

## **I. ELECTRICAL INSTALLATION WORKS**

### **• SCOPE**

The Contractor shall provide the Supervisor with a programmed indicating when each type of electrical installation, conduit, is to commence and when representative samples of such installations will be ready for inspection.

The Supervisor's approval of the sample must be obtained before further work commences. The works shall be executed with the highest level according Albanian standards.

The following technical specifications are complementary to the schematic diagrams and drawings. The items described here in cover all labour, materials and items of service required for the completion of a correct, functional, and unobtrusive installation of the electrical systems in strict accordance with the design drawings.

In the following technical specifications are described the electric systems of the buildings

### **• Verification of Dimensions:**

The Contractor shall become familiar with details on the work, shall verify dimensions in the field, and shall advise the Project Manager of any discrepancy before performing any work. If any departure from the design is deemed necessary by the Contractor, details of such departures and reasons therefore shall be submitted as soon as practicable to the Project Manager for approval. No such departures shall be made without the prior written approval of the Project Manager.

### **• Contractor damages:**

The Contractor shall promptly repair all indicated utility lines or systems damaged by his operations. Damages to lines or systems not indicated, which are caused by his operations shall be treated as “Changes” under the terms of the General Provisions of the contract.

### **• REFERENCES**

The general concept of the installations is modular and based on EN regulations and in certain cases to DIN (i.e. DIN 4102).

List of applicable standards to the project:

1. Albanian Safety Standards and Regulations.
2. Electrical protection regulation (Albanian Electrical Energy Enterprise)
3. ALBANIA Standards
4. Albanian Norms for installation and design
5. Manufacturer's equipment standard and specifications.

### **• CONTRACTORS DOCUMENTATION (SHOP DRAWINGS)**

Based on the design documents, the Contractor shall submit to be verified and approved by the Supervisor and Employer and all possible alterations that could happen during the construction period: buildings logs, building books, test certificates of the materials and all other test certificates, as well as other necessary documentation.

The Contractor shall submit for the Supervisor's and Project Manager approval at the time for submission of detailed design, in three copies, the following:

- Design calculations for the illumination

- Design of main riser cable dimension including the relevant calculations
- Detailed design plans and shop drawings of all floors (1:50)
- Relevant layout plans and details (such as the electrical scheme and front view of the distribution boards)
- Details of materials (such as the material specifications of each appliances)
- Manufacturer's specifications and details with supporting calculations where appropriate.
- Method statement for execution of all aspects of the work on Site
- Contractor's updated work Program.

The detailed design submitted to the Supervisor and Employer for approval shall give full information regarding the design of the works proposed, and approval of the design shall be obtained before any work is commenced.

Prior to submission of the detailed design the contractor shall reach agreement with the competent authorities that statutory approvals can be reached within a determined period.

### • **PERFORMANCE CRITERIA OF THE ELECTRICAL SYSTEM**

Grounding system:

- TNC System for Main Distribution Power Panels (NPP & EPP)
- TNS System for UPS and Sub distribution

Rated operational voltage ( $U_e$ ):

- 400 V (L/L)
- 230 V (L/N)

Rated insulation voltage ( $U_i$ ):

- $\geq 690$  V

Rated impulse withstands voltage ( $U_{imp}$ ) of low voltage facilities:

- 12 kV

Test voltage of low voltage facilities:

- 1 min. 50 Hz 3500 V

Rated frequency:

- 50 Hz

Rated service:

- Uninterrupted

Voltage drop between sources and loads:

- 4 % maximum on AC (from transformer outgoing clamps to the nearest socket)

Cos phi:

- 0, 90 on mains supply

Neutral sizing:

- In accordance with codes and standards
- Equal to phase sections on the circuits from the sources (mains and genet)

Breaking capacity and short-circuit withstand:

- CEI 947.2 P1 (cycle 0 – 3 min. – CO)
- $I_{cu} \geq 10$  kA

## 1. ELECTRICAL SYSTEM DESIGN

Compilation of the technical specification has as scope to underline the role of the Contractor in way to define in the best way and the right material for the implementation of the work.

In the project are the below systems:

1. *Power sockets system*
2. *Normal and emergency lighting network*
3. *IT & telephony sockets system*
4. *CCTV system*
5. *Fire Detection system*
6. *Grounding and lightning protection system*
7. *Electrical Distribution Board (switchboards)*
8. *20/0.4kV Medium Voltage/Low Voltage Transformer Station*

Designing of the electrical system for the building is based on the Term of References, base in the architectural spaces, functionality of the institution, the EU norms, and standards. We design electric project, for all mentioned systems design should be implemented ICE standards (DIN, BS, IEC, etc.).

The distribution system should be implemented TN-S system (Neuter and the equipotential grounding conductor PE separate) system, which realizes high rate of protection.

### • Power supply of building

The LV distribution system constitutes the most important part of the electrical system of the building. Low voltage network of the building will be supplied from the 20/0.4kV Medium/low Voltage Electric Transformer Station, located near the school and gym building.

