx)			(≥ 0.60)		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:  
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M4 multifunkcionalni kabinet (Light scene 1)

**Summary**

Ground area	47.92 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · M4 multifunkcionalni kabinet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	542 lx	$\geq 500$ lx	✓	WP4
	$g_1$	0.64	$\geq 0.60$	✓	WP4
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	17	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	757 kWh/a	max. 1700 kWh/a	✓	
Room	Lighting power density	6.38 W/m <sup>2</sup>	–		
		1.18 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 5.925 m x 8.100 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

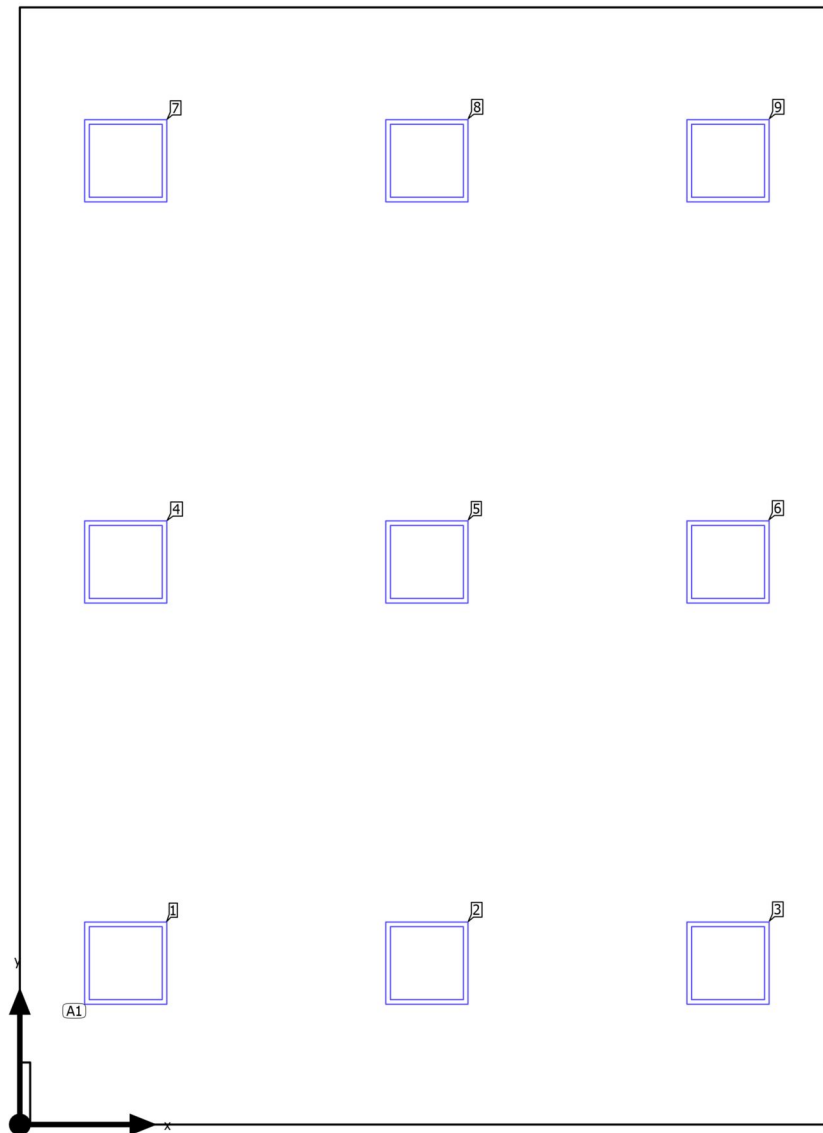
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

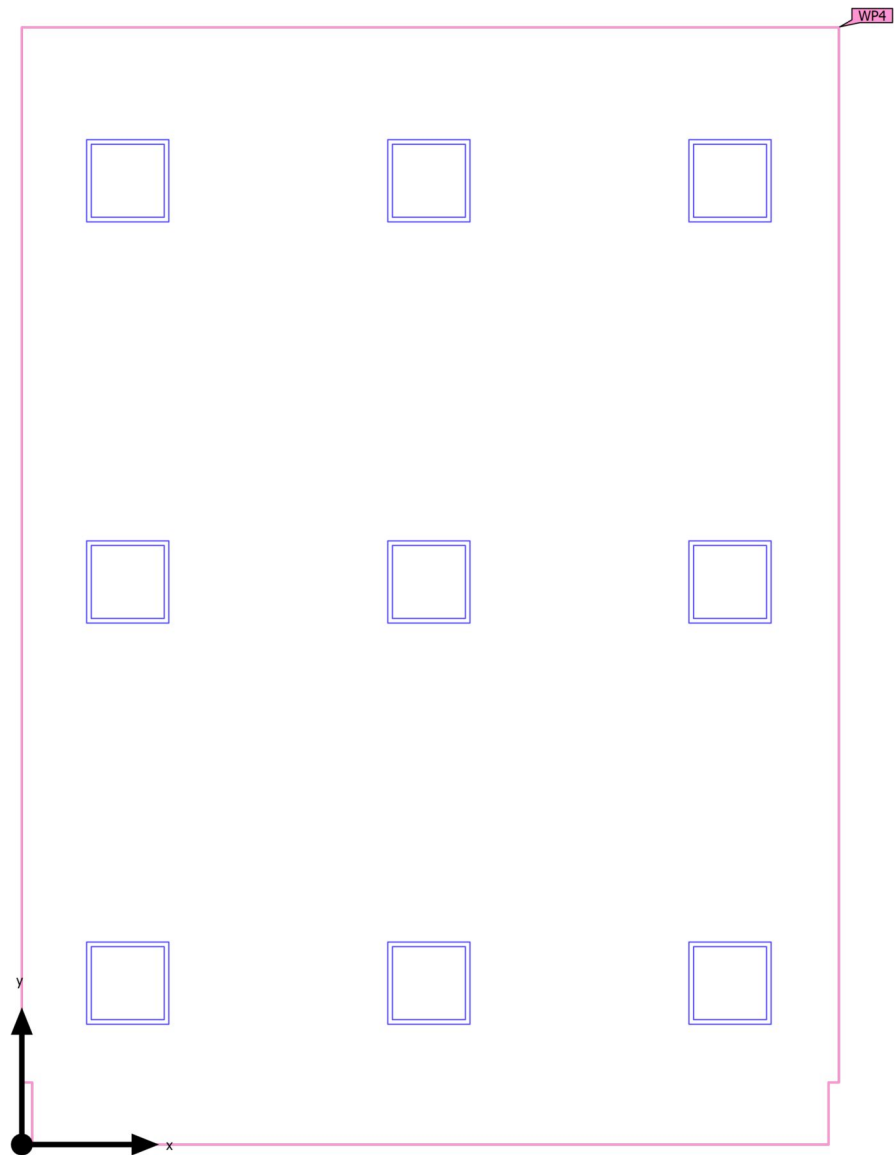
Building 1 · Sprat · M4 multifunkcionalni kabinet

## Luminaire layout plan



Building 1 · Sprat · M4 multifunkcionalni kabinet (Light scene 1)

## Calculation objects



Building 1 · Sprat · M4 multifunkcionalni kabinet (Light scene 1)

**Calculation objects**

## Working planes

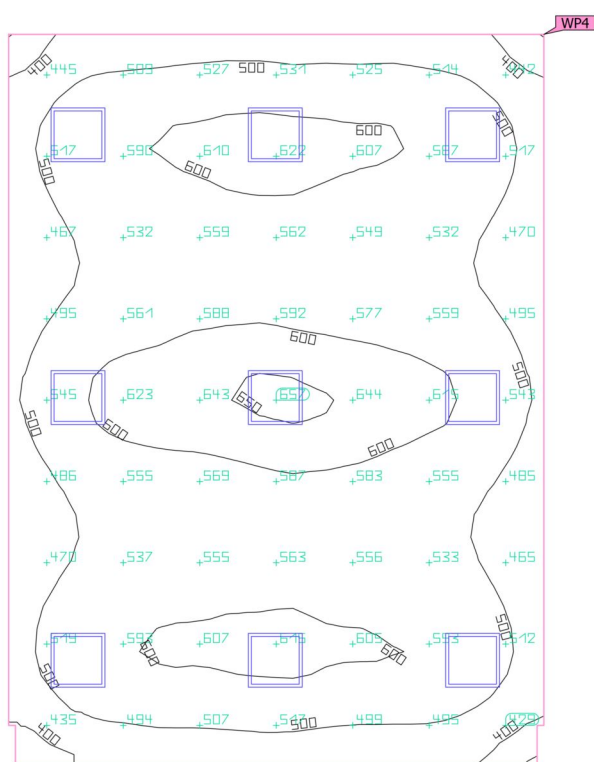
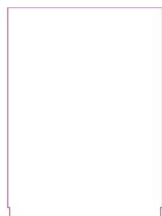
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M4 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	542 lx ( $\geq 500$ lx) ✓	347 lx	655 lx	0.64 ( $\geq 0.60$ ) ✓	0.53	WP4

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M4 multifunkcionalni kabinet (Light scene 1)

**Working plane (M4 multifunkcionalni kabinet)**

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M4 multifunkcionalni kabinet)	542 lx	347 lx	655 lx	0.64	0.53	WP4
Perpendicular illuminance (adaptive)	( $\geq 500$ lx)			( $\geq 0.60$ )		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: DIALux presetting (34.2 Standard (office))

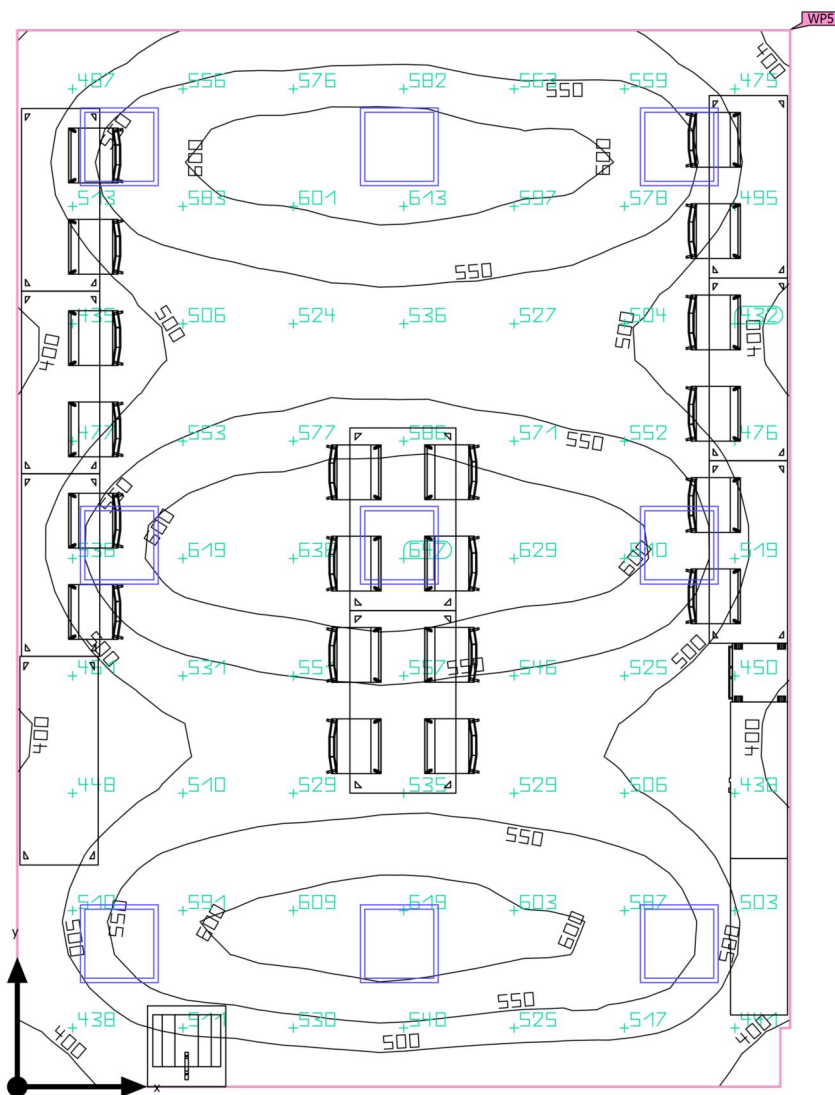
Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



Building 1 · Sprat · M5 multifunkcionalni kabinet (Light scene 1)

## Summary



Ground area	47.96 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · M5 multifunkcionalni kabinet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	536 lx	$\geq 500$ lx	✓	WP5
	$g_1$	0.65	$\geq 0.60$	✓	WP5
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	17	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	757 kWh/a	max. 1700 kWh/a	✓	
Room	Lighting power density	6.38 W/m <sup>2</sup>	–		
		1.19 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 5.925 m x 8.100 m and SHR of 0.25.

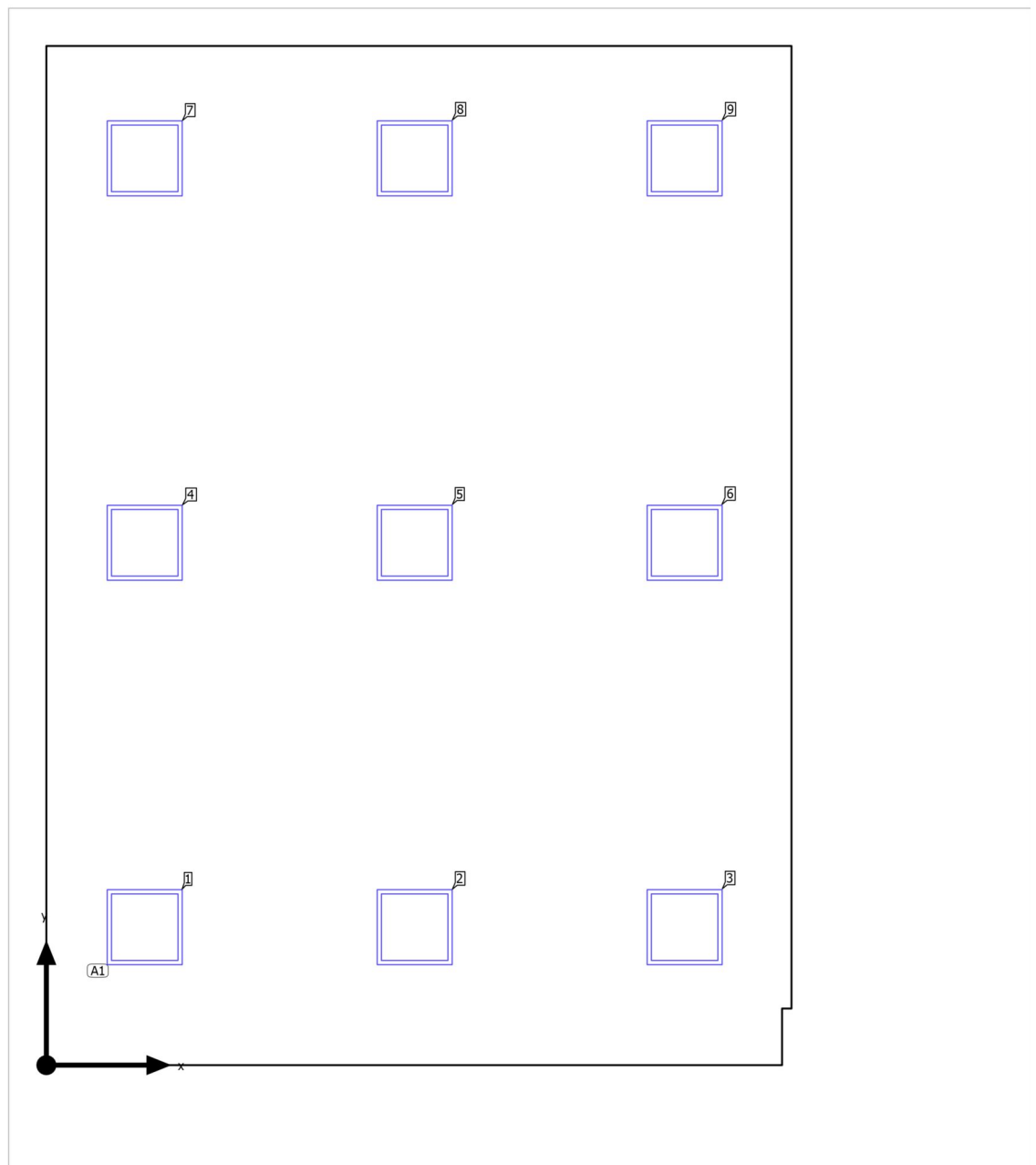
(2) Calculated using DIN:18599-4.

