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	Designer	A. Sand	Project number	02-25	Version	v01	
	Responsible specialist	A. Sand	Document sign	EL-3-01	Date	18.08.2025	

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PROJECT COMPOSITION

Volume 0	Common part
Volume 1-1	Position plan
Volume 1-2	External electrical network
Volume 2	Architecture, fire safety
Volume 3	Foundations
Volume 4	Heating, ventilation
Volume 5	High current
Volume 6	ATS

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1 ELECTRICAL INSTALLATION

1.1 GENERAL

1.1.1 Design work scope

This work involves the connection of two identical temporary warehouses at the preliminary design stage. The buildings are designated 01 and 02. The warehouses are standard products developed by the Polish company BANAIR Inc. Sp. z oo and are not designed. The foundations, access road, and electrical and communication lines to the connection points are designed for the building.

The design process aims to produce a functional and economical solution that meets the requirements, taking into account all relevant laws, regulations and standards.

This part of the preliminary design describes the electrical installation of the internal high-current networks of the facility. The layout plan and external networks are presented in separate project volumes.

1.1.2 General information about the building

Number of floors in the building:	1 ground floor
Building fire safety class:	TP3
Usage of buildings:	VI
Intended purpose of the building:	12529 (other warehouse)

Other technical specifications of the building are given in the architectural part of the project, Volume 2.

1.1.3 Basic electrical data of the building

	Building 01	Building 02
Type of electrical installation	2	
Connection point	Consumer substation 0.4kV switchboard	
Power grid wiring system	TN-C	
Guidance system	TN-S	
Designable voltage system	~3N 3x230/400V, 50Hz	
Installed capacity	148 kW	148 kW
Power consumption	140 kW	140 kW
Power factor	0.95	0.95
Building main fuse size	250A	250A
Size of the main fuse of the object	630 A	
Backup power supply	diesel generator	diesel generator
Cable fire reaction class	Dca-s2,d2,a2	

1.1.4 Source data

The starting points and source data for the project preparation are the following materials:

1) Client's initial task:

The main basis for the design work is the client's initial task:

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PROTAN ELMARK Design No. 25/0369/SE Steszew, June 2025
STRUCTURAL DESIGN STEEL HALL AXIAL DIMENSIONS 23x40x5.7m
Banair Inc
Slupy 42, 10-381 Olsztyn, Poland
Project no. 457W EST
2) Architectural plans.

1.1.5 Designers

General design contractor

Registration code:
Address: Tallinn
Project manager:
Phone: , e-mail:

Structures, Fire safety, Heating, Ventilation

Registration code:
MTR reg no. Address:
Tallinn Structures:

Heating, Ventilation: Tel:
, e-mail:

External electrical network, high-voltage installation

Registration code:
Address: , Tallinn
MTR reg: 22.09.2009
Responsible specialist:
Phone: , e-mail:

Communication, Automatic fire alarm

Telegroup AS
Registration code: 10201478
Address: Töökoja 3, 11313, Tallinn
Project manager: Kari Lorvi
Phone: 680 0888, e-mail: telegrupp@telegrupp.ee

1.1.6 Construction studies

No separate structural studies have been carried out for the design of the electrical installation for the design of this building. Other studies are outlined in the general part of the project, Volume 0.

1.1.7 Normative documents

When designing electrical installations, the laws, regulations and relevant standards in force in the Republic of Estonia must be taken into account, to the extent that they are necessary for the implementation of this project. The main documents to be taken into account are the following:

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1) Building Code;

2) Regulation No. 97 of the Minister of Economic Affairs and Infrastructure "Requirements for Building Projects";

3) EVS 932:2017 "Construction project";

4) Fire Safety Act;

5) Regulation No. 17 of the Minister of the Interior "Fire safety requirements for buildings";

6) Equipment Safety Act;

7) EVS 812-7:2018 "Fire safety of buildings. Part 7: Fire safety requirements for buildings";

8) EVS-HD 60364-1:2008+A11:2017 "Low-voltage electrical installations. Part 1: Fundamentals, general characteristics, definitions";