The main power supply line of the buildings from Medium Voltage/Low Voltage Electric Transformer Room located near school building as shown on general layout of the design. From Main Electrical Panel – Electric Cabin (M.E.P-E.C), due to the calculation referring to the length is foreseen to be multicore EPR insulation cable,  $U_n=0.6/1kV$ , FG16OR16 type, with section:

- School building  $S = 3 \times [(1 \times 150) + (1 \times 95)] \text{ mm}^2$ .
- Gym School  $S = (4 \times 35) \text{ mm}^2$ .
- Kindergarten building  $S = (4 \times 35) \text{ mm}^2$ .

From the carried-out calculations, taking into consideration all parameters and nameplates of the equipment in the object, we have the following results:

#### A. Calculation tables of total electric power:

<b>1. Installed power</b>	<b><math>P_{inst} = 316 \text{ kW}</math></b>
<b>2. Demand active power</b>	<b><math>P_{kerk} = 173 \text{ kW}</math></b>
<b>3. Demand factor</b>	<b><math>K_{kerk} = 0.55</math></b>
<b>4. Power factor <math>\cos \varphi</math></b>	<b><math>\cos \varphi = 0.9</math></b>

#### B. Calculation tables of electric power for school building:

<b>1. Installed power</b>	<b><math>P_{inst} = 218 \text{ kW}</math></b>
<b>2. Calculated power</b>	<b><math>P_{kerk} = 127 \text{ kW}</math></b>
<b>3. Utilization Factor</b>	<b><math>K_u = 0.56</math></b>
<b>4. Demand power</b>	<b><math>P_{kerk} = 114 \text{ kW}</math></b>

<b>5. Simulity Factor</b>	<b><math>K_{kerk} = 0.9</math></b>
<b>6. Total demand factor</b>	<b><math>K_{kerk} = 0.52</math></b>
<b>7. Power factor <math>\cos \varphi</math></b>	<b><math>\cos \varphi = 0.9</math></b>

*C. Calculation tables of electric power for gym school building:*

<b>8. Installed power</b>	<b><math>P_{inst} = 57 \text{ kW}</math></b>
<b>9. Demand power</b>	<b><math>P_{kerk} = 33 \text{ kW}</math></b>
<b>10. Demand factor</b>	<b><math>K_{kerk} = 0.58</math></b>
<b>11. Power factor <math>\cos \varphi</math></b>	<b><math>\cos \varphi = 0.9</math></b>

*D. Calculation tables of electric power for kindergarten building:*

<b>12. Installed power</b>	<b><math>P_{inst} = 40 \text{ kW}</math></b>
<b>13. Demand power</b>	<b><math>P_{kerk} = 25 \text{ kW}</math></b>
<b>14. Demand factor</b>	<b><math>K_{kerk} = 0.625</math></b>
<b>15. Power factor <math>\cos \varphi</math></b>	<b><math>\cos \varphi = 0.9</math></b>

*E. Calculation tables of electric power for outdoor lighting + transformer room:*

<b>1. Installed power</b>	<b><math>P_{inst} = 1 \text{ kW}</math></b>
<b>2. Demand power</b>	<b><math>P_{kerk} = 1 \text{ kW}</math></b>
<b>3. Demand factor</b>	<b><math>K_{kerk} = 1</math></b>
<b>4. Power factor <math>\cos \varphi</math></b>	<b><math>\cos \varphi = 0.9</math></b>

#### • **UPS equipment for school building**

Due to the object topology, there will be installed one UPS equipment in the building, respectively:

- UPS=30 kVA, Online, floor standing located on First Floor of School building
- UPS=2 kVA rack mounted, for kindergarten building
- UPS=600 VA rack mounted, for gym building

The UPS-s installed will supply all the outlets computers offices in the Teacher's Room, Info's Lab. Director's Office, Psychologist and Laboratory Room. Also, they will supply Fire Alarm Control Panel (F.A.C.P), emergency lighting, CCTV, RACK-s, Audio System.

References:

- Standard: Safety: IEC 62040-1
- EMC standard: IEC 62040-2
- Manufacturer: ISO 9001

#### **a) General**

Static groups supply with uninterrupted power will be supplied all weak currents systems (fire detection system, telephone switchboard, IT switches, Network Video Recorder, Sound Diffusion System). Entire computer sockets supplied from the UPS, normal and emergency lighting system.

In case of black out supply, UPS device immediately supply the customers connected with it, allowing supply by them through batteries accumulators, which are part of the UPS group. When the voltage of the network, or even diesel-generator, returned or displayed, supply of consumer redone again out of batteries. UPS is equipped with bypass switch which, in specific cases to

exclude manually from the UPS device network connection.

The UPS shall be a single-UPS unit, operating in double-conversion mode, it shall be a type of UPS (as per standard IEC 62040-2), made up of the following components, described in detail in this specification:

- rectifier;
- battery charger;
- inverter;
- battery;
- static bypass (via a static switch);
- manual maintenance bypass;
- user and communications interface;
- battery management system;

The UPS shall ensure continuity of electric power to the load within the specified tolerances, without interruption upon failure or deterioration of the normal AC source (utility power) for a maximum protection time determined by the capacity of the backup batteries installed.