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

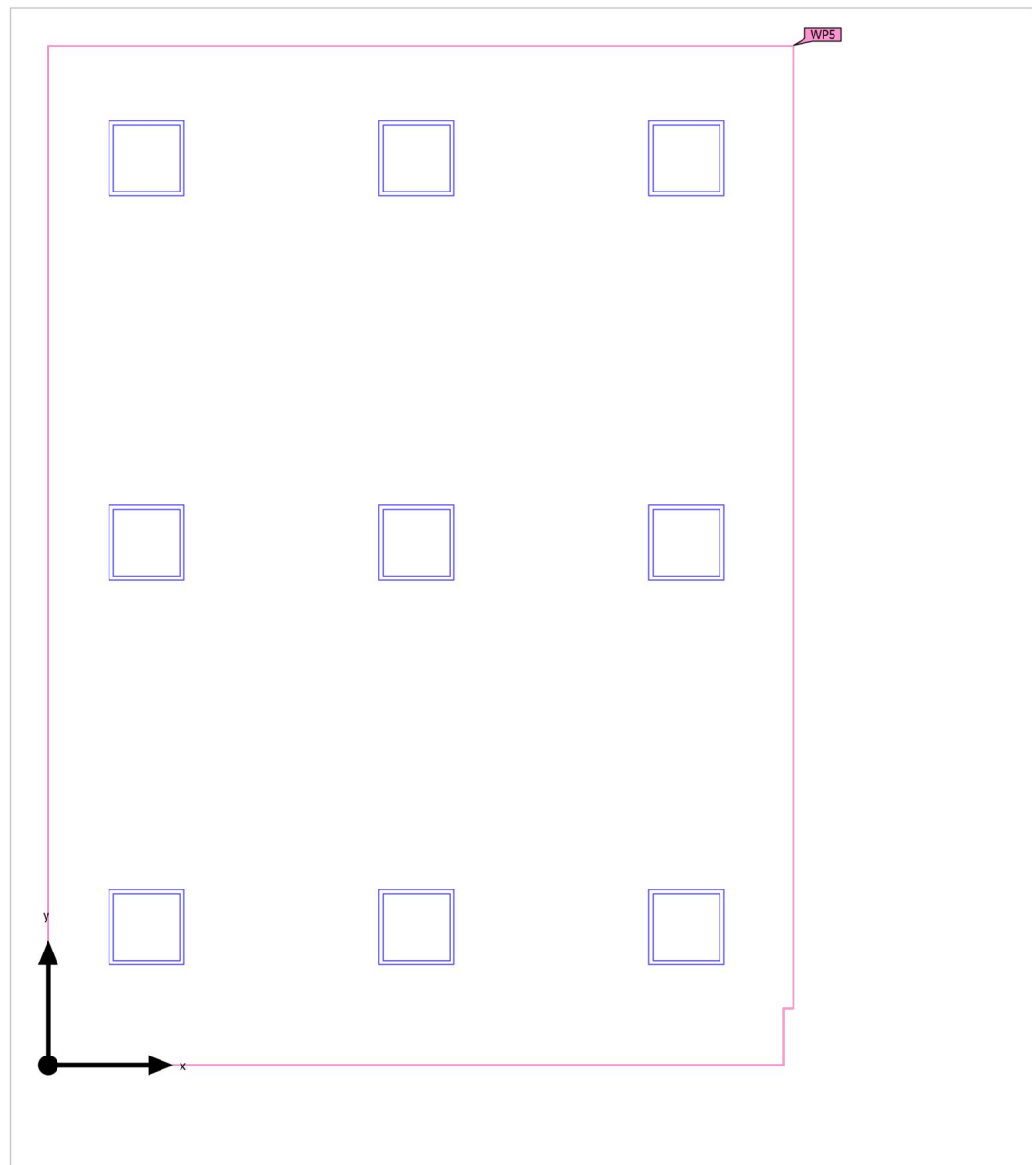
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M5 multifunkcionalni kabinet

**Luminaire layout plan**

Building 1 · Sprat · M5 multifunkcionalni kabinet (Light scene 1)

## Calculation objects



Building 1 · Sprat · M5 multifunkcionalni kabinet (Light scene 1)

**Calculation objects**

## Working planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M5 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	536 lx ( $\geq 500$ lx) ✓	350 lx	647 lx	0.65 ( $\geq 0.60$ ) ✓	0.54	WP5

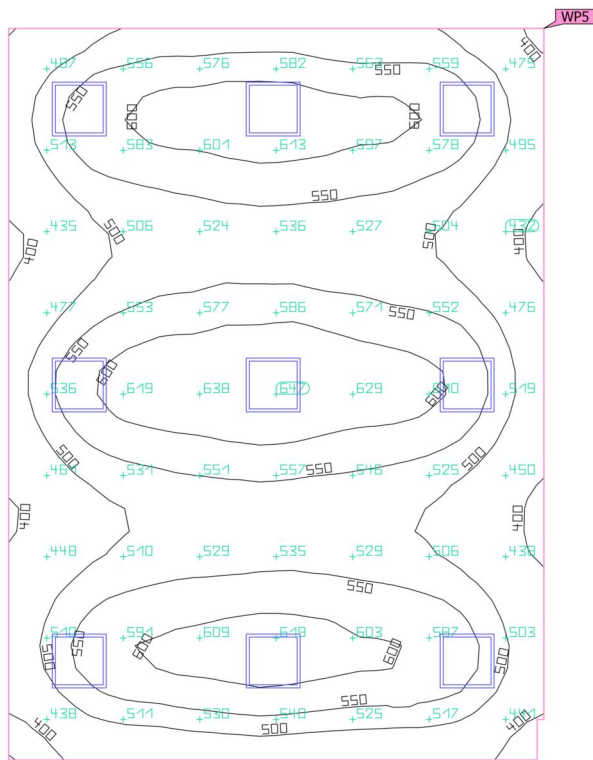
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M5 multifunkcionalni kabinet (Light scene 1)

Working plane (M5 multifunkcionalni kabinet)

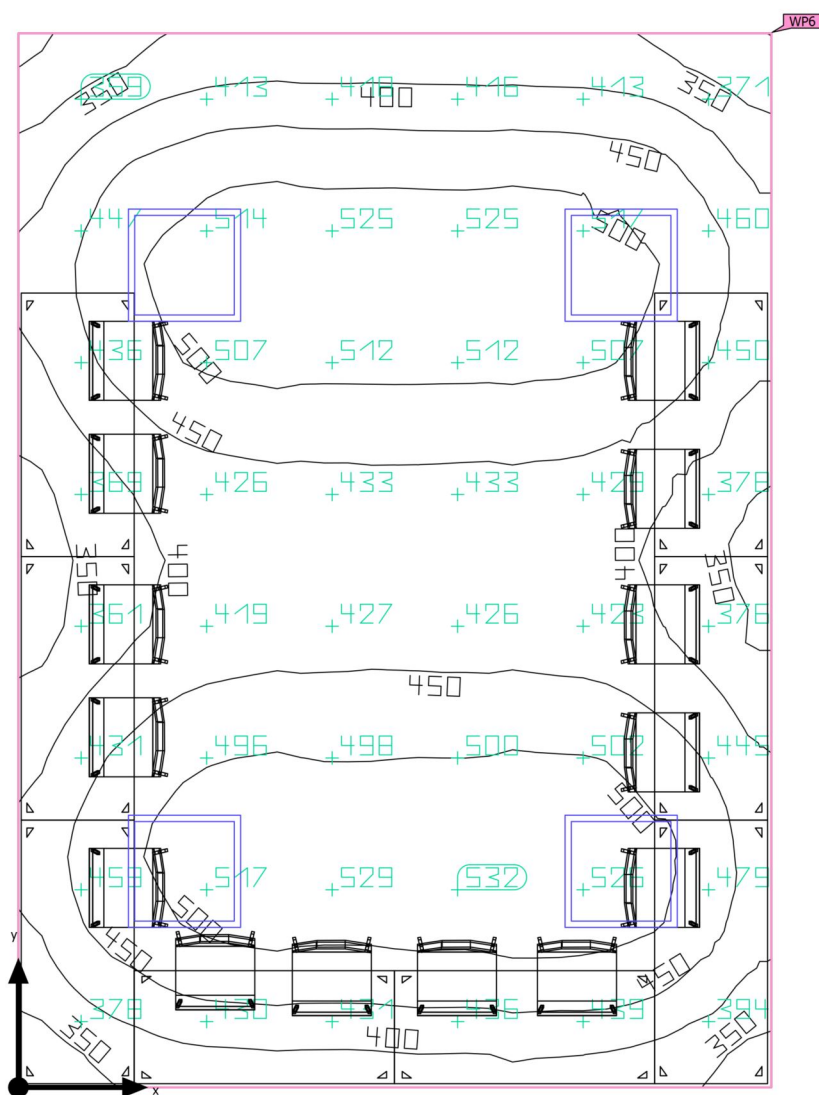


Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M5 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	536 lx (≥ 500 lx) ✓	350 lx	647 lx	0.65 (≥ 0.60) ✓	0.54	WP5

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:  
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M6 multifunkcionalni kabinet (Light scene 1)

**Summary**

Ground area	22.40 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · M6 multifunkcionalni kabinet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	449 lx	$\geq 400$ lx	✓	WP6
	$g_1$	0.65	$\geq 0.60$	✓	WP6
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	16	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	181 kWh/a	max. 800 kWh/a	✓	
Room	Lighting power density	6.07 W/m <sup>2</sup>	–		
		1.35 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 5.600 m x 4.000 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

Utilisation profile: Educational premises - Educational buildings (44.1 Classroom - general activities)

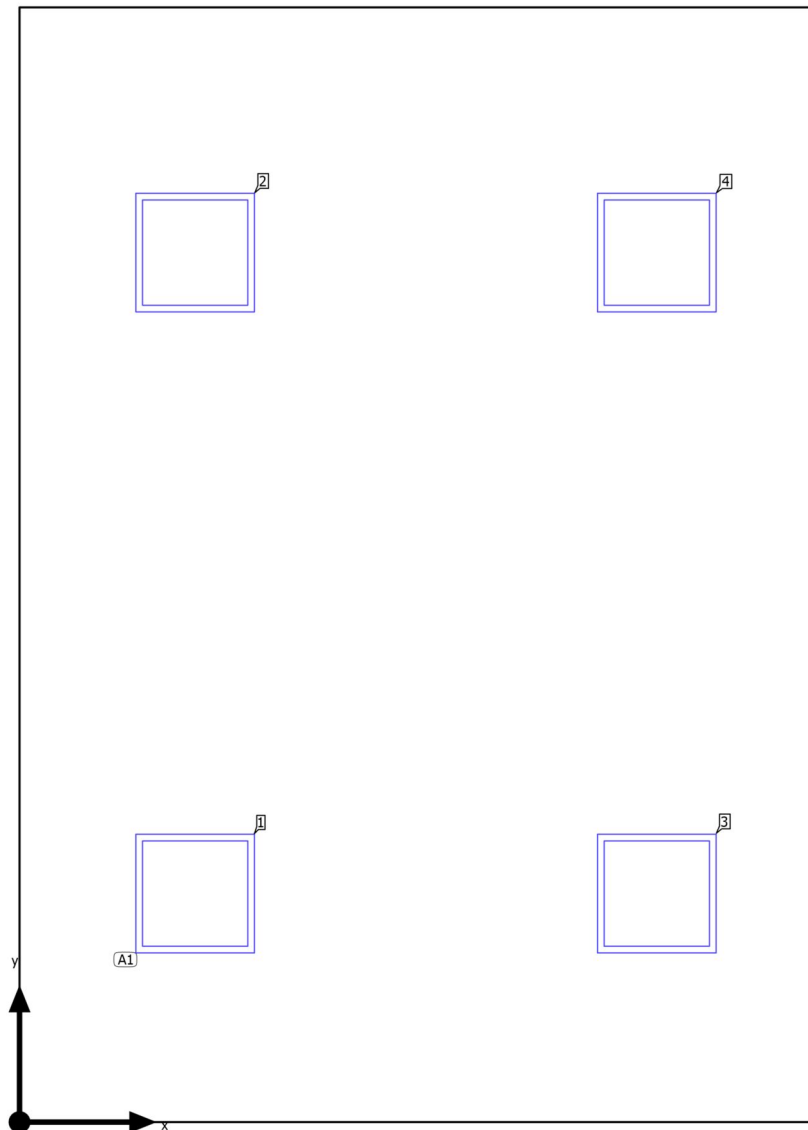
Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



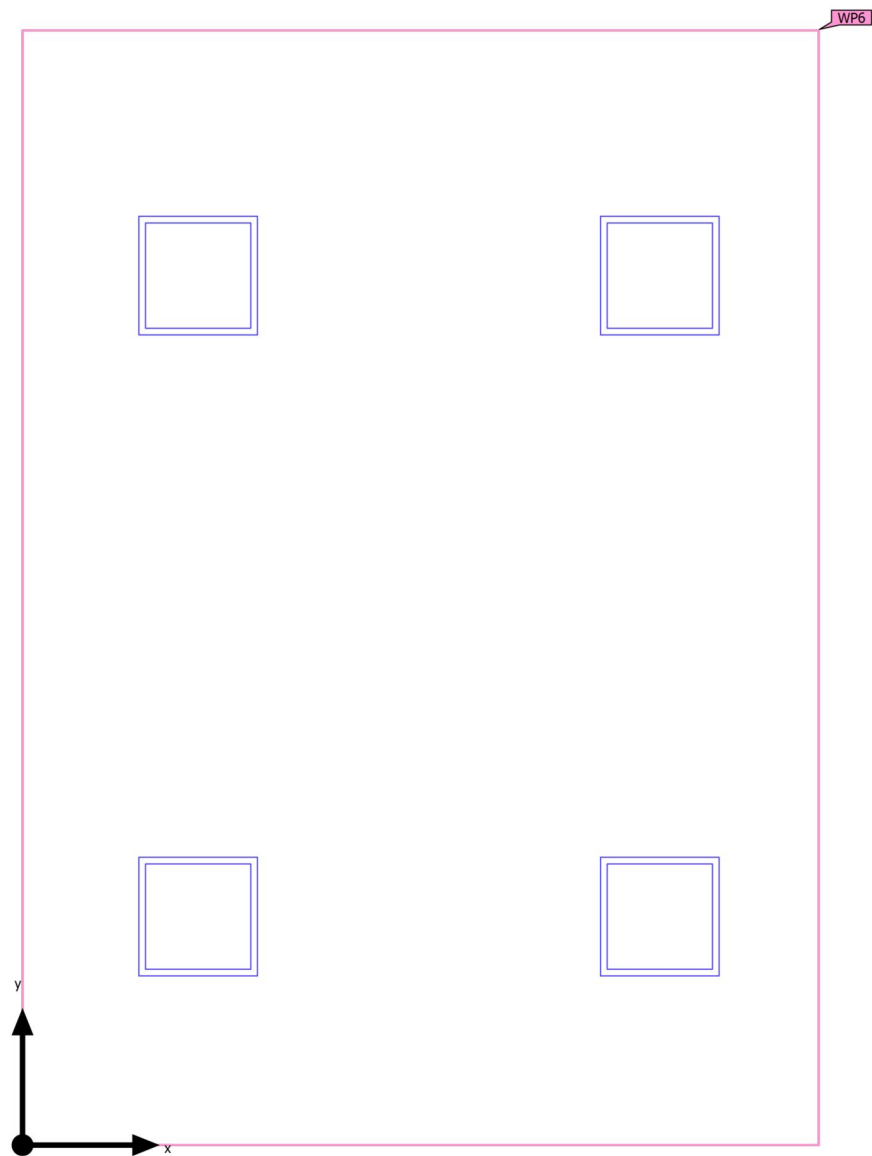
Building 1 · Sprat · M6 multifunkcionalni kabinet

## Luminaire layout plan



Building 1 · Sprat · M6 multifunkcionalni kabinet (Light scene 1)

## Calculation objects



Building 1 · Sprat · M6 multifunkcionalni kabinet (Light scene 1)