9) EVS-HD 60364-4-41:2017+A12:2019 "Low-voltage electrical installations. Part 4-41: Protection methods. Protection against electric shock";

10) EVS-HD 60364-4-42:2011+A1+A11:2021 "Low-voltage electrical installations. Part 4-42: Protection methods. Protection against thermal effects";

11) EVS-HD 60364-4-43:2023 "Low-voltage electrical installations. Part 4-43: Protection methods. Overcurrent protection";

12) EVS-HD 60364-4-444:2010 "Low-voltage electrical installations. Protection methods. Protection against voltage disturbances and electromagnetic disturbances";

13) EVS-HD 60364-5-51:2009/A12:2017 "Electrical installations of buildings. Part 5-51: Selection and installation of electrical equipment. General guidelines";

14) EVS-HD 60364-5-52:2011+A11:2017 "Low-voltage electrical installations. Part 5-52: Selection and installation of electrical equipment. Guidelines";

15) EVS-HD 60364-5-53:2022 "Low-voltage electrical installations. Part 5-53: Selection and installation of electrical equipment. Switchgear and controlgear";

16) EVS-HD 60364-5-54:2011+A11:2017 "Low-voltage electrical installations. Part 5-54: Selection and installation of electrical equipment. Earthing and protective conductors";

17) EVS-HD 60364-5-551:2010+A11:2016 "Low-voltage electrical installations. Part 5-55: Selection and installation of electrical equipment. Other equipment. Section 551: Low-voltage generating sets";

18) EVS-HD 60364-5-56:2019 "Low-voltage electrical installations. Part 5-56: Selection and installation of electrical equipment. Safety systems";

19) EVS-EN 61140:2016 "Protection against electric shock. Common requirements for installations and equipment";

20) EVS-EN 61439 "Low-voltage switchgear and controlgear assemblies";

21) EVS-EN 60529:2001/AC:2014/AC:2019 "Degrees of protection provided by enclosures (IP code)";

22) EVS-HD 60364-6:2016+A11+A12 "Low-voltage electrical installations. Part 6: Inspection procedures";

23) EVS-EN 60898-1:2019 "Electrical accessories. Residual current circuit-breakers for household and similar installations. Part 1: Alternating current circuit-breakers";

24) EVS-EN IEC 60947-2:2025 "Low-voltage switchgear and controlgear. Part 2: Circuit breakers";

25) EVS-EN 62305-1:2011 "Lightning protection. Part 1: General principles";

26) EVS-EN 62305-3:2011 "Lightning protection. Part 3: Physical damage to structures and danger to life";

27) EVS-EN 62305-4:2011 "Lightning protection. Part 4: Electrical and electronic systems of buildings";

28) EVS-HD 60364-5-559:2013+A11:2017 "Low-voltage electrical installations. Part 5-559: Selection and installation of electrical equipment. Luminaires and lighting installations";

29) EVS-EN IEC 62471 "Photobiological safety of lamps and lamp equipment";

30) EVS-EN IEC 60598-1 "Luminaires";

31) EVS-EN IEC 61347-2-1:2024 "Control gear for electric light sources - Safety - Part 2-1: Particular requirements for starting devices (other than glow starters)";

32) EVS-EN IEC 60598-2-22:2022 "Luminaires. Part 2-22: Particular requirements. Luminaires for emergency lighting";

33) EVS-EN 1838:2025 "Lighting applications. Emergency lighting for buildings";

34) EVS-EN 50172:2024 "Emergency lighting systems for evacuation";

35) EVS 620-2: 2012/A1:2017 "Fire safety. Part 2: Safety signs";

36) EVS-EN 12464-1:2021 "Light and lighting. Workplace lighting. Part 1: Indoor workplaces";

37) EVS-EN 50525 "Wires and cables. High voltage wires and cables with rated voltages up to and including 450/750 V (Uo/U). ";

38) EVS-EN IEC 60099-5:2018 "Surge arresters - Part 5: Selection and application recommendations"

39) Land RYL 2010 – General quality requirements for construction works.