For the uninterrupted power supply for the office building project 4 ups have been chosen for each floor, so that the floors are independent of each other, thereby increasing the security of uninterrupted power supply.

Below are the technical specifications for each of 30kVA UPS:

#### **b) Technical features of UPS 30 kVA, On-Line**

UPS equipment is completed with batteries and must fulfil the following features:

##### Electrical Data Sheet

UPS Rating	30 kVA
<b>Input Specifications</b>	
Input voltage	380V/400V/415V
Nominal input current (A)	48/46/44
Maximum input current (A)	58/55/53
Input current limitation (A)	65/63/60
Input frequency	45-65 Hz
Input wiring	3P+N+PE
Input thdi	<3% @ 10Kva, <4% @ 15-40 kVa
<b>Bypass Specifications</b>	
Bypass voltage	380V/400V/415V
Minimum bypass voltage	304/320/332
Maximum bypass voltage	437/460/477
Nominal bypass current (A)	46/43/42
Bypass frequency	50/60Hz
Bypass wiring	3P+N+PE
<b>Output Specifications</b>	
Output voltage	380V/400V/415V
Nominal output current (A)	46/43/42
Output frequency	50/60Hz
Output wiring	3P+N+PE
Output THDU	<3% @ 100% LINEAR LOAD, <5.5% @ 100% NON-LINEAR LOAD

### Battery specifications

Charging power

Programmable from 1% TO 20% of UPS

Capacity, Default IS 10%

Maximum charging power (W)	6000
Nominal battery voltage (VDC)	+/- 240
Nominal float voltage (VDC)	+/-270
End of discharge voltage (Full load) (VDC)	+/-198
Battery current at full load and nominal battery voltage (A)	66
Battery current at full load and minimum battery voltage (A)	81
Ripple current	<5% C10
Maximum short circuit withstand	Icc=10 kA

### Recommended cable sizes

Input cable size (mm <sup>2</sup> )	16
Bypass cable size (mm <sup>2</sup> )	16
Output cable size (mm <sup>2</sup> )	16
Battery input cable size (mm <sup>2</sup> )	25
PE cable size (mm <sup>2</sup> )	16

- **Specification for the Main Low Voltage Electrical Panel**

Requirements of construction of the system of installation

- General information

The main L.V low voltage switchboard will be manufactured in conformance to standard IEC 61439-2 and will be tested according to the 15 tests defined by this international standard of LV electrical switchgear assemblies.

- 12 Type tests carried out by the manufacturer:
  1. Strength of material and parts
  2. Degree of protection of enclosures
  3. Clearance and creepage creep age distances
  4. Protection against electric shocks and integrity of protective circuits
  5. Incorporation of switching devices and components
  6. Internal electrical circuits and connections
  7. Terminals for external conductors
  8. Dielectric properties
  9. Temperature rise limits
  10. Short circuit withstand strength
  11. Electromagnetic compatibility
  12. Mechanical operation
- 3 routine tests carried out by the panel builder:
  1. Wiring, functional operation
  2. Insulation
  3. Protection measures

In order to guarantee the quality of the delivered assembly, the contractor of this batch will obligatorily provide the certificates or compliance certificates of the 12 Type tests of the manufacturer as well as a copy of the routine test certificates.

- Main Electrical Panel Ground Floor – School (M.E.P.G.F-S)
  - ✓ Type: tested;
  - ✓ Installation: surface mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ External auxiliary voltage: 400/230V AC;
  - ✓ Main circuit breaker: MCCB type,  $I_n=250A$ ,  $I_{cc}=25kA$ , 3~ 400V/ 50Hz;
  - ✓ Breaking Capacity  $I_{cc}$ : 25kA;
  - ✓ With Digital Analyzer of Electrical Parameters;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: Metallic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Technical Room Electrical Panel – School (T.R.E.P-S)
  - ✓ Type: tested;
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);