**Calculation objects**

## Working planes

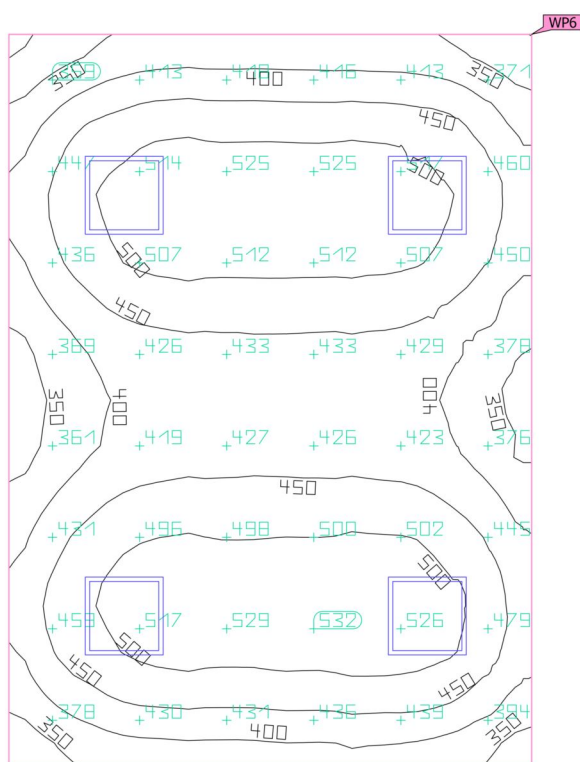
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M6 multifunkcionalni kabinet) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	449 lx ( $\geq 400$ lx) ✓	291 lx	538 lx	0.65 ( $\geq 0.60$ ) ✓	0.54	WP6

Utilisation profile: Educational premises - Educational buildings (44.1 Classroom - general activities)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · M6 multifunkcionalni kabinet (Light scene 1)

**Working plane (M6 multifunkcionalni kabinet)**

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (M6 multifunkcionalni kabinet)	449 lx	291 lx	538 lx	0.65	0.54	WP6
Perpendicular illuminance (adaptive)	( $\geq 400$ lx)			( $\geq 0.60$ )		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: Educational premises - Educational buildings (44.1 Classroom - general activities)

Notes on planning:

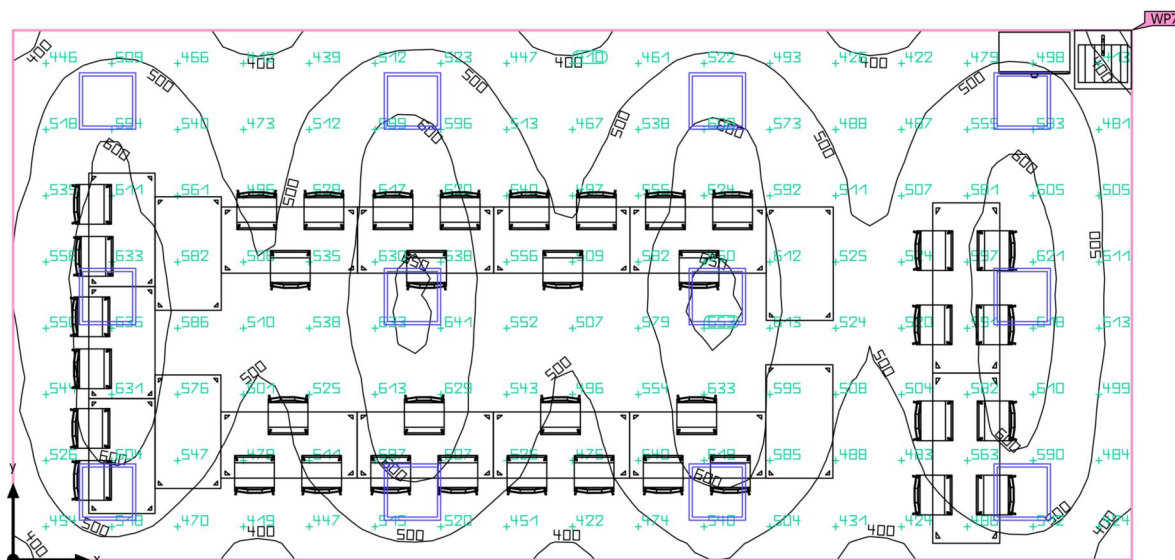
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



Building 1 · Sprat · Multifunkcionalna sala

## Description

Building 1 · Sprat · Multifunkcionalna sala (Light scene 1)

**Summary**

Ground area	66.22 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.227 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · Multifunkcionalna sala (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	534 lx	$\geq 500 \text{ lx}$	✓	WP7
	$g_1$	0.65	$\geq 0.60$	✓	WP7
Glare valuation <sup>(1)</sup>	$R_{UG, \text{max}}$	17	$\leq 19$	✓	
Energy estimation <sup>(2)</sup>	Consumption	1010 kWh/a	max. 2350 kWh/a	✓	
Room	Lighting power density	6.16 W/m <sup>2</sup>	–		
		1.15 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 11.825 m x 5.600 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

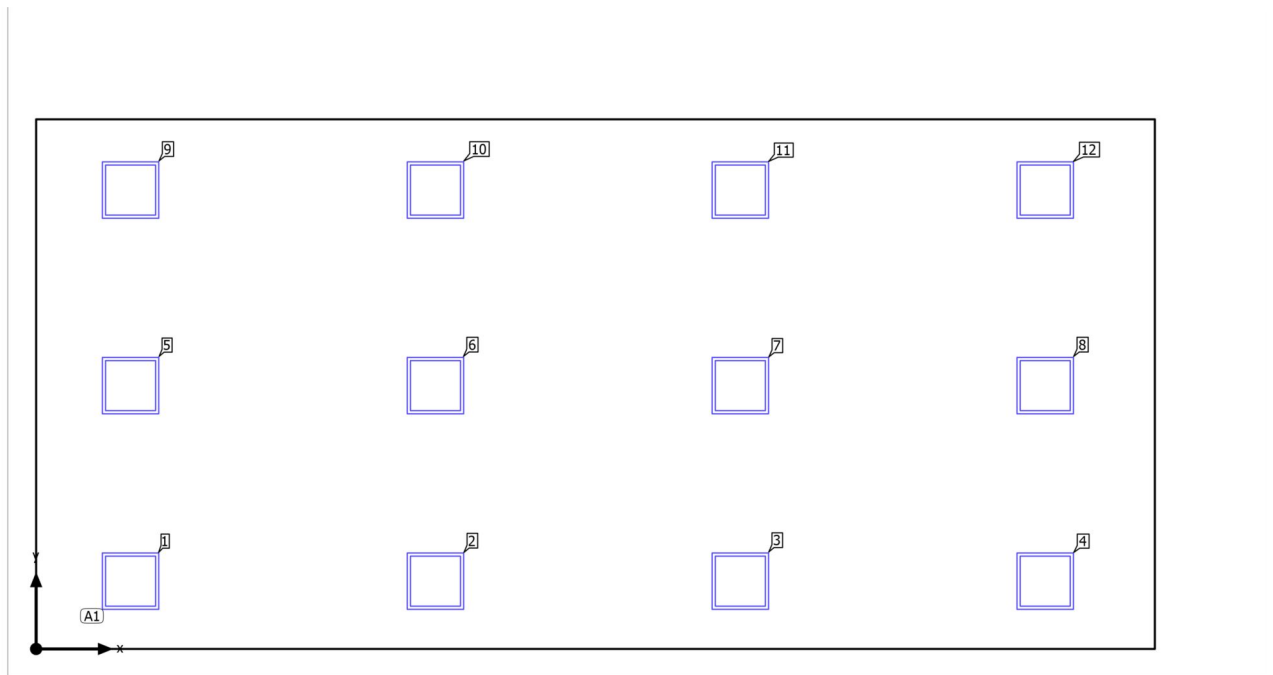
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Multifunkcionalna sala

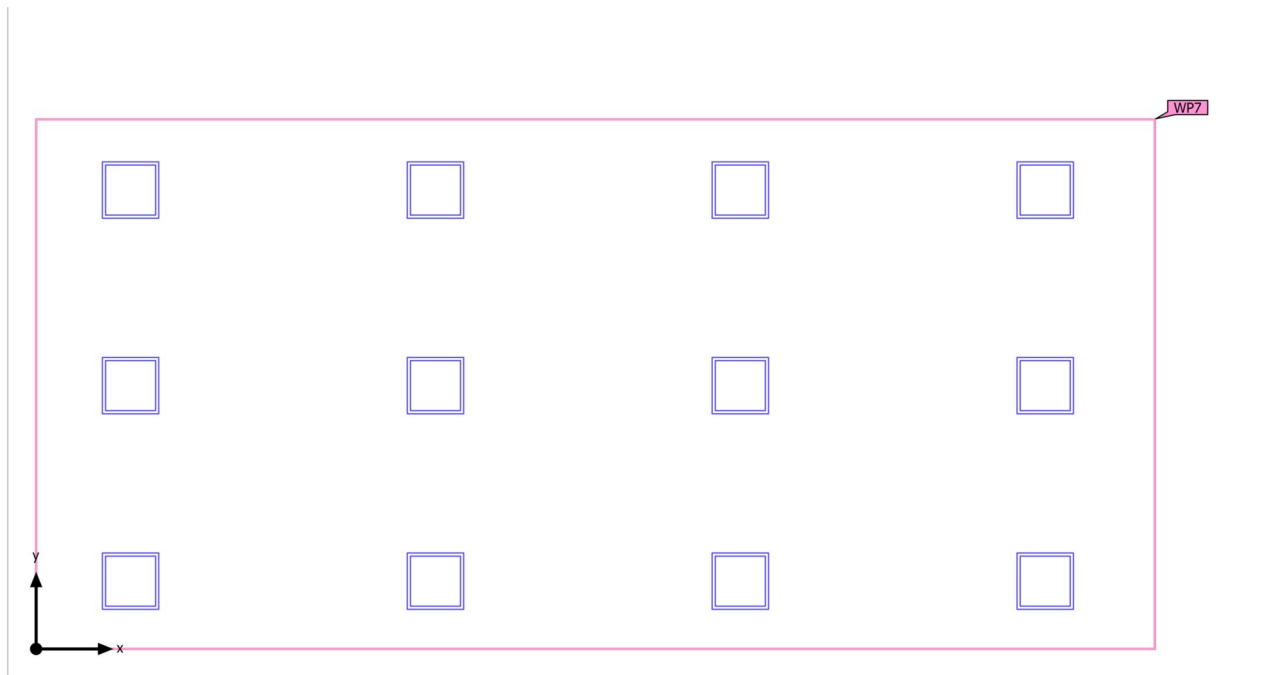
## Luminaire layout plan





Building 1 · Sprat · Multifunkcionalna sala (Light scene 1)

## Calculation objects



Building 1 · Sprat · Multifunkcionalna sala (Light scene 1)

**Calculation objects**

## Working planes

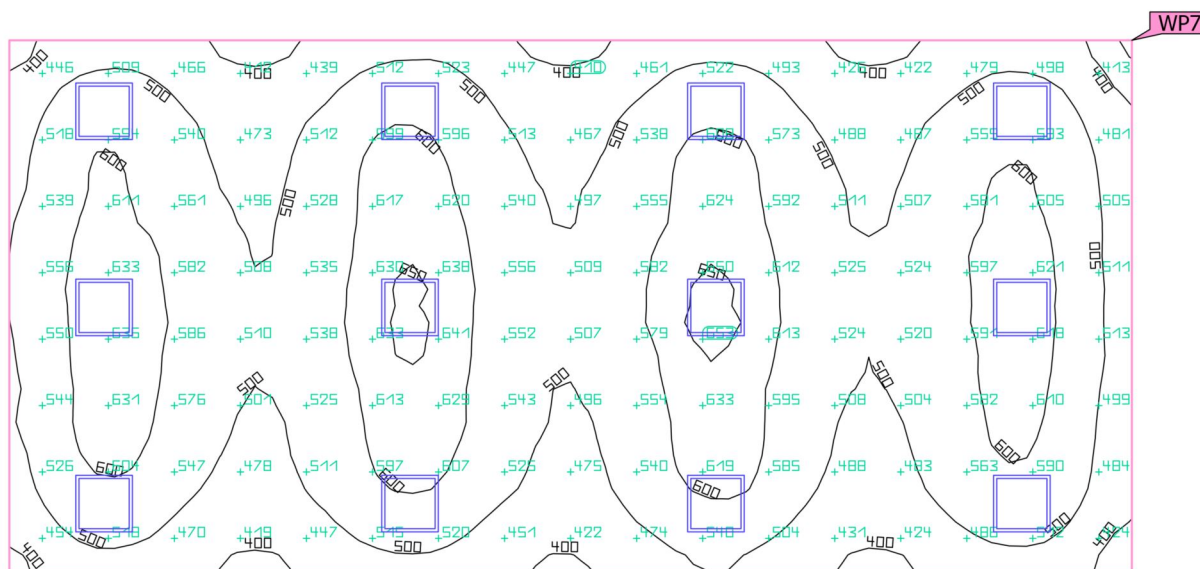
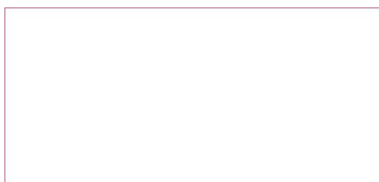
Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Multifunkcionalna sala) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	534 lx ( $\geq 500$ lx) ✓	348 lx	656 lx	0.65 ( $\geq 0.60$ ) ✓	0.53	WP7

Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Multifunkcionalna sala (Light scene 1)

**Working plane (Multifunkcionalna sala)**

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Multifunkcionalna sala)	534 lx	348 lx	656 lx	0.65	0.53	WP7
Perpendicular illuminance (adaptive)	( $\geq 500$ lx)			( $\geq 0.60$ )		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

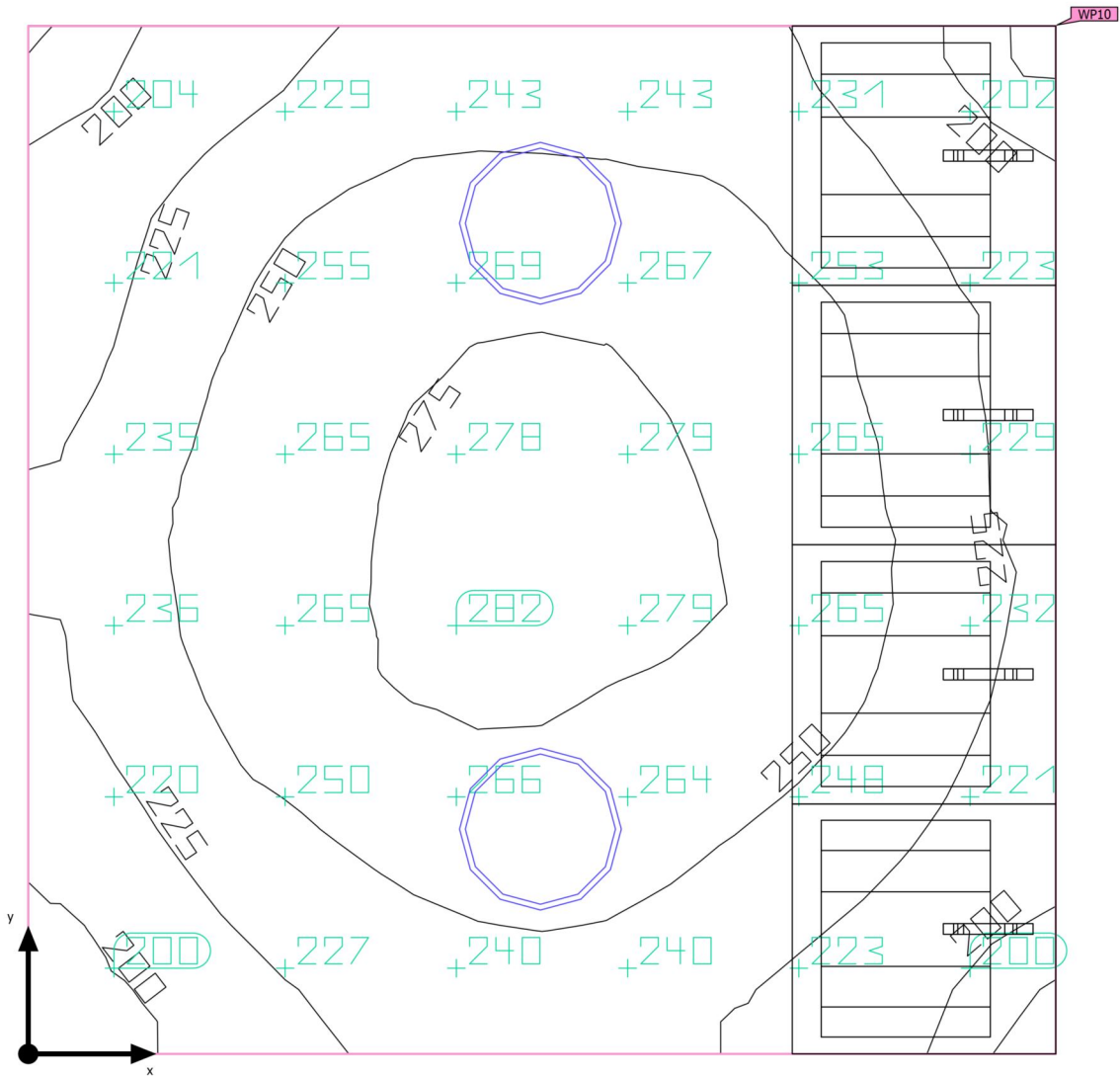
Utilisation profile: DIALux presetting (34.2 Standard (office))