The hierarchy of competence for legislation and regulatory information is generally as follows:

1) European directives

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2) International agreements

3) Estonian laws

4) Ministerial regulations

5) Standards

- globally international (IEC)
- Mandatory in the European Economic Community (EN)
- European Harmonization Documents (HD)
- Transcribed in Estonia (EVS-EN; EVS-HD)
- Estonian nationals (EVS)

6) Guidelines and regulations

- domestic
- official
- internal
- manufacturers' instructions, user manuals, information books

1.2 BUILDING IN A DIRECT CURRENT INSTALLATION

1.2.1 Current situation

The area where the warehouses will be erected is an undeveloped area, partially covered with brush. There are no existing networks.

1.2.2 Low-voltage main distribution systems

For the electrical supply diagram, see the external networks section of the project, Volume 1-2, Figure ELV-5-01.

The low-voltage main distribution systems of a building consist of a main distribution center (MDC) and the consumer supply lines that exit from it.

The electrical distribution network shall be constructed according to the TN-CS (5-wire) system. The main distribution center of the building shall be located within the perimeter of the warehouse. The distribution centers shall structurally comply with the requirements of the EN 61439 standard series.

Main distribution center

The main switchboard has one section and two inputs. The input from the main grid and the input from the diesel generator are equipped with an automatic transfer switch RLA. The generator and the main grid cannot operate simultaneously. The inputs must be equipped with devices ensuring protective separation. The input of the main switchboard is equipped with combined type 1 and type 2 surge arresters.

All trunk circuits leaving the main switchboard are protected by automatic miniature circuit breakers (MCB). The outputs required by the standards are equipped with residual current devices.

The main distribution center is surface-mounted and is installed on a separate metal frame that is not connected to the warehouse structure.

1.2.3 Electricity metering system

The building's electricity meters must be installed at the inputs of the main distribution centers.

1.2.4 Backup power system

A separate, independent container diesel generator intended for outdoor installation will be provided for both buildings.

The backup power system ensures electrical power to the entire building in the event of a main power failure.

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Diesel generator systems are planned with a capacity of 250 kVA / 200 kW (PRP), which will be installed next to the building, near the building's main distribution center.

The diesel generator system must be procured and installed as a complete unit with a diesel generator and generator control panel, vibration isolators, liquid cooling radiator, fuel oil storage and filling system, noise muffler, exhaust gas exhaust system, ventilation systems for exhausting hot air and bringing in fresh air, and all necessary accessories and instructions as described below.

The system must be able to ensure the continuous operation of the loads connected to the distribution center in the event of a failure of the main power supply. The system must be able to achieve and maintain a stable 400 V/50 Hz network condition and keep it within the limits described below.

The synchronization device is not used. When the main power supply is restored, the reconnection occurs with interruption.

The system shall be capable of fully restoring the power supply to primary consumers within a maximum of 10 seconds after the interruption of the normal mode power supply. Ensure that the system is suitable to maintain continuous operation at its rated full load even under the worst climatic conditions and be capable of a 10% overload for one hour during a 12-hour operating period without excessive heating of the machine or alternator and without electrical and mechanical disturbances.

The diesel generator is installed on a concrete base of the required size. The power and control cables between the generator and the distribution center are installed in a protective pipe in the ground.

1.2.5 Grounding and potential equalization

1.2.5.1 Grounding installation

To ensure electrical safety, the following protection methods have been used in the project:

- As basic protection (protection against direct contact) - basic insulation between hazardous live parts and live conductive parts and the use of protective covers and enclosures;
- As a fault protection (indirect contact protection) - automatic power shut-off together with the construction of a grounded equipotential bonding system, which ensures that the calculated touch voltage of the live conductive parts of the electrical installation is below 50 V; The permissible touch voltage for group 1 of the treatment room must not be higher than 25 V;
- As additional protection (in case of environmental conditions that increase the risk, etc.) - residual current protection with a rated operating current of not more than 30 mA.

The building is provided with an earthing and lightning protection installation. Normally voltage-free metal structures of electrical equipment are earthed unless the manufacturer of the equipment provides otherwise (for example, double-insulated equipment). The building is provided with one central main earthing bar in the building's main distribution centre.