- ✓ Power frequency: 50Hz;
  - ✓ Main circuit breaker: MCB type, In=32A, Icc=15kA, 3~ 400V/ 50Hz;
  - ✓ Breaking Capacity Icc: 15kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V / 50Hz;
  - ✓ Degrees of protection: Metallic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board 1 Ground Floor – School (E.D.B1.G.F-S)
    - ✓ Type: tested;
    - ✓ Installation: flush mounted
    - ✓ Rated Voltage: 1kV (AC);
    - ✓ Operating Voltage: 0.4kV (AC);
    - ✓ Power frequency: 50Hz;
    - ✓ Main circuit breaker: MCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
    - ✓ Breaking Capacity Icc: 10kA;
    - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
    - ✓ Degrees of protection: plastic type, IK08, IP40;
    - ✓ Connections: Inlet and outlet connection cable should be below;
    - ✓ Connection clamps for connection of all inlet and outlet cables
    - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board 2 Ground Floor – School (E.D.B2.G.F-S)
    - ✓ Type: tested;
    - ✓ Installation: flush mounted
    - ✓ Rated Voltage: 1kV (AC);
    - ✓ Operating Voltage: 0.4kV (AC);
    - ✓ Power frequency: 50Hz;
    - ✓ Main circuit breaker: MCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
    - ✓ Breaking Capacity Icc: 10kA;
    - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
    - ✓ Degrees of protection: plastic type, IK08, IP40;
    - ✓ Connections: Inlet and outlet connection cable should be below;
    - ✓ Connection clamps for connection of all inlet and outlet cables
    - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board 1 First Floor – School (E.D.B1.F.F-S)
    - ✓ Type: tested;
    - ✓ Installation: flush mounted
    - ✓ Rated Voltage: 1kV (AC);
    - ✓ Operating Voltage: 0.4kV (AC);
    - ✓ Power frequency: 50Hz;
    - ✓ Main circuit breaker: MCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
    - ✓ Breaking Capacity Icc: 10kA;
    - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
    - ✓ Degrees of protection: plastic type, IK08, IP40;
    - ✓ Connections: Inlet and outlet connection cable should be below;
    - ✓ Connection clamps for connection of all inlet and outlet cables
    - ✓ (According to the scheme of single line diagram given the project).



- Electrical Distribution Board 2 First Floor – School (E.D.B2.F.F-S)
  - ✓ Type: tested;
  - ✓ Installation: flush mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ Main circuit breaker: MCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
  - ✓ Breaking Capacity Icc: 10kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: plastic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board 1 Second Floor – School (E.D.B1.S.F-S)
  - ✓ Type: tested;
  - ✓ Installation: flush mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ Main circuit breaker: MCCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
  - ✓ Breaking Capacity Icc: 10kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: plastic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board 2 Second Floor – School (E.D.B2.S.F-S)
  - ✓ Type: tested;
  - ✓ Installation: flush mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ External auxiliary voltage: 400/230V AC;
  - ✓ Main circuit breaker: MCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
  - ✓ Breaking Capacity Icc: 10kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: plastic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board First Floor – Info. Cabinet (E.D.B.F.F-I.C)
  - ✓ Type: tested;
  - ✓ Installation: 90 modules, surface mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ External auxiliary voltage: 400/230V AC;
  - ✓ Main circuit breaker: MCCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
  - ✓ Breaking Capacity Icc: 10kA;

- ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
- ✓ Degrees of protection: Metallic type, IK08, IP40;
- ✓ Connections: Inlet and outlet connection cable should be below;
- ✓ Connection clamps for connection of all inlet and outlet cables
- ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board Second Floor – Info. Cabinet (E.D.B.S.F-I.C)
  - ✓ Type: tested;
  - ✓ Installation: flush mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ Main circuit breaker: MCCB type, In=32A, Icc=10kA, 3~ 400V/ 50Hz
  - ✓ Breaking Capacity Icc: 10kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: plastic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Electrical Distribution Board First Floor – UPS (E.D.B.F.F-UPS)
  - ✓ Type: tested;
  - ✓ Installation: flush mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ Main circuit breaker: MCB type, In=50A, Icc=15kA, 3~ 400V/ 50Hz
  - ✓ Breaking Capacity Icc: 15kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: plastic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Main Electrical Panel - Gym School (M.E.P-G.S)
  - ✓ Type: tested;
  - ✓ Installation: surface mounted
  - ✓ Rated Voltage: 1kV (AC);
  - ✓ Operating Voltage: 0.4kV (AC);
  - ✓ Power frequency: 50Hz;
  - ✓ Main circuit breaker: MCB type, In=80A, Icc=15kA, 3~ 400V / 50Hz;
  - ✓ Breaking Capacity Icc: 15kA;
  - ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
  - ✓ Degrees of protection: Metallic type, IK08, IP40;
  - ✓ Connections: Inlet and outlet connection cable should be below;
  - ✓ Connection clamps for connection of all inlet and outlet cables
  - ✓ (According to the scheme of single line diagram given the project).
- Main Electrical Panel Kindergarten (M.E.P-K)
  - ✓ Type: tested;
  - ✓ Installation: surface mounted
  - ✓ Rated Voltage: 1kV (AC);

- ✓ Operating Voltage: 0.4kV (AC);
- ✓ Power frequency: 50Hz;
- ✓ Main circuit breaker: MCB type, In=63A, Icc=15kA, 3~ 400V/ 50Hz;
- ✓ Breaking Capacity Icc: 15kA;
- ✓ With overvoltage discharge SPD, 3~ 400V/ 50Hz;
- ✓ Degrees of protection: Metallic type, IK08, IP40;
- ✓ Connections: Inlet and outlet connection cable should be below;
- ✓ Connection clamps for connection of all inlet and outlet cables
- ✓ (According to the scheme of single line diagram given the project).

All bus bars must be of electrolytic copper fulfilling all the conditions of dynamic and thermal stability to short circuit currents R.L.SH. The consumer unit as in the figure should be in the space required for the placement of all the circuit-breaker and count with a reserve of 15-20% for possible developments in the future.