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Toalet (Light scene 1)

Summary



Ground area	3.80 m <sup>2</sup>
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %
Maintenance factor	0.80 (fixed)

Clearance height	3.200 m
Mounting height	3.200 m
Height <sub>Working plane</sub>	0.800 m
Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · Toalet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	243 lx	$\geq 100 \text{ lx}$	✓	WP10
	$g_1$	0.77	$\geq 0.40$	✓	WP10
Glare valuation <sup>(1)</sup>	$R_{UG, \text{max}}$	19	$\leq 22$	✓	
Energy estimation <sup>(2)</sup>	Consumption	62.8 kWh/a	max. 150 kWh/a	✓	
Room	Lighting power density	8.57 W/m <sup>2</sup>	–		
		3.53 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 1.950 m x 1.950 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

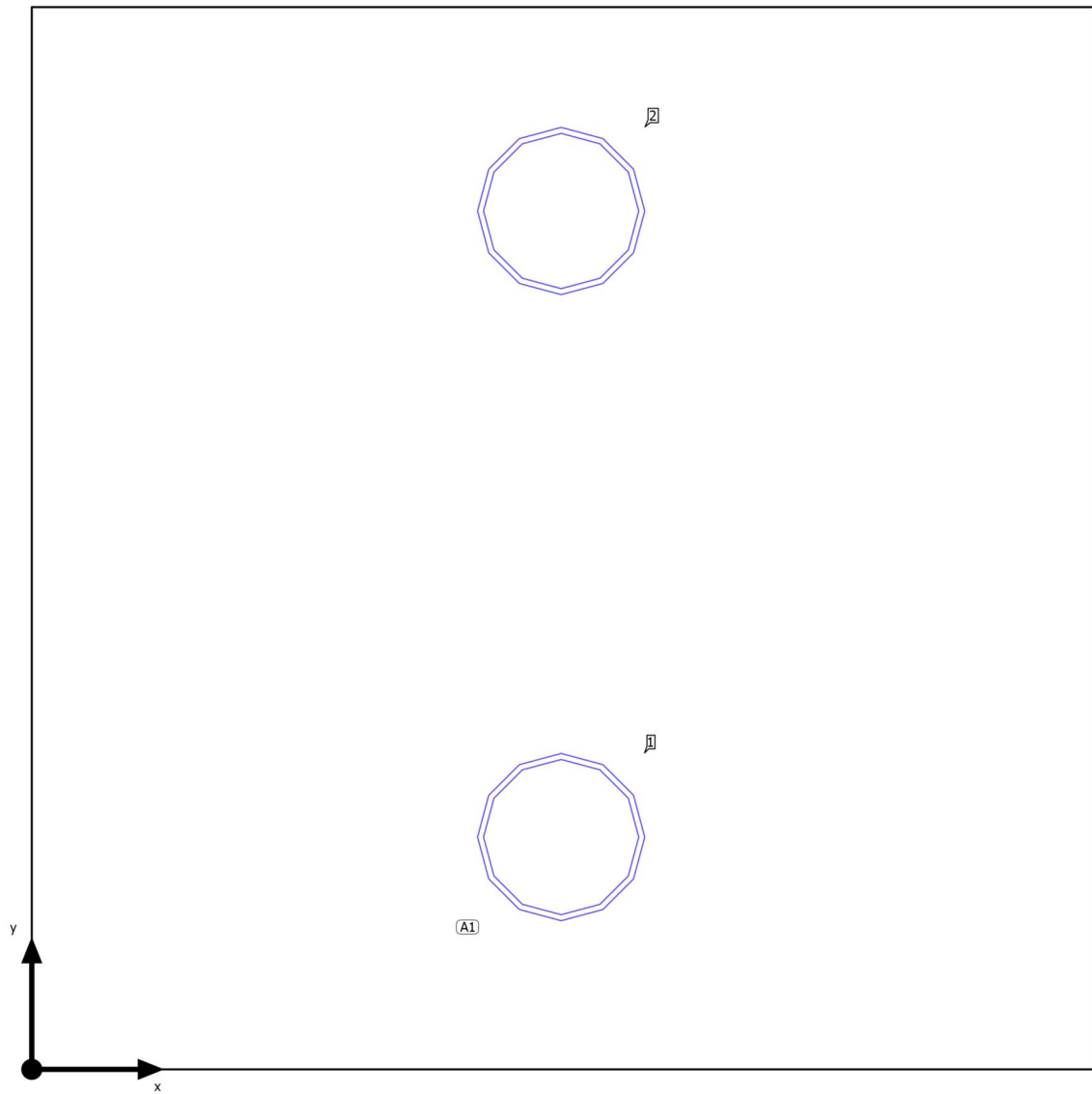
Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.2 Rest rooms)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

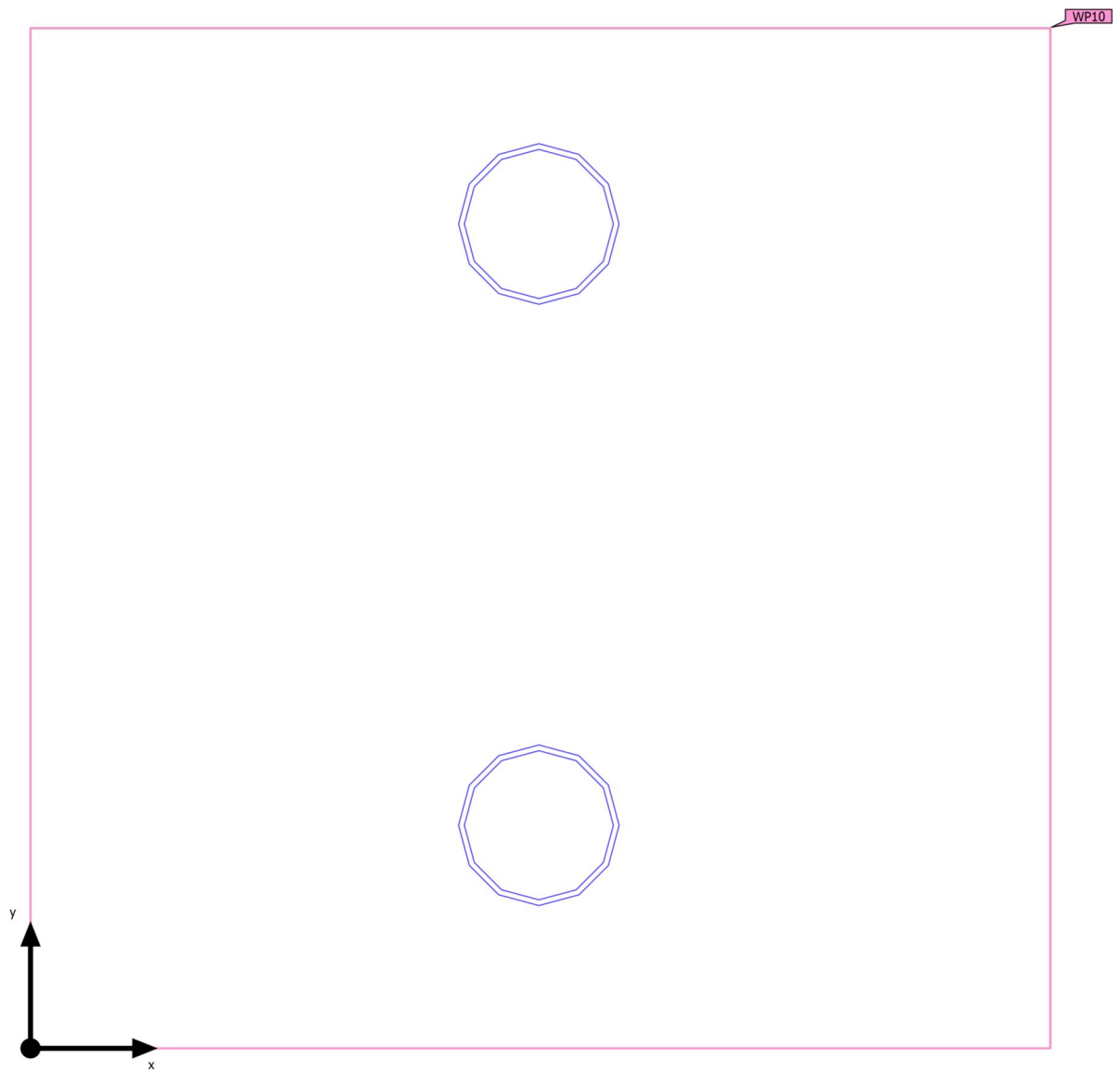
Building 1 · Sprat · Toalet

## Luminaire layout plan



Building 1 · Sprat · Toalet (Light scene 1)

## Calculation objects



Building 1 · Sprat · Toalet (Light scene 1)

**Calculation objects**

## Working planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Toalet )	243 lx	186 lx	284 lx	0.77	0.65	WP10
Perpendicular illuminance (adaptive)	( $\geq 100$ lx)			( $\geq 0.40$ )		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.2 Rest rooms)

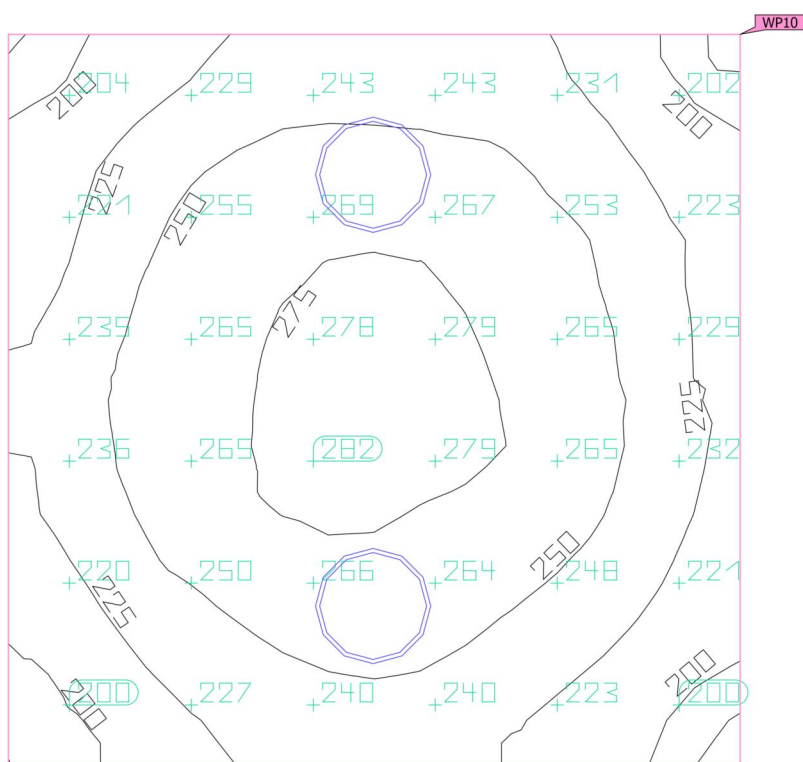
Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.



Building 1 · Sprat · Toalet (Light scene 1)

### Working plane (Toalet )



Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Toalet ) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	243 lx ( $\geq 100$ lx) ✓	186 lx	284 lx	0.77 ( $\geq 0.40$ ) ✓	0.65	WP10

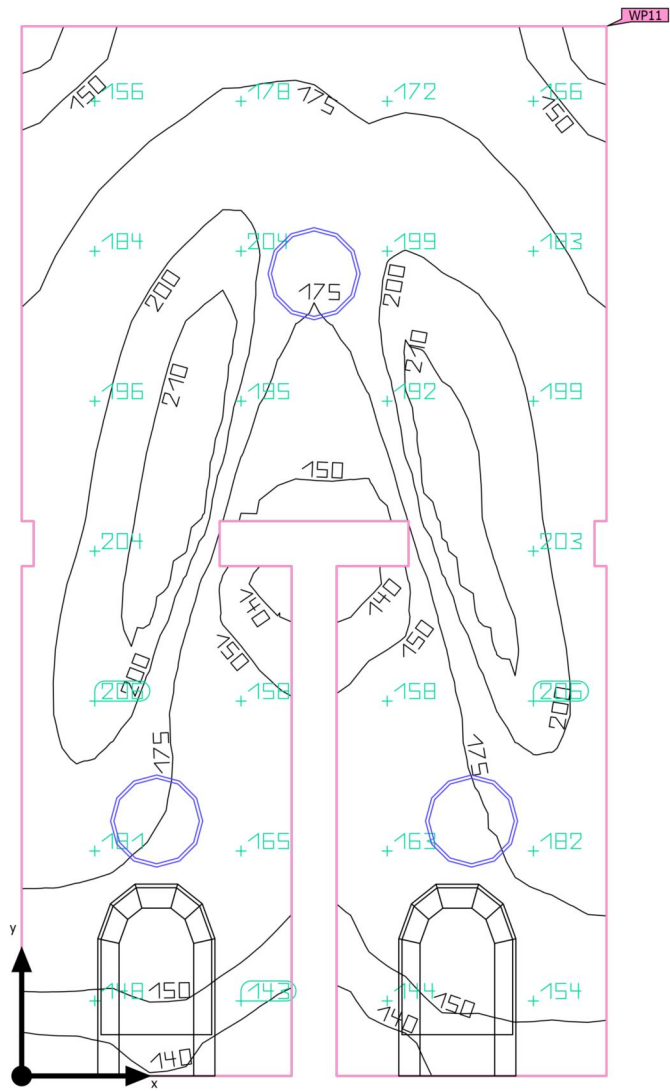
Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.2 Rest rooms)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Toalet (Light scene 1)

Summary



Ground area	6.46 m <sup>2</sup>	Clearance height	3.200 m
Reflection factors	Ceiling: 70.0 %, Walls: 50.0 %, Floor: 20.0 %	Mounting height	3.200 m
Maintenance factor	0.80 (fixed)	Height <sub>Working plane</sub>	0.800 m
		Wall zone <sub>Working plane</sub>	0.000 m

Building 1 · Sprat · Toalet (Light scene 1)

## Summary

### Results

	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	176 lx	$\geq 100$ lx	✓	WP11
	$g_1$	0.75	$\geq 0.40$	✓	WP11
Glare valuation <sup>(1)</sup>	$R_{UG, \max}$	19	$\leq 22$	✓	
Energy estimation <sup>(2)</sup>	Consumption	94.1 kWh/a	max. 250 kWh/a	✓	
Room	Lighting power density	7.57 W/m <sup>2</sup>	–		
		4.29 W/m <sup>2</sup> /100 lx	–		

(1) Based on a rectangular space of 3.500 m x 1.950 m and SHR of 0.25.

(2) Calculated using DIN:18599-4.