All equipment in the building is grounded using the designed grounding installation. The building's grounding installation and the lightning protection grounding installation are common. The grounding installation is built as a ring grounding conductor around the building. The grounding resistance of the grounding installation must not exceed 30Ω.

The grounding circuits of the two warehouses are connected together to achieve a wide grounding circuit.

1.2.5.2 Potential equalization

The electrical installation will be built as a TN-S wiring system (5-wire).

Connections are made to the grounding bar of the main distribution center to metal cable trays, metal structures, etc. To equalize the potentials, the building floor reinforcement and the grounding circuit are electrically connected. All uninsulated conductive parts of electrical equipment are grounded with the protective conductor (PE) in the cable.

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1.2.6 Cable routes

Lighting and power circuits, power wires and cables for low-current, low-voltage and security system equipment are generally installed in cable trays, unless they are installed in pipes.

Since there are few cables, it is best to use the lighting suspension channels when necessary. Only the main structural elements can be used for suspension.

Surface-mounted cables must be protected from mechanical damage by metal pipes up to a height of 2.0 m from the floor. Laying circuits with different voltages in a common pipe is not permitted.

The design has taken into account the environmental class C3 of the cable trays, according to the standard EVS-EN ISO 12944-2 "Paints and varnishes. Corrosion protection of steel structures by paint coating systems. Part 2: Classification of environments"

1.2.7 Cable lines

Necessary conduits are provided for cables entering/exiting the building. Cable lines inside the building are installed in horizontal and vertical cable trays.

The type of cables is selected according to the fire sensitivity established by the regulation. The fire sensitivity must generally be at least Dca-s2,d2,a2. Use halogen-free cables.

Cables outside buildings that are exposed to direct sunlight are protected from direct UV radiation or cables with UV-resistant insulation are installed.

1.2.8 Power supply for power equipment

1.2.8.1 Electrical supply of technical systems

The technical systems receive power directly from the building's main distribution center.

All technical system devices are equipped with a safety switch, if they are not already included in the device package. The protection degree of the safety switches is at least IP44.

Ventilation equipment must be blocked in the event of a fire alarm being triggered.

The devices used are connected to the power supply according to the manufacturer's factory requirements. The temperature sensors built into the motor are connected to the motor control circuit.

1.2.9 Electrical connection systems

1.2.9.1 Sockets

The project provides for single- and three-phase sockets with grounding contact with protection level IP44, equipped with a protective cover. The exact locations and quantity of sockets will be specified in the next stage of the project.

Socket circuits up to 32A are generally equipped with 30mA residual current circuit breakers. If a specific electrical device is installed in the socket, the need for residual current protection must be specified according to the device's installation instructions.

1.2.10 Lighting systems

1.2.10.1 General lighting

The design of the luminaires must comply with IEC (International Electro-technical Commission) standards. Luminaires used

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must be flicker-free, easy to clean, serviceable and suitable for the room environment (area of use). Use high-quality, energy-efficient LED lights with a long lifespan. The protection class of the lights is selected according to the room environment.

The minimum average illuminance in rooms specified by the standard must be as follows:

Room name	Luminous intensity dus, lx	RUGL	Color rendering index, Ra	Maintenance stallion	Cleaning frequency per year	Work surface height, m
Warehouses, storage rooms	150	25	80	0.8	2	0.5

The color temperature of the light sources according to the room is 4000 K.

The lighting group's protective equipment, cable cross-section and number of luminaires are selected according to the recommendations of the ballast manufacturer. Lighting groups are formed based on energy saving – the groups are not excessively large and it is pointless to illuminate surfaces that are not used by people, e.g. illuminating an entire large room only for a few people.

Lighting is switched manually using standard switches or push buttons.

Installation height of switches and/or buttons:

- generally h=1400 mm;

The lighting switches are surface mounted.

1.2.10.2 Emergency lighting system

The building will be provided with exit lighting. Exit lights with battery-operated devices and corresponding stickers will be provided at the building's exit doors. In addition to general lighting, battery-operated lights will be installed on the centerline of the building.