- These consumer units must fulfil the criteria of the circuit-breaker thermal heat, have way for the deployment of cables, they should be mounting on the wall. The panels will be in plastic cover, with partial service, with drawer, for placement on the floor and the class of protection IP-40.
- All bus bars tied must be of electrolytic copper fulfilling all the conditions of dynamic and thermal stability to short circuit currents RLSH.
- In addition to working slot should be provided even reserve switchgear 15% (installed as switchgear) and 10% as reserve vacancies.

The consumer units should be the cover of plastic, they should be by glass doors facilitating the work of maintenance personnel, to be completed with the necessary accessories for the safety of all the cabling and other equipment. Such a panel facilitates the work of the circuit breaker through internal air circulation and enables a distribution of the circuit breaker in different phases and facility requirements.



*Figure 1 : Low Voltage Main Electrical Panel*

The low voltage consumer unit are especially important fulfilment and internal construction with their own kits and accessories. As shown in figure 4. Assembling the panels properly and appropriate architecture allows a space sufficient to fulfil working conditions of the circuit breaker and eliminates human error in assembling and installation of them. Recommended is the use of modular structures.



*Figure 2 : Available and necessary accessories*

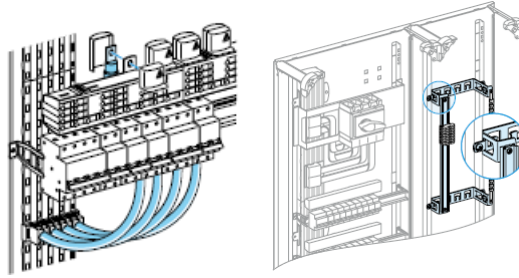


Figure 3 : Structure realized with proper kits and accessories to the customer

- **Automatic circuit breaker for protection**

Protective equipment should be circuit breaker of the rate CEI 60898 and CEI 60947-2 as in Figure 3 and Figure 4. This circuit breaker protects equipment and ensure a swift action by overloads and shorts circuit current. This circuit breaker should be connected first terminal equipment and counties that do not have direct staff presence.



Figure 4 : One and two pole circuit breakers according standard by CEI 60898

Characteristics of the circuit breaker:

- ✓ Short circuit current: 6KA
- ✓ Nominal current: 6 – 32A
- ✓ Nominal working voltage: 230V
- ✓ Number of cycles: 20 000
- ✓



Figure 5 : Two pole circuit breaker by CEI 60947-2

Characteristics of the circuit breaker:

- ✓ Short circuit current: 6KA
- ✓ Nominal current: 6 – 32A
- ✓ Nominal working voltage: 230V
- ✓ Number of cycles: 20 000

Differential circuit breaker by the rate CEI 61008, besides providing protection against overloads and short circuits and leakage currents protection of land. To ensure personnel from any potential errors during installation and in damage to equipment which have direct contact with. Categorically all circles must be protected with a differential circuit breaker according to Figures.



*Figure 6 : Two and four polar differential circuit breakers by CEI 6100*

Characteristics of the differential circuit:

- ✓ Short circuit current: 6 - 10KA
- ✓ Nominal current: 1 – 63A
- ✓ Nominal working voltage: 230V
- ✓ Characteristic of the fall: “C”
- ✓ Number of cycles: 10 000 - 20 000

Protective equipment from overvoltage by the rate CEI 61643, should serve to protect the electrical system from overvoltage unforeseen occurring stroke of lightning or even those shocks that come from distribution network OSSHE during switching different and in serious defects in the equipment transformation.



*Figure 7 : Overvoltage discharger and three phases by CEI 61643*

Characteristics of the overvoltage dischargers:

- ✓ Nominal working voltage: 230/400V
- ✓ Frequency: 50Hz
- ✓ Power disconnection: 25KA
- ✓ Action Time: 25ns
- ✓ working Temperature: -25, +60

Measuring devices according to CEI 60051 norms serve simple control electrical system parameters. Necessary during maintenance as well as the quick elimination of defects, these devices help technical service personnel to act quickly in case of potential failure and observe periodically based electrical network data as current and voltage.

For qualified personnel for accurate control and measurement of energy consumption and for monitoring of specific parameters such as power coefficient used equipment according to IEC 62053-21 rate as in Figure. These devices provide a quality measurement of active energy in level 1 and 2 to the reactive power scale.

- **Power cable power**

All kinds of cables to be used in the project shall comply with the technical specifications of FG16R16 / FG16OR16 0,6/1 kV category; Flexible or rigid power control cable for fixed installations not propagating fire and width low corrosive gas emission. G16 quality HEPR insulated. CPR UE 305/11.