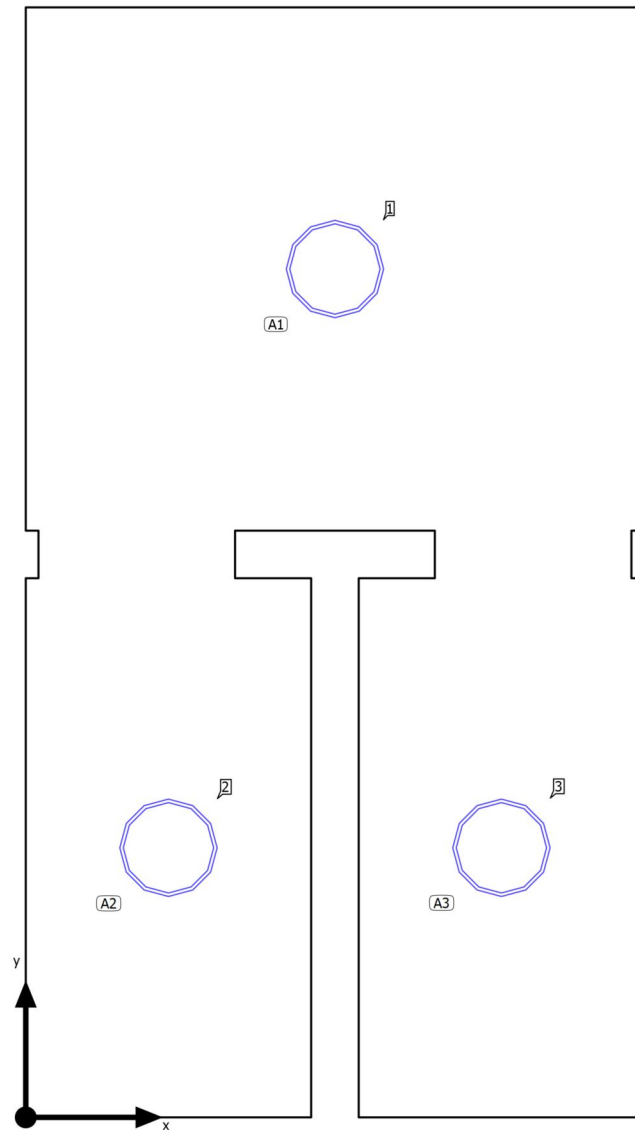
Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.2 Rest rooms)

Notes on planning:

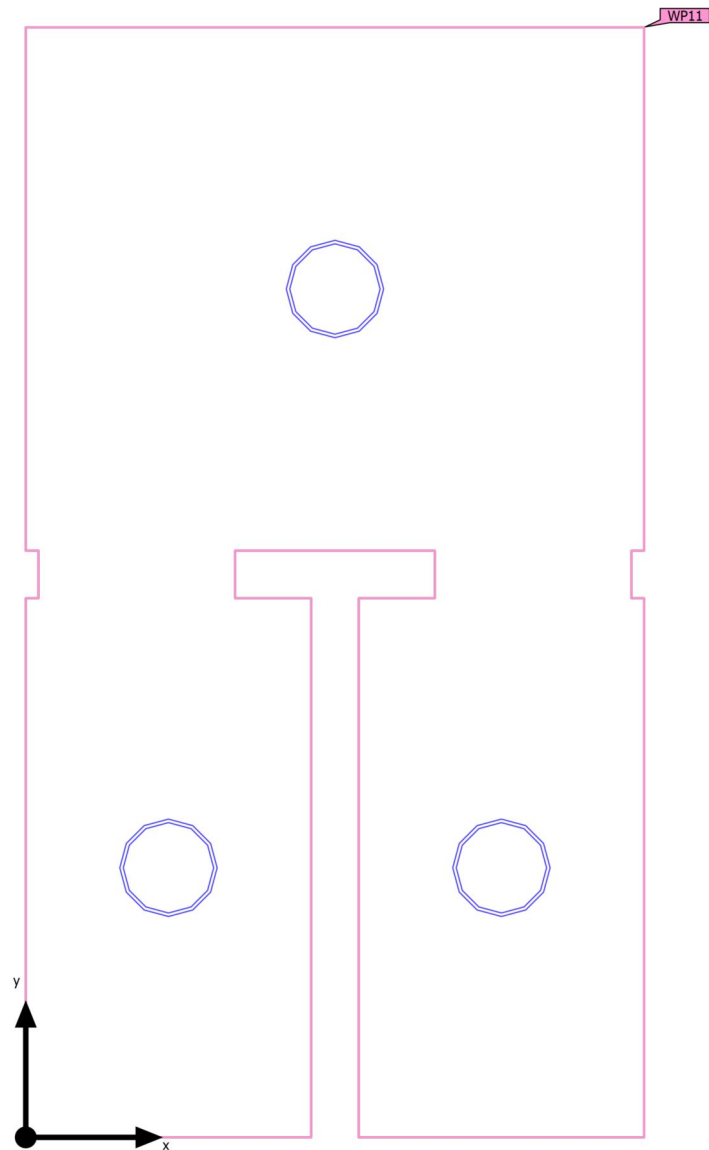
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Toalet

## Luminaire layout plan



Building 1 · Sprat · Toalet (Light scene 1)

**Calculation objects**

Building 1 · Sprat · Toalet (Light scene 1)

**Calculation objects**

## Working planes

Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Toalet ) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.000 m	176 lx ( $\geq 100$ lx) ✓	132 lx	215 lx	0.75 ( $\geq 0.40$ ) ✓	0.61	WP11

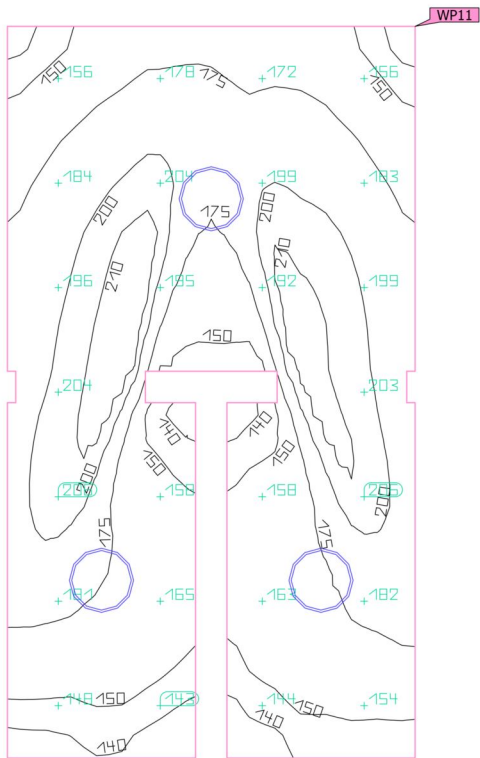
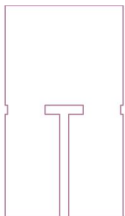
Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.2 Rest rooms)

Notes on planning:

The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

Building 1 · Sprat · Toalet (Light scene 1)

Working plane (Toalet )



Properties	$\bar{E}$ (Target)	$E_{min}$	$E_{max}$	$g_1$ (Target)	$g_2$	Index
Working plane (Toalet )	176 lx	132 lx	215 lx	0.75	0.61	WP11
Perpendicular illuminance (adaptive)	$\geq 100$ lx			$\geq 0.40$		
Height: 0.800 m, Wall zone: 0.000 m	✓			✓		

Utilisation profile: General areas inside buildings - Rest, sanitation and first aid rooms (10.2 Rest rooms)

Notes on planning:  
The results were calculated without consideration of objects and furniture. No results were determined on their surfaces.

## Glossary

### A

#### A

Formula symbol for a surface in the geometry

---

### B

#### Background area

The background area borders the direct ambient area according to DIN EN 12464-1 and reaches up to the borders of the room. In larger rooms, the background area is at least 3 m wide. It is located horizontally at floor level.

---

### C

#### CCT

(Engl. correlated colour temperature)  
Body temperature of a thermal radiator which serves to describe its light colour. Unit: Kelvin [K]. The lesser the numerical value the redder; the greater the numerical value the bluer the light colour. The colour temperature of gas-discharge lamps and semi-conductors are termed "correlated colour temperature" in contrast to the colour temperature of thermal radiators.

Allocation of the light colours to the colour temperature ranges acc. to EN 12464-1:

Light colour - colour temperature [K]  
warm white (ww) < 3,300 K  
neutral white (nw) ≥ 3,300 – 5,300 K  
daylight white (dw) > 5,300 K

---

#### Clearance height

The designation for the distance between upper edge of the floor and bottom edge of the ceiling (in the completely furnished status of room).

---

#### Control group

A group of luminaires that are dimmed and controlled together. For each lighting scene, a control group provides its own dimming value. All luminaires within a control group share this dimming value. The control groups with their luminaires are automatically determined by DIALux on the basis of the created light scenes and their luminaire groups.

---

#### CRI

(Engl. colour rendering index)  
Designation for the colour rendering index of a luminaire or a lamp acc. to DIN 6169: 1976 or CIE 13.3: 1995.

The general colour rendering index Ra (or CRI) is a dimensionless figure that describes the quality of a white light source in regards to its similarity with the remission spectra of defined 8 test colours (see DIN 6169 or CIE 1974) to a reference light source.

---



## Glossary

### D

Daylight autonomy	Describes what percentage of the daily working time the required illuminance is met by daylight. The nominal illuminance is used from the room profile, unlike described in EN 17037. The calculation is not done in the centre of the room but at the placed sensor measuring point. A room is considered sufficiently supplied with daylight if it achieves at least 50% daylight autonomy.
Daylight factor	Ratio of the illuminance achieved solely by daylight incidence at a point in the inside to the horizontal illuminance in the outer area under an unobstructed sky.  Formula symbol: D (Engl. daylight factor) Unit: %
Daylight quotient effective area	A calculation surface within which the daylight quotient is calculated.

### E

Energy evaluation	<p>Based on an hourly calculation procedure for daylight in indoor spaces, considering the project geometry and any existing daylight control systems. Orientation and location of the project are also considered. The calculation uses the specified system power of the luminaires to determine the energy demand. A linear relationship between power and luminous flux in the dimmed state is assumed for daylight-controlled luminaires. Times of use and nominal illuminance are determined from the usage profiles of the spaces. Switched-on luminaires that are explicitly excluded from control also consider the specified times-of-use. The daylight control systems use a simplified control logic that closes them at an outdoor horizontal illuminance of 27,500lx.</p> <p>The calendar year 2022 is used as a reference only. It is not a simulation of this year. The reference year is only used to assign the days of the week to the calculated results. The changeover to summer time is not considered. The reference sky type used is the average sky described in CIE 110 without direct sunlight.</p> <p>The method was developed together with the Fraunhofer Institute for Building Physics and is available for review by the Joint Working Group 1 ISO TC 274 as an extension of the previous annual regression-based method.</p>
Eta ( $\eta$ )	<p>(light output ratio)</p> <p>The light output ratio describes what percentage of the luminous flux of a free radiating lamp (or LED module) is emitted by the luminaire when installed.</p> <p>Unit: %</p>

## Glossary

### G

$g_1$	Often also $U_o$ (Engl. overall uniformity) Designates the overall uniformity of the illuminance on a surface. It is the quotient from $E_{min}$ to $\bar{E}$ and is required, for instance, in standards for illumination of workstations.
$g_2$	Actually it designates the "non-uniformity" of the illuminance on a surface. It is the quotient of $E_{min}$ to $E_{max}$ and is generally only relevant for certifying the emergency lighting acc. to EN 1838.

### I

<b>Illuminance</b>	Describes the ratio of the luminous flux that strikes a certain surface to the size of this surface ( $lm/m^2 = lx$ ). The illuminance is not tied to an object surface. It can be determined anywhere in space (inside or outside). The illuminance is not a product feature because it is a recipient value. Luxometers are used for measuring.  Unit: Lux Abbreviation: lx Formula symbol: E
<b>Illuminance, adaptive</b>	For the determining of the middle adaptive illuminance on a surface, this is rastered "adaptively". In the area of large illuminance differences within the surface, the raster is subdivided finer; within lesser differences, a rougher classification is made.
<b>Illuminance, horizontal</b>	Illuminance that is calculated or measured on a horizontal (level) surface (this can be for example a table top or the floor). The horizontal illuminance is usually identified by the formula letter $E_h$ .
<b>Illuminance, perpendicular</b>	Illuminance that is calculated or measured plumb-vertical to a surface. This needs to be taken into account for tilted surfaces. If the surface is horizontal or vertical, then there is no difference between the perpendicular and the horizontal or vertical illuminance.
<b>Illuminance, vertical</b>	Illuminance that is calculated or measured on a vertical surface (this can be for example the front of some shelves). The vertical illuminance is usually identified by the formula letter $E_v$ .

### L

<b>LENI</b>	(Engl. lighting energy numeric indicator) Lighting energy numeric indicator acc. to EN 15193  Unit: $kWh/(m^2 \cdot a)$
-------------	--

## Glossary

LLMF	<p>(Engl. lamp lumen maintenance factor)/acc. to CIE 97: 2005 Lamp flux maintenance factor that takes the luminous flux reduction into account of a luminaire or an LED module in the course of the operating time. The lamp flux maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no luminous flux reduction existing).</p>
LMF	<p>(Engl. luminaire maintenance factor)/acc. to CIE 97: 2005 Luminaire maintenance factor that takes the soiling into account of the luminaire in the course of the operating time. The luminaire maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).</p>
LSF	<p>(Engl. lamp survival factor)/acc. to CIE 97: 2005 Lamp survival factor that takes the total failure into account of a luminaire in the course of the operating time. The lamp survival factor is specified as a decimal digit and can have a maximum value of 1 (no failures existing within the time concerned or prompt replacement after the failure).</p>
Luminance	<p>Dimension for the "brightness impression" that the human eye has of a surface. The surface itself can emit light thereby or light striking it can be reflected (emitter value). It is the only photometric value that the human eye can perceive.</p> <p>Unit: Candela per square metre Abbreviation: cd/m<sup>2</sup> Formula symbol: L</p>
Luminous efficacy	<p>Ratio of the emitted luminous flux <math>\Phi</math> [lm] to the absorbed electrical power P [W] Unit: lm/W.</p> <p>This ratio can be formed for the lamp or LED module (lamp or module light output), the lamp or module with control gear (system light output) and the complete luminaire (luminaire light output).</p>
Luminous flux	<p>Dimension for the total light output that is emitted from one light source in all directions. It is thus an "emitter value" that specifies the entire emitting output. The luminous flux of a light source can only be determined in a laboratory. A difference is made between the lamp or LED module luminous flux and the luminaire luminous flux.</p> <p>Unit: Lumen Abbreviation: lm Formula symbol: <math>\Phi</math></p>
Luminous intensity	<p>Describes the intensity of the light in a certain direction (emitter value). The luminous intensity is a matter of the luminous flux <math>\Phi</math> that is emitted in a certain spherical angle <math>\Omega</math>. The radiation characteristics of a light source are presented graphically in a light distribution curve (LDC). The luminous intensity is an SI base unit.</p> <p>Unit: Candela Abbreviation: cd Formula symbol: I</p>

## Glossary

### M

Maintenance factor	See MF
MF	<p>(Engl. maintenance factor)/acc. to CIE 97: 2005</p> <p>Maintenance factor as decimal number between 0 and 1 that describes the ratio of the new value of a photometric planning parameter (e.g. of the illuminance) to a maintenance value after a certain time. The maintenance factor takes into account the soiling of luminaires and rooms as well as the luminous flux reduction and the failure of light sources.</p> <p>The maintenance factor is taken into account either overall or determined in detail acc. to CIE 97: 2005 by the formula <math>RMF \times LMF \times LLMF \times LSF</math>.</p>

### P

P	<p>(Engl. power)</p> <p>Electric power consumption</p> <p>Unit: watt</p> <p>Abbreviation: W</p>
---	---

### R

$R_{(UG)} \max$	<p>Measure of the psychological glare in indoor spaces.</p> <p>In addition to the luminance of luminaires, the level of the <math>R_{(UG)}</math> value also depends on the observer position, the viewing direction and the ambient luminance. The calculation is made according to the table method, see CIE 117. Among other things, EN 12464-1:2021 specifies maximum permissible <math>R_{(UG)}</math>- values <math>R_{(UGL)}</math> for various indoor workplaces.</p>
Reflection factor	The reflection factor of a surface describes how much of the striking light is reflected back. The reflection factor is defined by the colour of the surface.
RMF	<p>(Engl. room maintenance factor)/acc. to CIE 97: 2005</p> <p>Room maintenance factor that takes the soiling into account of the space encompassing surfaces in the course of the operating time. The room maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).</p>

### S

Surrounding area	The ambient area directly borders the area of the visual task and should be planned with a width of at least 0.5 m according to DIN EN 12464-1. It is at the same height as the area of the visual task.
------------------	--

## Glossary

### U

UGR (max)	(unified glare rating) Measure for the psychological glare effect in interiors. In addition to luminaire luminance, the UGR value also depends on the position of the observer, the viewing direction and the ambient luminance. Among other things, EN 12464-1 specifies maximum permissible UGR values for various indoor workplaces.
-----------	---