Exit lighting is solved as a separate system, independent of the general lighting systems. Emergency lighting uses LED technology.

Emergency lights are equipped with built-in autonomous batteries, battery backup time 1h.

On exit routes up to 2 m wide, the horizontal illuminance at the centre line of the floor of the exit route must not be less than 1 lx. The dimensions of the marker lights must correspond to the maximum viewing distance.

Evacuation lights are also installed:

- for a first aid station (5 lx on a vertical surface);
- for firefighting and rescue equipment and a fire alarm button (5 lx on a vertical surface).

The minimum installation height of emergency lights is 2m above the floor.

1.2.11 Outdoor lighting

No outdoor lighting is provided.

1.2.12 Heating systems and equipment

1.2.12.1 Electric heating system

For heating the building, up to three floor-mounted and portable electric air blowers of 45 kW each are provided per building. The air blowers are connected to the electrical network through a 3x125 A socket. The air blower is equipped with an autonomous built-in thermostat. The set temperature is set manually.

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1.2.12.2 Defrosting systems

Defrost heating with electric heating cables is intended for rainwater drainage systems located on the exterior facade of the building and on the roof eaves.

Defrost heating systems are controlled locally by a thermostat installed in the central control unit. A combined temperature and humidity sensor in the gutter must be used as the sensor.

1.2.13 Fire safety systems

1.2.13.1 Lightning protection

The building will be equipped with a class III lightning protection system in accordance with the EVS-EN 62305 standard.

External lightning protection system

Lightning arrester systems use lightning rods and network conductors. All components of the lightning arrester system must comply with the requirements of the standard EVS-EN 62305-3:2011. The selection of the lightning arrester system configuration is based on the methods specified in the standard: the protection angle and/or the rolling sphere method.

A lightning protection grid with a mesh size of 15x15 m (or a rolling sphere radius of 45 m) is provided on the roof of the building. The lightning arresters of the lightning protection system are installed at a height of at least 10 centimeters from the roof surface. The lightning protection grid is equipped with thermal compensators. To protect objects located on the roof (e.g. roof hatches), local lightning rods are additionally installed in such a way that the protected objects remain entirely within the protection zone of the lightning rod lightning arrester system. The lightning protection grid on the roof is made of galvanized round steel conductor Ø 8 mm.

Downpipe system

To prevent and reduce damage caused by lightning current flowing in the lightning protection system, down conductors are placed in such a way that there are several parallel current paths from the lightning strike point to the ground and the length of the current paths is as minimal as possible.

The horizontal distance between down conductors on a building with a lightning protection system class III is a maximum of 15 meters. It is preferable to place down conductors at equal distances along the perimeter.

The down conductors must be installed in such a way that they form the most straight extension of the lightning conductors. The down conductors are installed straight and vertically so that the shortest and most straight path into the ground is formed. The down conductors are installed on the facade. Hot-dip galvanized steel Ø 8 mm is used for the lightning protection down conductors. Disconnection points are installed on the down conductors of the lightning protection system to enable measurement of the earthing circuit. The disconnection points are at ground level.

Landing gear system

A ring earthing conductor is provided around the building, which is common to the building's earthing device. Extractions from the circuit are provided at the locations of the down conductors.

1.2.13.2 Firefighting related power and control systems

Fire safety systems and their power supply and control systems are installed in accordance with applicable standards. The electrical power supplies of the fire safety systems are provided with two-way power supply and RLA - a conventional power circuit and a diesel generator. Both buildings have their own central diesel generator.

Ventilation systems and air heating devices are equipped with a fire alarm interlock in the event of an ATS system alarm.

The fire safety aspect of the project has determined the smoke extraction solution and activation level. Smoke extraction is carried out through manually opened smoke dampers according to solution 2, activation level 2. Smoke extraction is controlled from a button located at the entrance to the building.

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The minimum operating time of smoke extraction is 60 minutes. The cables of fire safety systems are fire-resistant or otherwise protected against fire in such a way that fire resistance is guaranteed for at least 1.0 hour (E60).

The ATS central unit receives power directly from the building's main distribution center through separate circuit breakers.