- F - Flexible fine wired conductor class 5.
  - G16 - heavy ethylene-propylene rubber type G16
  - O - Round multi core cable
  - 1. R16 - PVC sheath type R16,
- Construction:
    - 1. Fine wired copper conductor, class 5
    - 2. Rigid EPM rubber, G16 quality
    - 3. Thermoplastic compound, fire resistant, non-water absorbing
    - 4. Anti-abrasive PVC compound R16 quality, fire retardant, with reduced gas emission

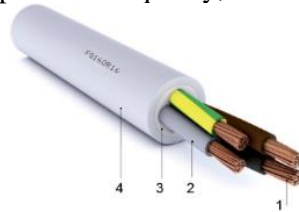


Figure 8 : FG16OR16 cable type

- Reference standards:
  - CEI 20-13; IEC 60502-1
  - CEI UNEL 35318-35322-35016
  - EN 50575:2014
  - + EN 50575/A1:2016
- General:
  - Flexible conductor, class 5 copper made.
  - Elastomeric mixture insulation (G16 quality).
  - Not fibrous and not hygroscopic filler
  - Outer Sheath of transparent PVC R16 type.
- Technical features:
  - Nominal voltage U0: 0.6 kV (AC) 1.8 kV (DC);
  - Nominal voltage U: 1 kV (AC), 1.8 kV (DC);
  - Test voltage: 4 kV;
  - Maximum voltage Um : 1.2 kV(AC); 1.8 kV (DC);
  - Maximum operating temperature: 90°C;
  - Maximum short circuit temperature for sections up to 240mm<sup>2</sup>: 250;
  - maximum short circuit temperature for sections over 240mm<sup>2</sup>: 240;
  - Min. operating temperature (without mechanical shocks): -15°C;
  - Minimum installation and use temperature: 0°C.
- Common features:

For electrical power system in constructions and other civil engineering building, in order to limit fire and smoke production and spread, in accordance with the CPR. Power and control use outdoor and indoor applications, even wet. Suitable for fixed installations at open air, in tube or canals, masonry, metals structures, overhead wire and for direct or indirect underground wiring. Not indicated for connection with photovoltaic panels. Power and control use outdoor applications, even wet AD6.

- Employment

Minimum bending radius per D cable diameter (in mm):

- Power flexible cables, class 5= 4 D;
- Control flexible cables, class 5 = 6 D;
- Maximum pulling stress: 50N/mm<sup>2</sup>.



- Core colours
  - Single core: black;
  - Two cores: blue-brown;
  - Three cores: brown-black-gray (or blue-brown-Y/G);
  - Four cores: blue-brown-black-gray (or Y/G instead blue);
  - Five cores: Y/G-blue-brown-black-gray (or black instead Y/G);
  - Multicores: black with numbers

### Technical features FTG10OM1 cable



Figure 9 : Multicore cable FTG10OM1type

Technical specifications for FTG10(O)M1 cable:

Conductor :	flexible red copper conductor Cl.5
Insulation:	rubber, type G.10
Outer sheath:	blue (RAL 5012) halogen-free compound, type M1
Nominal Voltage:	0.6/1kV
Temperature range:	-25°C deri ne +90°C

According to the standards:

- EN 50266 / IEC 60332-3-24 / CEI 20-22III
- EN 50267-2-1 / IEC 60754-1 / DIN VDE 0482 part.267-2-1
- IEC 60331 / EN 50200

For power, normal and emergency lighting lines will be used FG16OR16 cable with 90min duration against fire with PVC insulation.

Power load calculated for cables above requirement should respect the official campaign:

- a) For cables 1-6mm<sup>2</sup> average power density 4A / mm<sup>2</sup>
- b) The average density cables electricity 6-16mm<sup>2</sup> 2-4Amm<sup>2</sup>
- c) For cables> 16mm<sup>2</sup> average power density 1-2Amm<sup>2</sup>

Applying these conditions the system loads in power cables will be used for long and their installation will be required guarantee longevity. Distribution network will consist of the main electrical distribution board panel to be placed in the kitchen room and. In each panel will be placed electrical protective equipment, measuring and switching devices, which will make the protection, metering and customer switching.

### Technical features N07V-K conductor

Cables for indoors and wiring. Fire retardant, with a low emission of corrosive gases. PVC insulation in R2 quality (a double layer up to 6mm). Flexible conductor, class 5 copper made.



Figure 10 : N07V-K copper conductor

- Reference standards:
  - CEI UNEL 35752
  - CEI 20-22/2



- CEI EN 60332-1-2
- CEI EN 50267-2-1
- Low voltage directive 2006/95/EC
- RoHS 2011/65/CE directive
- General:
  - PVC insulation in R2 quality (a double layer up to 6mm)
  - Flexible conductor, class 5 copper made.
- Technical features:
  - Nominal voltage U0: 0.45 kV
  - Nominal voltage U : 0.75 kV
  - Test voltage: 3 kV
  - Maximum voltage Um : 1 kV for fixed and protected installation‘
  - Maximum operating temperature: +70°C
  - Maximum short circuit temperature: +160°C
  - Min. operating temperature (without mechanical shocks): -10°C
  - Minimum installation and use temperature: +5°C

- Common features:

This cable is suitable for fixed and protected installation at voltage until 1000V. It must be laid inside pipes at sight, embedded or close systems. Section 1 mm<sup>2</sup> is used for wirings of electric sets or for electric circuits of lifts. Do not install into contact with warm surfaces.