UGR observer	Calculation point in the room, for the DIALux the UGR value is determined. The location and height of the calculation point should correspond to the typical observer position (position and eye level of the user).
--------------	--

### V

Visual task area	The area that is needed for carrying out the visual task in accordance with DIN EN 12464 -1. The height corresponds with the height at which the visual task is executed.
------------------	---

### W

Wall zone	Circumferential area between working plane and walls which is not taken into account for the calculation.
-----------	---

Working plane	Virtual measuring or calculation surface at the height of the visual task that generally follows the room geometry. The working plane may also feature a wall zone.
---------------	---

## **5 MATERIAL SPECIFICATION**

**MATERIAL SPECIFICATION**  
*of electrical installations of low voltage*

a row. no.	Item description	one measures	quantity
------------------	------------------	-----------------	----------

## 1 DISTRIBUTION CABINETS AND POWER SUPPLY LINES

- 1.1. Delivery of equipment that needs to be installed in the existing main distribution cabinet GRO located in the technical room under the stairs. The item should include the examination of the equipment from which the consumers on the floor are supplied, their dismantling, rescheduling of the equipment cabinets and installation of new equipment. The following equipment is installed in the cabinet (NOTE: the existing electric meter is kept):

automatic switch iC12H-C/63A, 1p; 10 kA	psc	3
automatic switch iC60H-C/25A, 3p; 10 kA	psc	1
the item includes busbars, row clamps, POK channels, plastic labels, pertinax, nameplates, copper braids, cable glands, single-pole scheme, pocket for single-pole scheme and other necessary small material necessary for the installation of the cabinet. Complete equipment with all connections. Total for material:	set	1

- 1.2. Delivery of distribution cabinet RO-1. RO-1 is workshop-made, intended for mounting on the wall, suitable dimensions, degree of protection IP40, with the introduction of the power cable on the lower side and the drain cables on the upper side. Made from twice pickled sheet metal with a thickness of 2 mm and varnished according to the request of the interior designer. The cabinet frame is made of 2 mm thick profiled iron. The wardrobe has wings that can be locked with a lock and key. The following elements are installed in the cabinet, according to the single-pole scheme:

Interpact disconnecter INS 100A, 1-0, 3P	psc	1
differential current protective device iID 40/0,03A, 4p	psc	1
automatic switch iC60N-C/40A, 1p; 6 kA	psc	3
automatic switch iC60N-C/16A, 1p; 6 kA	psc	26
automatic switch iC60N-C/10A, 1p; 6 kA	psc	6
the item includes busbars, row clamps, POK channels, plastic labels, pertinax, nameplates, copper braids, cable glands, single-pole scheme, pocket for single-pole scheme and other necessary small material necessary for the installation of the cabinet. Total for material:	set	1

- 1.3. Distribution board delivery: RT-2; factory production, IP40. The board is built-in, for the installation of 36 modules (2x18M). The item also includes all "small" elements necessary for the installation of the panel, switches and cable routing. Install the following equipment in the panel according to the single-pole scheme:

Interpact disconnecter iSW 63A, 1-0, 3P	psc	1
differential current protective device iLD 63/0,03A, 4p	psc	1
automatic switch iC60N-C/16A, 1p; 6 kA	psc	28
automatic switch iC60N-C/10A, 1p; 6 kA	psc	7
the item includes busbars, row clamps, POK channels, plastic labels, pertinax, nameplates, copper braids, cable glands, single-pole scheme, pocket for single-pole scheme and other necessary small material necessary for the installation of the cabinet. Total for material:	set	1

- 1.4. Procurement of cable terminations for the termination of the cable to make the connection in GRO and RO-1, and in everything according to the technical description and assembly instructions, for power cables cross-section 4x25+ 1x16 mm<sup>2</sup>. Total for procurement, calculated by the installed cable termination:

psc 2

- 1.5. Procurement and delivery of cables of the following types:

N2XH-J 5x16 mm <sup>2</sup>	m	29
N2XH-J 1x16 mm <sup>2</sup>	m	26
N2XH-J 4x25 mm <sup>2</sup>	m	26

## 2 GENERAL ELECTRICAL INSTALLATION

- 2.1. Procurement and delivery of cables of the following types:

N2XH-j 5x2.5mm <sup>2</sup>	m	15
-----------------------------	---	----

- 2.2. Procurement and delivery of cables of the following types:

N2XH-j 3x2.5mm <sup>2</sup>	m	1272
-----------------------------	---	------

## 3 ELECTRICAL LIGHTING INSTALLATION

- 3.1. Procurement and delivery of cables of the following types:

N2XH-j 3x1.5 mm <sup>2</sup>	m	850.0
------------------------------	---	-------

- 3.2. (S1) Procurement and delivery of recessed LED luminaire with excellent glare control and high efficiency for office and education. The 36 LED cells (arranged in a 6x6 pattern) each have a prismatic primary lens that allows for greater light output with low glare and user comfort. LED driver with fixed output. Class II electrical, IP40, Impact resistance: IK04. Body: sheet steel, white. Diffuser: prism structure. Complete with 4000K LED. UGR < 19 and L65 < 3000 cd/m<sup>2</sup> according to EN 12464. Dimensions: 596x596x32 mm; Lamp input power: 34 W; Luminous flux of the lamp: 4392 lm; Lamp efficiency: 129 lm/W; Weight: 2.1 kg. Total for material:

psc 60



Procurement and delivery of the extension housing for the lamp S1. Total for material:		psc	60
3.3. (S2) Procurement and delivery of LED panels with an opal homogeneous surface that emits light. Total luminous flux: 4400 lm, Lamp input power: 36 W, Luminous efficiency: 122 lm/W, Correlated color temperature (CCT) 4000K. Lifetime: 50,000 hours @L80, color rendering: CRI > 80. Dimensions: 1196x296x35 mm, weight: 1.72 kg. Total for material:			
		psc	5
Procurement and delivery of the extension housing for the lamp S2. Total for material:		psc	5
3.4. (S3) Procurement and delivery of an overhead LED lamp. Diffuser: opal polycarbonate. Class II electrical, IP65, IK10. Complete with 4000K LED. Suitable for direct mounting on the wall or ceiling. Loop-in, loop-out is possible for cables up to 2.5 mm <sup>2</sup> . BESA compatible. Dimensions: Ø307x58 mm; Lamp input power: 16.3 W; Luminous flux of the lamp: 1950 lm; Lamp efficiency: 120 lm/W; Weight: 0.98 kg Total for material:			
		psc	5
3.5. (P1) Supply and delivery of emergency surface mount LED light, manual test (3 hours) with open space optics. IP40. Electrical connection (230VAC). Complete with LEDs. Lamp input power: 4 W. Dimensions: 146x146x34 mm. Weight: 1 kg. Luminous flux: 130 lm. Lamp efficiency: 33 lm/W. Total for material:			
		psc	7
3.6. (P2) Procurement and delivery of an overhead LED lamp for lighting exit routes with min. 1 lux in accordance with EN 1838; neutral white 4000K; polycarbonate lens; Screw mounting of gear carrier and cover IP 40; Made of cast aluminum; housing color white (RAL9016); Gear carrier made of galvanized sheet metal; Lamp with local power from 3 hours of autonomy, with automatic test (automatic testing) via the lamp, optional central monitoring via DALI, display of the status of the lamp via the LED status; NFC interface for addressing, configuration and maintenance via PROset pen or PROset application; addressing is also possible visually or through EZ-address; power supply: 220-240 V AC (+/- 10%), 50-60 Hz; Lamp input power: 9.3 W; SC1; Plug-in terminals for through wiring up to 2.5 mm <sup>2</sup> ; Impact strength: IK04; Dimensions: 146 x 146 x 48 mm; weight: 0.82 kg; The lamp is delivered complete with a light source, necessary equipment for work. Total for material:			
		psc	2
3.7. (P4) Procurement and delivery of LED pictograms, autonomy 1,2,3 or 8h (can be selected using a switch), in standby or permanent connection, input power 6.1 W, housing lamp made of polycarbonate (RAL9016), expected lifetime is 50,000 working hours , uniform illumination of the pictogram >500cd/m <sup>2</sup> , the lamp is easy to mount, complete with pictograms according to the ISO 7010 standard, maximum visible distance 23m, the lamp does not need to be maintained thanks to LED technology, protection IP40, mechanical protection IK03, the possibility of working at an ambient temperature of 5 °C to 40°C, dimensions 330x45x190mm, weight 0.8kg. Total for material:			
		psc	2
3.8. Procurement and delivery of an overhead ceiling motion sensor (detector) with degree of protection IP20, detection radius 4m. Total for material:			
		psc	4

#### 4 INSTALLATION EQUIPMENT

##### 4.1. Procurement and delivery of modular accessories , white color

built-in PVC box Ø60mm

armature 2M

decorative mask 2M

socket 2P+E 16A, 2M - 1pc - white color

Total for material: set 12

##### 4.2. Procurement and delivery of modular accessories , white color

built-in PVC box Ø60mm

armature 2M

decorative mask 2M

socket 2P+E 16A, 2M - 1pc - white color, with IP44 degree of protection

Total for material: set 1

##### 4.3. Procurement and delivery of modular accessories , white color

built-in PVC box 3M

armature 3M

decorative mask 3M - white color

socket 2P+E 16A, 2M - 1 pc - white color

free module for low current, 1M - 1 pc - white color

Total for material: set 7

##### 4.4. Procurement and delivery of modular accessories , white color.

built-in PVC box 4M

armature 4M

decorative mask 4M - white color

socket 2P+E 16A, 2M - 2 pcs - white color

Total for material: set 36

##### 4.5. Procurement and delivery of modular accessories , white color.

built-in PVC box 6M

armature 6M

decorative mask 6M - white color

socket 2P+E 16A, 2M - 2 pcs - white color

free modules for low current, 1M - 2 pcs

Total for material: set 12

---

**FLOOR CONNECTORS**


---

- 4.6. Procurement and delivery of equipment for the floor box 4M. - Built-in housing 4M, metal, for installation in the floor or double floor. Built-in dimensions 208.5x182mm, depth min. 83 mm. Adjustable height 83-128mm. - Floor box insert for housing 4M modules - Floor box cover 4M, metal, installation dimensions 200.5x177mm, depth min. 17.5mm For installation in the floor box: - single-phase Shuko socket 2P+E, 16A - pcs 2; Total for material:
- set 11
- 4.7. Procurement and delivery of equipment for floor box 7M. - Built-in housing 7M, metal, for installation in the floor or double floor. Built-in dimensions 273x182.5mm, depth min. 83 mm. Adjustable height 83-128mm. - Floor box insert for housing 7M modules - Floor box cover 7M, metal, installation dimensions 265x178mm, depth min 17.5mm For installation in the floor box: - single-phase Shuko socket 2P+E, 16A - 2 pieces; - free modules for low current 1M - pcs 2; - blind modules - cover 1M - pc 1; Total for material:
- set 8
- 4.8. Procurement and delivery of equipment for the floor box 2x7M. - Built-in housing 2x7M, metal, for installation in the floor or double floor. Built-in dimensions 273x269.5mm, depth min. 83 mm. Adjustable height 83-128mm. - Floor box insert for housing 2x7M modules - Floor box cover 2x7M, metal, installation dimensions 265x265mm, depth min 17.5mm For installation in the floor box: - single-phase Shuko connector 2P+E, 16A - 4 pcs.; - free modules for low current 1M - 4 pieces; - blind modules - cover 1M - pc 2; Total for material:
- set 8

---

**SWITCHES**


---

- 4.9. Procurement and delivery of modular accessories , white color
- built-in PVC box 2M  
 armature 2M  
 decorative mask 2M - white color  
 ordinary switch 2M - 1pc - white color  
 Total for material:
- set 2
- 4.10. Procurement and delivery of modular accessories , white color
- built-in PVC box 2M  
 armature 2M  
 decorative mask 2M - white color  
 ordinary switch 1M - 2pcs - white color  
 Total for material:
- set 6

**5 INSTALLATION OF POTENTIAL EQUALIZATION**

- |  |   |     |
|--|---|-----|
| 5.1. Fine wire conductor section H07Z-R 1x6mm <sup>2</sup> . Total for material:   | m | 105 |
| 5.2. Fine wire conductor section H07Z-R 1x16mm <sup>2</sup> . The item also includes HFT halogen free pipes through a concrete jacket. Total for material: | m | 100 |

Responsible Engineer:  
Slobodan Marković, dipl.ing.el.

## **6 BILL OF QUANTITIES OF MATERIALS AND WORKS**

**BILL OF QUANTITIES**  
*electrical installation of low voltage*

This bill of quantities envisages the delivery and installation of its material, specified by position and its small unspecified material required for complete production and installation as indicated by position, testing and commissioning as well as bringing to the proper original condition. All material used must be of first-class quality and conform to standards. The work must be carried out by a skilled workforce, in full compliance with the applicable technical regulations for the same types of work. The price includes the cost of materials, labor costs and all taxes and contributions on material. The specified equipment manufacturers are not exclusive. The Contractor may install other equipment or material, provided that such equipment or material has the same electrical and structural characteristics as stated, and confirmed by the expert - the supervisory authority.

a row. no.	Description of the item	unit of measure	quantity	price unit	sum
------------------	-------------------------	--------------------	----------	---------------	-----

**1 DISTRIBUTION CABINETS AND POWER SUPPLY LINES**

- 1.1. Delivery and installation of equipment that needs to be installed in the existing main distribution cabinet GRO located in the technical room under the stairs. The item should include the examination of the equipment from which the consumers on the floor are supplied, their dismantling, rescheduling of the equipment cabinets and installation of new equipment. The following equipment is installed in the cabinet (NOTE: the existing electric meter is kept):

automatic switch iC12H-C/63A, 1p; 10 kA	pcs	3
automatic switch iC60H-C/25A, 3p; 10 kA	pcs	1
the item includes busbars, row clamps, POK channels, plastic labels, pertinax, nameplates, copper braids, cable glands, single-pole scheme, pocket for single-pole scheme and other necessary small material necessary for the installation of the cabinet. Complete equipment with all connections. Total for material and labor:	set	1

- 1.2. Delivery and installation of the distribution cabinet **RO-1**. **RO-1** is workshop-made, designed for mounting on the wall, suitable dimensions, degree of protection IP40, with the introduction of the power cable on the lower side and the drain cables on the upper side. Made from twice pickled sheet metal with a thickness of 2 mm and varnished according to the request of the interior designer. The cabinet frame is made of 2 mm thick profiled iron. The wardrobe has wings that can be locked with a lock and key. The following elements are installed in the cabinet, according to the single-pole scheme:

Interpact disconnecter INS 100A, 1-0, 3P	pcs	1
differential current protective device iID 40/0,03A, 4p	psc	1

automatic switch iC60N-C/40A, 1p; 6 kA	pcs	3
automatic switch iC60N-C/16A, 1p; 6 kA	pcs	26
automatic switch iC60N-C/10A, 1p; 6 kA	pcs	6
the item includes busbars, row clamps, POK channels, plastic labels, pertinax, nameplates, copper braids, cable glands, single-pole scheme, pocket for single-pole scheme and other necessary small material necessary for the installation of the cabinet. Total for material and labor:	set	1

- 1.3. Delivery and installation of distribution board: RT-2; factory production, IP40. The board is built-in, for the installation of 36 modules (2x18M). The item also includes all "small" elements necessary for the installation of the panel, switches and cable routing. Install the following equipment in the panel according to the single-pole scheme:

Interpact disconnecter iSW 63A, 1-0, 3P	pcs	1
differential current protective device iID 63/0,03A, 4p	psc	1
automatic switch iC60N-C/16A, 1p; 6 kA	pcs	28
automatic switch iC60N-C/10A, 1p; 6 kA	pcs	7
the item includes busbars, row clamps, POK channels, plastic labels, pertinax, nameplates, copper braids, cable glands, single-pole scheme, pocket for single-pole scheme and other necessary small material necessary for the installation of the cabinet. Total for material and labor:	set	1

- 1.4. Dismantling of existing switchboards, as well as elements in the switchboard. Dismantled equipment must be stored in a place designated by the investor. Total for work:
- |  |           |   |
|--|-----------|---|
|  | flat rate | 1 |
|--|-----------|---|

- 1.5. Procurement and installation of cable terminations for the termination of the cable for making connections in GRO and RO-1, and in everything according to the technical description and assembly instructions, for power cables croos-section 4x25+ 1x16 mm<sup>2</sup>. Total for procurement and work, calculated by the installed cable termination:

	pcs	2
--	-----	---

- 1.6. Procurement, delivery and installation of a power cable with GRO, intended for powering the distribution board RT-1; as well as for powering RT-2 with RT-1. The conductors are laid partly on the wall and ceiling under the plaster, and partly through halogen-free installation hoses of the appropriate diameter under the concrete lining. The conductors are laid in the wall with the creation of slits and the repair of damaged surfaces. The item includes all the small materials needed for their installation, electrical connection on both sides, halogen-free installation hoses, cleaning as well as restoring damaged surfaces to their original state. A set of cable deliveries, as well as materials for their installation, with installation, connection and testing of cables of the following types:

N2XH-J 5x16 mm <sup>2</sup>	m	29
N2XH-J 1x16 mm <sup>2</sup>	m	26
N2XH-J 4x25 mm <sup>2</sup>	m	26

---

**Total distribution cabinets and lines:**

## 2 GENERAL ELECTRICAL INSTALLATION

- 2.1. Procurement, delivery and construction of three-phase connection points for electricity supply needs. ramps according to plan and single-pole schemes. The conductors are laid partly on the wall and ceiling under the plaster, and partly through halogen-free installation hoses of the appropriate diameter under the concrete lining. Conductors are laid in the wall with slits and repair of damaged surfaces. The item includes all the small materials needed for their installation, electrical connection on both sides, halogen-free installation hoses, cleaning as well as restoring damaged surfaces to their original state. Total for material and labor:

N2XH-j 5x2.5mm <sup>2</sup>	m	15
-----------------------------	---	----

- 2.2. Procurement, delivery and execution of single-phase connection points for socket circuits and other connection points according to the plan and single-pole schemes. The conductors are laid partly on the wall and ceiling under the plaster, partly above the suspended ceiling, and partly through installation halogen-free hoses with an internal section of 16 mm under the concrete floor screed. Conductors are laid in the wall with slits and repair of damaged surfaces. The item includes all the small materials needed for their installation, electrical connection on both sides, halogen-free installation hoses, cleaning as well as restoring damaged surfaces to their original state. Total for material and labor:

N2XH-j 3x2.5mm <sup>2</sup>	m	1272
-----------------------------	---	------

---

**Total electrical installation of general consumption:**



### 3 ELECTRICAL LIGHTING INSTALLATION

- 3.1. Delivery of materials and execution of lighting circuits without installing lamps and switches. Inside the building, the conductors are laid partly on the wall and ceiling under the plaster, and partly above the suspended ceiling. Outside the building, conductors are laid through an earthen trench of appropriate dimensions. The conductors are laid in the wall with the creation of slits and the repair of damaged surfaces. The item includes all small materials required for their installation, electrical connection on both sides, cleaning and restoration of damaged surfaces. Carry out the installation in all respects according to the technical description. Total for material and labor:

N2XH-j 3x1.5 mm <sup>2</sup>	m	850.0
------------------------------	---	-------

- 3.2. **(S1)**Supply, delivery and installation of built-in LED lamps with excellent glare control and high efficiency for office and education. The 36 LED cells (arranged in a 6x6 pattern) each have a prismatic primary lens that allows for greater light output with low glare and user comfort. LED driver with fixed output. Class II electrical, IP40, Impact resistance: IK04. Body: sheet steel, white. Diffuser: prism structure. Complete with 4000K LED. UGR < 19 and L65 < 3000 cd/m<sup>2</sup> according to EN 12464. Dimensions: 596x596x32 mm; Lamp input power: 34 W; Luminous flux of the lamp: 4392 lm; Lamp efficiency: 129 lm/W; Weight: 2.1 kg. Total for material and labor:

	pcs	60
--	-----	----

Procurement, delivery and installation of an additional housing for the lamp S1. Total for material and labor:

	pcs	60
--	-----	----

- 3.3. **(S2)**Procurement, delivery and installation of LED panels with an opal homogeneous surface that emits light. Total luminous flux: 4400 lm, Lamp input power: 36 W, Luminous efficiency: 122 lm/W, Correlated color temperature (CCT) 4000K. Lifetime: 50,000 hours @L80, color rendering: CRI > 80. Dimensions: 1196x296x35 mm, weight: 1.72 kg. Total for material and labor:

	pcs	5
--	-----	---

Procurement, delivery and installation of the additional housing for the lamp S2. Total for material and labor:

	pcs	5
--	-----	---

- 3.4. **(S3)** Procurement, delivery and installation of overhead LED lamps. Diffuser: opal polycarbonate. Class II electrical, IP65, IK10. Complete with 4000K LED. Suitable for direct mounting on the wall or ceiling. Loop-in, loop-out is possible for cables up to 2.5 mm<sup>2</sup>. BESA compatible. Dimensions: Ø307x58 mm; Lamp input power: 16.3 W; Luminous flux of the lamp: 1950 lm; Lamp efficiency: 120 lm/W; Weight: 0.98 kg. Total for material and labor:

	pcs	5
--	-----	---

- 3.5. **(P1)**Supply, delivery and installation of emergency LED surface mount light, manual test (3 hours) with open space optics. IP40. Electrical connection (230VAC). Complete with LEDs. Lamp input power: 4 W. Dimensions: 146x146x34 mm. Weight: 1 kg. Luminous flux: 130 lm. Lamp efficiency: 33 lm/W. Total for material and labor:

pcs 7

- 3.6. **(P2)**Procurement, delivery and installation of an overhead LED lamp for lighting exit routes with min. 1 lux in accordance with EN 1838; neutral white 4000K; polycarbonate lens; Screw mounting of gear carrier and cover IP 40; Made of cast aluminum; housing color white (RAL9016); Gear carrier made of galvanized sheet metal; Lamp with local power from 3 hours of autonomy, with automatic test (automatic testing) via the lamp, optional central monitoring via DALI, display of the status of the lamp via the LED status; NFC interface for addressing, configuration and maintenance via PROset pen or PROset application; addressing is also possible visually or through EZ-address; power supply: 220-240 V AC (+/- 10%), 50-60 Hz; Lamp input power: 9.3 W; SC1; Plug-in terminals for through wiring up to 2.5 mm<sup>2</sup>; Impact strength: IK04; Dimensions: 146 x 146 x 48 mm; weight: 0.82 kg; The lamp is delivered complete with a light source, necessary equipment for work. Total for material and labor:

pcs 2

- 3.7. **(P4)** Procurement, delivery and installation of LED pictograms, autonomy 1,2,3 or 8h (can be selected using a switch), in standby or permanent connection, input power 6.1 W, housing lamp made of polycarbonate (RAL9016), expected lifetime is 50,000 working hours, uniform illumination of pictograms >500cd/m<sup>2</sup>, the lamp is easy to mount, complete with pictograms according to the ISO 7010 standard, maximum visible distance 23m, the lamp does not need to be maintained thanks to LED technology, protection IP40, mechanical protection IK03, the possibility of working at an ambient temperature of 5° C to 40°C, dimensions 330x45x190mm, weight 0.8kg. Total for material and labor:

pcs 2

- 3.8. Procurement, delivery and installation of an overhead ceiling motion sensor (detector) with degree of protection IP20, detection radius 4m. Total for material and labor:

pcs 4

---

**Total electrical lighting installation:**

#### 4 INSTALLATION EQUIPMENT

- 4.1. Procurement, delivery and installation of modular accessories, white color  
 built-in PVC box Ø60mm  
 armature 2M  
 decorative mask 2M  
 socket 2P+E 16A, 2M - 1pc - white color  
 Total for material and labor: set 12
- 4.2. Procurement, delivery and installation of modular accessories, white color  
 built-in PVC box Ø60mm  
 armature 2M  
 decorative mask 2M  
 socket 2P+E 16A, 2M - 1pc - white color, with IP44 degree of protection  
 Total for material and labor: set 1
- 4.3. Procurement, delivery and installation of modular accessories, white color  
 built-in PVC box 3M  
 armature 3M  
 decorative mask 3M - white color  
 socket 2P+E 16A, 2M - 1 pc - white color  
 free module for low current, 1M - 1 pc - white color  
 Total for material and labor: set 7
- 4.4. Procurement, delivery and installation of modular accessories, white color.  
 built-in PVC box 4M  
 armature 4M  
 decorative mask 4M - white color  
 socket 2P+E 16A, 2M - 2 pcs - white color  
 Total for material and labor: set 36
- 4.5. Procurement, delivery and installation of modular accessories, white color.  
 built-in PVC box 6M  
 armature 6M  
 decorative mask 6M - white color  
 socket 2P+E 16A, 2M - 2 pcs - white color  
 free modules for low current, 1M - 2 pcs  
 Total for material and labor: set 12

---

#### FLOOR CONNECTORS

- 4.6. Procurement, delivery and installation of equipment for the floor box 4M.
- Built-in housing 4M, metal, for installation in the floor or double floor. Built-in dimensions 208.5x182mm, depth min. 83 mm. Adjustable height 83-128mm.
  - Floor box insert to accommodate 4M modules
  - Floor box cover 4M, metal, installation dimensions 200.5x177mm, depth min 17.5mm
- For installation in a floor box:
- single-phase power socket 2P+E, 16A - 2 pieces;
- Total for material and work: set 11
- 4.7. Procurement, delivery and installation of equipment for floor box 7M.
- Built-in housing 7M, metal, for installation in the floor or double floor. Built-in dimensions 273x182.5mm, depth min. 83 mm. Adjustable height 83-128mm.
  - Floor box insert for housing 7M modules
  - Floor box cover 7M, metal, installation dimensions 265x178mm, depth min 17.5mm
- For installation in a floor box:
- single-phase power socket 2P+E, 16A - 2 pieces;
  - free modules for low current 1M - pcs 2;
  - blind modules - cover 1M - pc 1;
- Total for material and work: set 8
- 4.8. Procurement, delivery and installation of equipment for the floor box 2x7M.
- Built-in housing 2x7M, metal, for installation in the floor or double floor. Built-in dimensions 273x269.5mm, depth min. 83 mm. Adjustable height 83-128mm.
  - Floor box insert for accommodating 2x7M modules
  - Floor box cover 2x7M, metal, installation dimensions 265x265mm, depth min 17.5mm
- For installation in a floor box:
- single-phase power socket 2P+E, 16A - 4 pieces;
  - free modules for low current 1M - 4 pieces;
  - blind modules - cover 1M - pc 2;
- Total for material and work: set 8

---

## SWITCHES

4.9. Procurement, delivery and installation of modular accessories, white color

built-in PVC box 2M

armature 2M

decorative mask 2M - white color

ordinary switch 2M - 1pc - white color

Total for material and labor: set 2

4.10. Procurement, delivery and installation of modular accessories, white color

built-in PVC box 2M

armature 2M

decorative mask 2M - white color

ordinary switch 1M - 2pcs - white color

Total for material and labor: set 6

4.11. Dismantling of existing switches and sockets. Dismantled equipment must be stored in a place designated by the investor. Total for work:

flat  
rate 1

---

**Total installation equipment:**

**5 INSTALLATION OF POTENTIAL EQUALIZATION**

5.1. Make a galvanic connection of all metal masses in the building that belong to the electrical installation with a fine wire conductor of section H07Z-R 1x6mm<sup>2</sup>. Total for material and labor:

m 105

5.2. Make a galvanic connection of all metal masses in the building that do not belong to the electrical installation with a halogen-free fine-wire conductor H07Z-R 1x16mm<sup>2</sup> (RACK cabinet, VIK equipment...). The item also includes HFT halogen free pipes through a concrete jacket. Total for material and labor:

m 100

---

**Total equipotential bonding installations:**

**6 EXAMINATION**

6.1. Examination of electrical installations of high current with obtaining a certificate.

flat  
rate 1

---

**Total examination:**

**7 Creation of the project of the derived condition (maintenance)**

flat  
rate 1

---

---

**RECAPITULATION**

- 
- |          |   |
|----------|---|
| <b>1</b> | <b>DISTRIBUTION CABINETS AND POWER SUPPLY LINES</b>                   |
| <b>2</b> | <b>GENERAL ELECTRICAL INSTALLATION</b>                                |
| <b>3</b> | <b>ELECTRICAL LIGHTING INSTALLATION</b>                               |
| <b>4</b> | <b>INSTALLATION EQUIPMENT</b>   |
| <b>5</b> | <b>INSTALLATION OF POTENTIAL EQUALIZATION</b>                         |
| <b>6</b> | <b>EXAMINATION</b>  |
| <b>7</b> | <b>Creation of the project of the derived condition (maintenance)</b> |
- 

**TOTAL excluding VAT****VAT AMOUNT (21%)****TOTAL WITH VAT**

---

Responsible Engineer:

Slobodan Marković, Spec.Sci.El.Eng

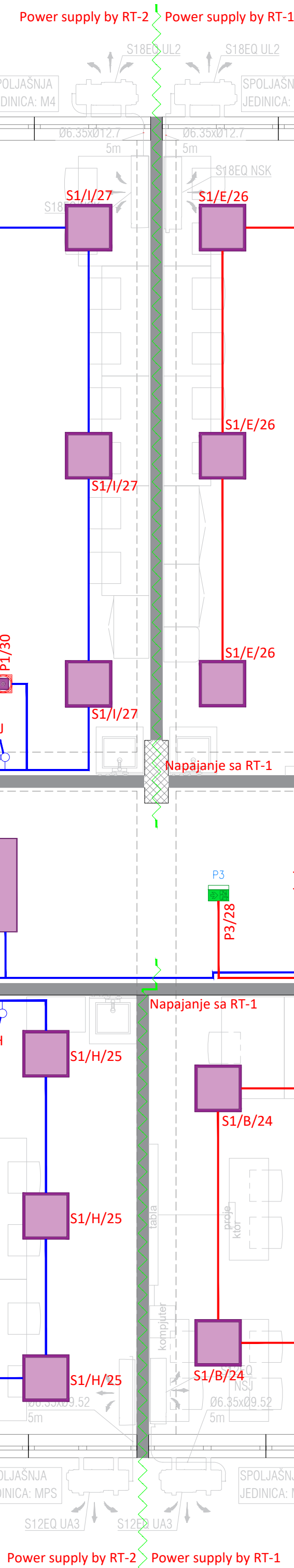
### **III GRAPHIC DOCUMENTATION**







Designation of single-phase power cables of type N2XH-j of the appropriate section with RT-2 for powering general lighting and panic lamps, and they are laid partly on the wall and ceiling under the plaster. The conductors are laid in the wall with the creation of slits and the repair of damaged surfaces.



No.	Room	Floor	Area
H	corridor	stone slabs	49.63 m <sup>2</sup>
T	toilet hand washing	ceramic tiles	3.80 m <sup>2</sup>
T1	toilet antechamber	ceramic tiles	3.22 m <sup>2</sup>
TM	toilet for men	ceramic tiles	1.53 m <sup>2</sup>
TZ	female toilet	ceramic tiles	1.53 m <sup>2</sup>
M1	multifunc. cabinet	PVC antistatic	33.18 m <sup>2</sup>
M2	multifunc. cabinet	PVC antistatic	47.93 m <sup>2</sup>
M3	multifunc. cabinet	PVC antistatic	47.93 m <sup>2</sup>
M4	multifunc. cabinet	PVC antistatic	47.93 m <sup>2</sup>
M5	multifunc. cabinet	PVC antistatic	47.96 m <sup>2</sup>
M6	multifunc. cabinet	PVC antistatic	22.40 m <sup>2</sup>
MPS	multifunc. cabinet	finished parquet type Tarkett	66.22 m <sup>2</sup>
K	kitchenette	ceramic tiles	10.00 m <sup>2</sup>

LEGEND:

**S1** cenis (arranged in a hexo pattern) each have a pismatic primary lens that reflects greater light output. With low glare and user comfort. LED driver with fixed output. Class I electrical, IP40, Impact resistance: IK04. Body: sheet steel, white. Diffuser: prism structure. Complete with 4000K LED. UGR < 19 and L65 < 3000 cd/m<sup>2</sup> according to EN 12464. Dimensions: 596x596x32 mm; Lamp input power: 34 W; Luminous flux of the lamp: 4392 lm; Lamp efficiency: 129 lm/W; Weight: 2.1 kg.

The lamp is intended for surface mounting. The lamp is installed in a surface housing.

S2

**S2** (S2) LED panel with an opal homogeneous surface that emits light. Total luminous flux: 4400 lm, Lamp input power: 36 W, Lamp efficiency: 122 lm/W, correlated color temperature (CCT) 4000K. Lifetime: 50,000 hours @L80, color rendering: CRI > 80. Dimensions: 1196x296x35 mm, weight: 1.72 kg. The lamp is intended for surface mounting. For surface mounting, the lamp is installed in a surface housing.