- Employment
  - Minimum bending radius per D cable diameter (in mm):
  - Fixed lay: D<12=3D D<20=4D
  - Free move: D<12=5D D<20=6D
  - Maximum pulling stress: 50 N/mm<sup>2</sup>.
- Core colours
  - Single core: black;
  - Two cores: blue-brown;
  - Three cores: brown-black-grey (or blue-brown-Y/G);
  - Four cores: blue-brown-black-grey (or Y/G instead blue);
  - Five cores: Y/G-blue-brown-black
  - Multicores: black with numbers

- Note

Maximum storage temperature: +40°C

Cores number	Cross section	Approx conductor diameter	Insulation medium thickness	Approx external production diameter	Approx cable weight	Electric resistance at 20°C	Current carrying capacities in air 30°C	Internal code
(N°)	(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(kg/km)	(Ohm/km)	(A)	
Unipolare / Single core								
1x	1	1.3	0.7	2.9	17	19.5	12	1900115
1x	1.5	1.6	0.7	3.1	21	13.3	15.5	1900120
1x	2.5	2	0.8	3.75	33	7.98	21	1900125
1x	4	2.6	0.8	4.4	48	4.95	28	1900130
1x	6	3.4	0.8	4.9	66	3.3	36	1900135
1x	10	4.4	1	6.4	112	1.91	50	1900140
1x	16	5.7	1	7.4	164	1.21	68	1900145
1x	25	6.9	1.2	9.1	254	0.78	89	1900150
1x	35	8.1	1.2	10.35	340	0.554	110	1900155
1x	50	9.8	1.4	12.4	485	0.386	134	1900160
1x	70	11.6	1.4	13.6	674	0.272	171	1900165
1x	95	13.3	1.6	15.8	894	0.206	207	1900170
1x	120	15.1	1.6	17.4	1110	0.161	239	1900175
1x	150	16.8	1.8	19.8	1400	0.129	275	1900180
1x	185	18.8	2	21.6	1700	0.106	314	1900185
1x	240	21.4	2.2	24.6	2230	0.0801	369	1900190

Figure 11 : Technical characteristics N07V-K copper conductor

Wherever you metallic tray or cable bridge, the cables will lie within them. Where there are no bridges or wall metallic tray or floor sections, cabling of the distribution network will be made tubular type PVC with RK15 dielectric composition. Connection cables in the derivation box will be hooded or clips appropriate. Composition of the boxes will be made of Styrofoam, with screw caps, the classes of protection IP-40.

- **The distribution networks**

It departs from the network to the local cadre (which are placed on the floors of the building) that goes to individual customers as plugs, computers, engines, etc. All the local staff or floors, in order to use their destination as well as the number of outgoing groups (typology of them) will be of two types:

- The type for placement on the floor
- The type of placement in the walls (screens)

All the staff will be more metal casing and filled with 2 or 4 modular devices polar. In most output groups, according to foreign standards, where necessary groups will be provided with the differential automatic circuit breaker with  $I_n = 30 \text{ mA}$ . As regards the rate of protection to all local cadres will be the protection IP - 44.

- **Rates of distribution network groups**

- All lighting groups and protected by dikes will automate the missing differential magneto-thermic and 30 mA.
- Section of wires lighting shall not be less than 1.5 mm<sup>2</sup> copper. Magneto-thermal circuit breaker will be 10A peak power of each group single phase not more than 1500 W.
- Socket section wires to be used for local working light will also be 1.5 mm<sup>2</sup> copper conductors. Automatic circuit breaker ate the same like item b above.
- Outlets for various electrical apparatus offices with power less than or equal to 2600 W, must be with section 2.5 mm<sup>2</sup> / copper and appropriate protection 16 A.
- For special customers (large photocopying machines, etc.) With power over 3600 W sections of the conductors must be 4 mm<sup>2</sup> and the protection of 25 A.

## 1. POWER SOCKETS NETWORK

A complete system with plug unit must be provided under the project, and electrical engineering drawings made by designers. All outlets will be installed in the object should be grounded type and protection to children. Outlets as well as the keys can be that type mounted under plastering or on the surface.

Single-phase voltage sockets as shown in the figure below have 1 pin for the stage, 1 pin for neutral and a pin for earth or earth contacts.



*Figure 12 : Universal two module sockets 16A, 250V, white and red colour*

All sockets, until it becomes another specification, must be 16A, 230V type 2-pin and coming to the surface. They should have flush fitting, shall be of a colour to match lighting keys blinders. Also, other accessory electric oppressive buttons, flat mount boxes etc. should be under general catalogue 2000 GEWISS or other similar accepted.