S3

**S3** (S3) Surface mounted LED lamp. Diffuser: opal polycarbonate. Class II electrical, IP65, IK10. Complete with 4000K LED. Suitable for direct mounting on the wall or ceiling. Loop-in, loop-out is possible for cables up to 2.5 mm². BESA compatible. Dimensions: Ø307x58 mm; Lamp input power: 16.3 W; Luminous flux of the lamp: 1950 lm; Lamp efficiency: 120 lm/W; Weight: 0.98 kg.

P1

**P1** (P1) Emergency surface mount LED flashlight, manual test (3 hours) with open space optics. IP40. Electrical connection (230VAC). Complete with LEDs. Lamp input power: 4 W. Dimensions: 146x146x34 mm. Weight: 1 kg. Luminous flux: 130 lm. Lamp efficiency: 33 lm/W.

**P2**

**P2** (P2) Superstructure LED lamp for lighting exit routes with min. 1 lux in accordance with EN 1838; neutral white 4000K; polycarbonate lens; Screw mounting of gear carrier and cover IP40; Made of cast aluminium; housing color white (RAL9016); Gear carrier made of galvanized sheet; Luminaire with local power supply from autonomy of 3 hours, with automatic test (automatic testing) via the lamp, optional central monitoring via DALI, display of the status of the luminaire via LED status; NFC interface for addressing, configuration and maintenance via ProSet pen or ProSet application; addressing is also possible visually or via E2-address; power supply: 220-240 V AC (+/- 10%), 50-60 Hz; Lamp input power: 3 W; SC1; Plug-in terminals for through wiring up to 2.5 mm<sup>2</sup>; Impact resistance: IK04; Dimensions: 146 x 146 x 48 mm; weight: 0.82 kg.

P3

**P3** LED pictogram, autonomy 1,2,3 or 8h (can be selected using a switch), in standby or permanent connection, input power 6.1 W, housing lamp made of polycarbonate (RAL9016), expected lifetime is 50,000 working hours, uniform illumination pictograms >500cd/m<sup>2</sup>, the lamp is easy to mount, complete with pictograms according to the ISO 7010 standard, maximum visible distance 23m, the lamp does not need to be maintained thanks to LED technology, protection IP40, mechanical protection IK08, the possibility of working at an ambient temperature of 5°C to 40°C, dimensions 330x45x190mm, weight 0.8kg.

- 
 Detector - motion sensor with a detection radius of 4m, IP20.


For one single-pole switch:

- single-pole switch 2M-1pc;
- built-in PVC box 2M;
- module support 2M;
- decorative frame 2M;

For two single-pole switches:

- single-pole switch 1M-2pcs;
- built-in PVC box 2M;
- module support 2M;
- decorative frame 2M;

NOTE: The switches are mounted at a height of 1.2 m from the finished floor

DESIGNER:	INVESTOR:
 Enproing DOO bul. vojvođe Stanka Radonjića br.47, I, lamela 1, stan 43, Podgorica tel: +382(0)67 215 992	Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy
Objekat: JU SREDNJA ELEKTROTEHNIČKA ŠKOLA "VASO ALIĞRĐIĆ"	Location: k.p. 1193, KO Podgorica I, Municipality of Podgorica

Leading designer: Zagorka Božović Pejanović,	Type of tehcnical documentation: <b>ADAPTATION PROJECT OF PARTS OF THE FACILITY</b>
---	--

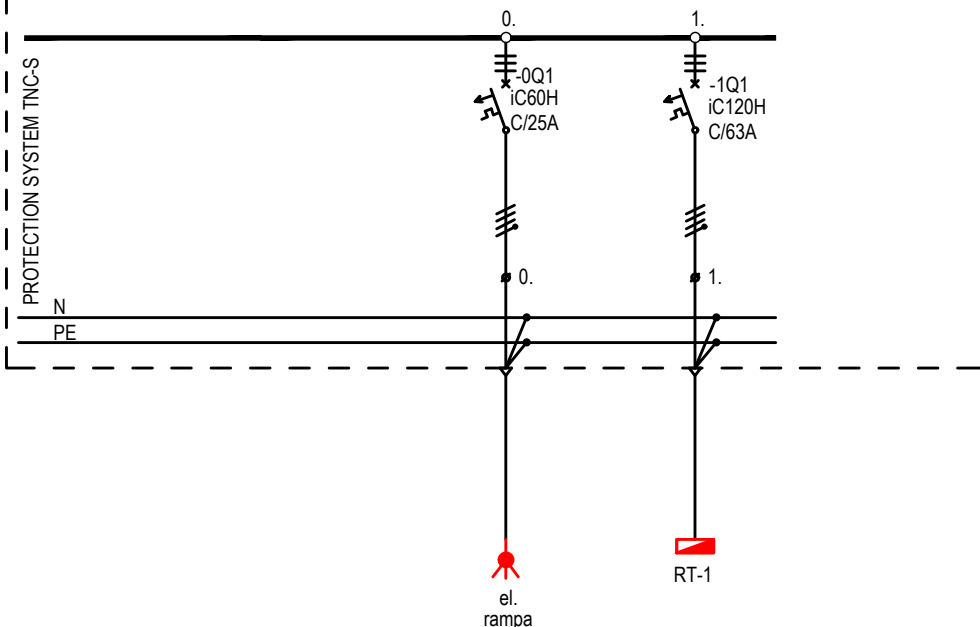
dipl. ing. arh.				
Authorized designer: Slobodan Marković, dipl.inž.el. br. lic. UPI 107/7-1164/2		Part of technical documentation: Electrical engineering project-low voltage		SCALE: 1:50
Assistant designer:		technician:	No. of attachment	Page no.


Danilo Mijanović, spec.sci.el.	Floor base- light design	2	125
Drafting date and M.P	Date of revision and M.P		

February, 2024. year

DEGREE OF MECHANICAL PROTECTION IP40

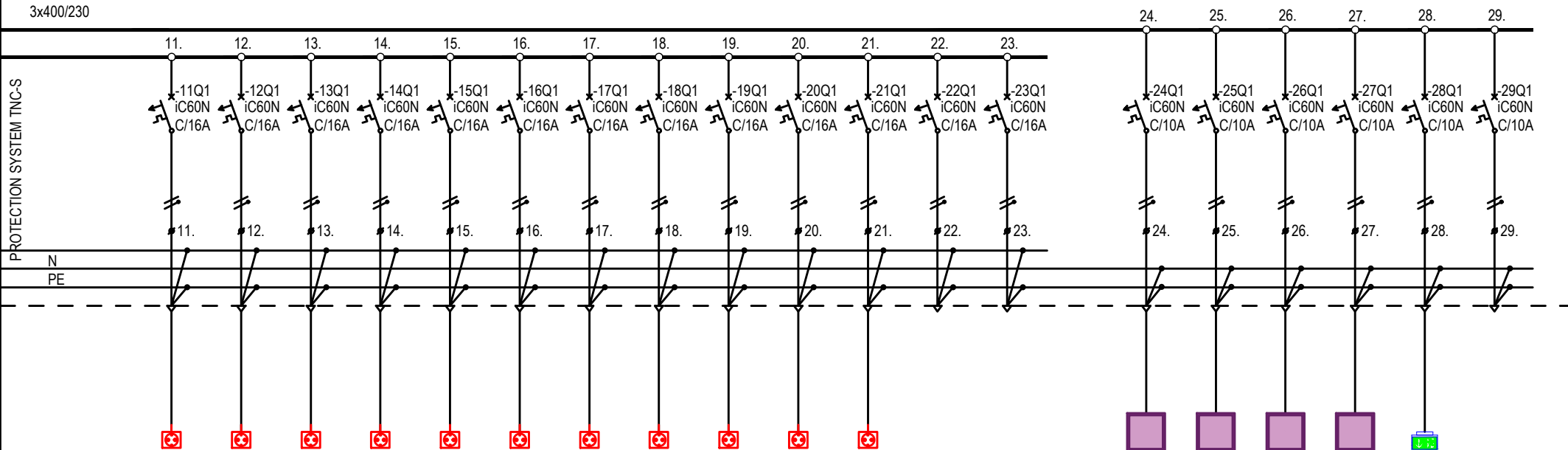
L1, L2, L3  
3x400/230

[illegible]

Drafting date and M.P.:          Februar, 2024.	Date of revision and M.P.:	Designer:	Object:	JU SREDNJA ELEKTROTEHNIČKA ŠKOLA "VASO ALIGRUDIĆ"	Location:	Attachment:						
		 Enproing DOO bul. vojvode Stanka Radonjića br.47, Iamela 1, stan 43., Podgorica tel: +382(0)67 215 992	Leading designer:	Zagorka Božović Pejanović, dipl. ing. arh.	k.p. 1193, KO Podgorica I Municipality of Podgorica	SINGLE-POLE EQUIPMENT SCHEME TO BE INSTALLED IN THE MAIN DISTRIBUTION CABINET GRO;						
			Investor:	Authorized designer:		Slobodan Marković, Spec.Sci.El.Eng br. lic. UPI 107/7-1164/2	Type of tehcnical documentation: ADAPTATION PROJECT OF PARTS OF THE FACILITY	Scale:	Format:	Revision:	No. of attachment:	Page no.:
			Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy	Assistant designer:		Danilo Mijanović spec.sci.el	Part of technical documentation: Electrical engineering project- high voltage					



L1, L2, L3  
3x400/230


[illegible]

Drafting date and M.P:	Date of revision and M.P:	Designer: <div>ENproing Enproing DOO bul. vojvode Stanka Radonjića br.47, Iamela 1, stan 43., Podgorica tel: +382(0)67 215 992</div>	Object: JU SREDNJA ELEKTROTEHNIČKA ŠKOLA "VASO ALIGRUDIĆ"	Location: k.p. 1193, KO Podgorica I Municipality of Podgorica	Attachment:  SINGLE-POLE SCHEME OF THE DISTRIBUTION CABINET RO-1;						
Februar, 2024.		Investor: Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy	Leading designer: Zagorka Božović Pejanović, dipl. ing. arh.	Authorized designer: Slobodan Marković, Spec.Sci.El.Eng br. lic. UPI 107/7-1164/2	Type of tehcnical documentation: ADAPTATION PROJECT OF PARTS OF THE FACILITY		Scale:	Format:	Revision:	No. of attachment:	Page no.:
		Assistant designer: Danilo Mijanović spec.sci.el		Part of tehcnical documentation: Electrical engineering project- high voltage			A4		4(2/2)	128	

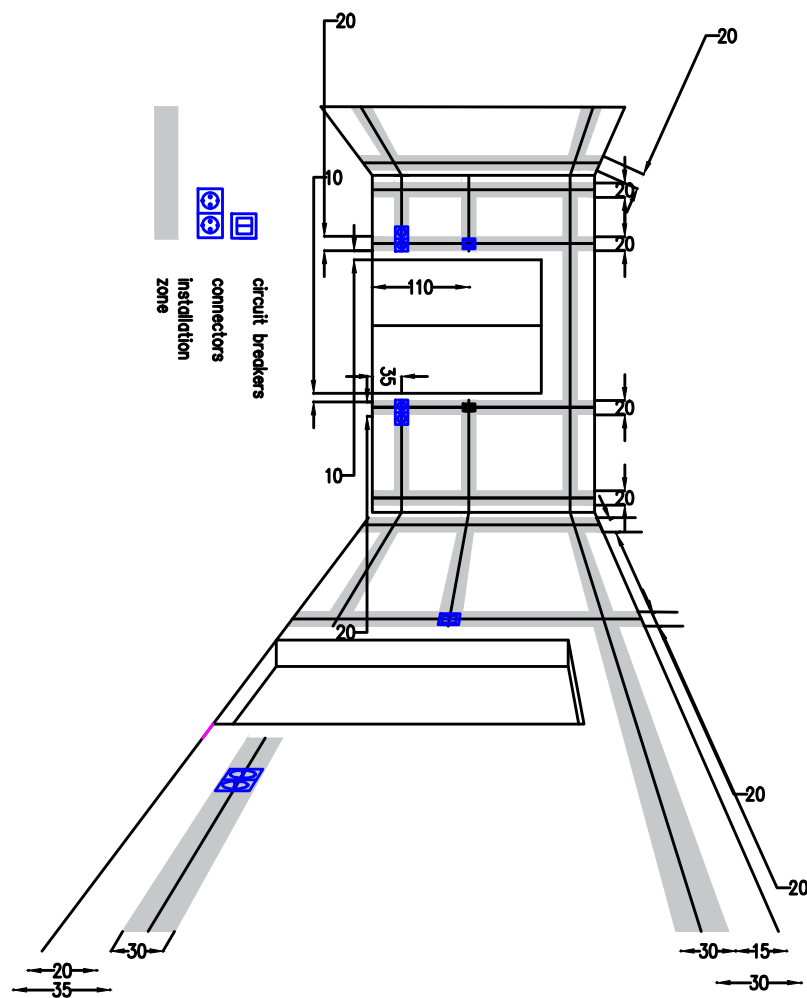


L1, L2, L3  
3x400/230

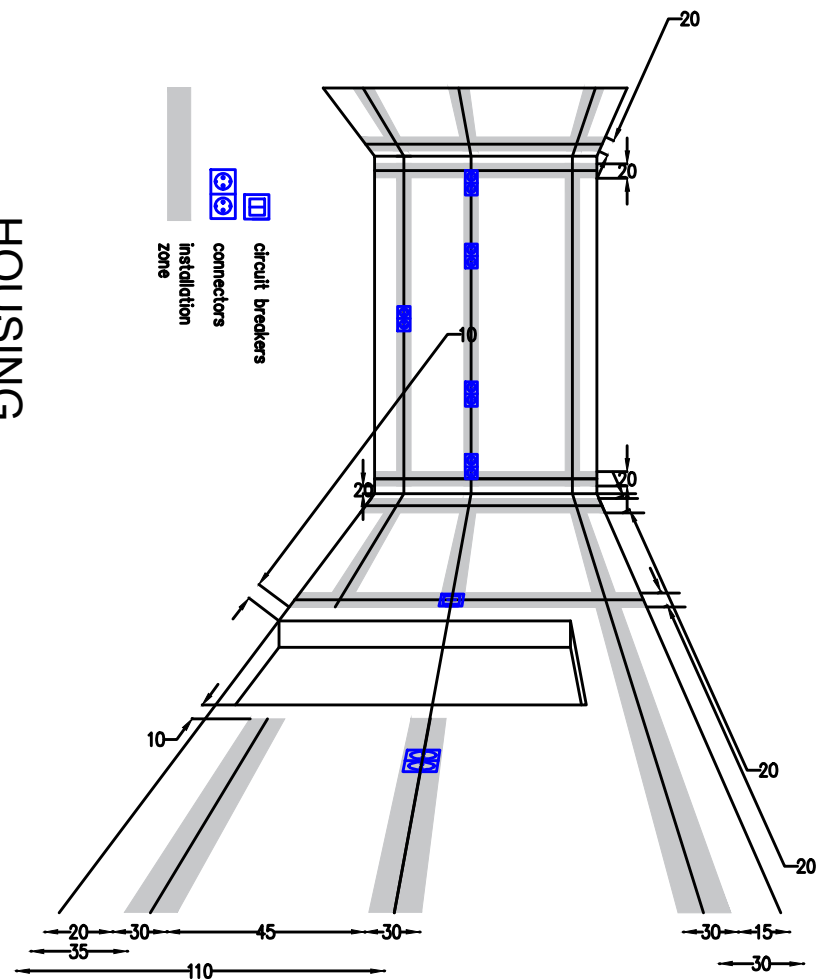


Drafting date and M.P.:       Februar, 2024.	Date of revision and M.P.:	Designer:	Object:	Location:	Attachment:						
		 <b>ENpro ing</b> Enproing DOO bul. vojvode Stanka Radonjića br.47, Iamača 1, stan 43, Podgorica tel: +382(0)67 215 992	Leading designer:	<b>k.p. 1193, KO Podgorica I Municipality of Podgorica</b>	SINGLE-POLE SCHEME OF THE RT-2						
			Investor:							Authorized designer:	Type of tehcnical documentation:
			<b>Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy</b>							Assistant designer:	Part of tehcnical documentation:





## HOUSING PREMISES



## KITCHEN

Drafting date and M.P.:  <
--