Technical characteristics of distribution boxes:

- in thermoplastic material self-extinguishing and resistant to abnormal heat and fire up to 650 °C (glow wire test) in compliance with IEC 60695-2-11 Standard
- lid in RAL 9016 with self-threaded screws included in the supply FLC09915
- operating temperature from -5 °C to +60 °C
- wiring accessories and junction boxes made in compliance with CEI EN 60670-1 and CEI EN 60670-22 Standards
- new enlarged box for 3 modules with new accessories (mortar cover, spacer, separator)

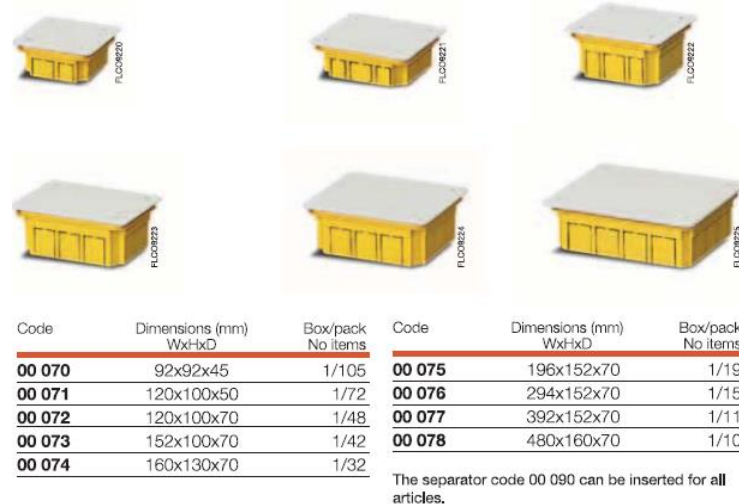


Figure 13 : Flush mounting distribution boxes IP40

## 2. NORMAL LIGHTING NETWORK

The indoor lighting for each type of area, is calculated the lighting flow rate according to the Albanian laws and European norm UNI EN 12464. Indoor luminaries in offices, reception, medical room and other indoor rooms Internet and reading room, medical room, bedrooms, toilet, technical rooms, bar-kitchen, corridors and staircases are been selected to fulfil the architectural interior satisfaction of the building. For indoor lighting, the minimum average illumination  $E_m$  has to be designed as follows:

Rooms	Intensitet
Classrooms	500 lux
Corridor,Staircase	200 lux
Psychologist Room	500 lux
Teacher's Room	500 lux
Libraries	500 lux
Storage	150 lux
Toilets	150 lux
Chemistry Lab.	500 lux
Physical Lab.	500 lux
Cabinet Info	500 lux
Dentist/Nurses	500 lux
Secretary	500 lux
Sub/Director's Office	500 lux
Director's Office	500 lux
Technical Room	200 lux

The entire lighting network will be installed with conductor N07V-K 1x1.5mm<sup>2</sup>.

A. LED Panel Luminaires, recessed mounting, 60x60cm, 36W, IP40

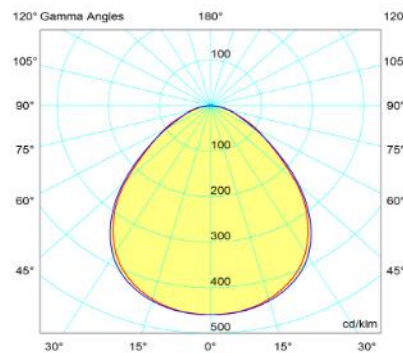


Figure 14 : LED Panel luminaires, 36W, IP40 and photometric diagram

Technical features:

- Reference: EN60598-1; EN60598-2-22; EN 62471;
- Model: LED Panel;
- Mounting: Surface mounting;
- Light source: LED lighting;
- Optical system: Opal diffuser;
- Light distribution: Direct;
- Materials: Aluminium white;
- Surface finish: White RAL 9003 (W03);
- Source Voltage: 220-240 [V];
- Frequency [Hz]: 50 [Hz];
- Power Factor (cos (fi): 0.96;
- Equivalent power: 4x18 [W];
- Luminaire Power : 36 [W];
- Luminaire Flux [lm]: 3600 [lm];
- Luminous Efficacy: 100 [lm/W];
- Temperature colour: 4000 [K];
- UGR: <19;
- IK rating: 05;
- Operating Temp. [°C]: (-20°C ÷ 40) [°C];
- Fire Resistance : 650 [°C];
- EEC: A++ / A+ / A;
- Insulation class: II;
- IP protection degree: IP40
- Dimensions: 595x595x41 mm;
- Weight: 3.5 kg;
- Average Life [h]: 50,000 h;
- Areas of application: education building.

B. High-bay LED luminaries completed with all hanging installation accessories 129W, 12129lm, 5000K, IP65



Figure 15 : High-bay LED 129W, 12129lm, 5000K, IP65

Technical data:

- Power consumption: 129W
- Supply voltage: 180-295VAC
- Connection cable length: 30cm
- Light flux: 12129 lm

- Light colour: 5000K (daylight white)
- colour rendering index: RA  $\geq$  80
- Beam angle: 120°
- LED chips: 210 x SMD3030 (Philips)
- Light emission: polycarbonate lens
- Lamp life: 50,000 h
- Housing: made of aluminium, good heat dissipation
- Housing protection: IP65
- Driver: Meanwell, efficiency  $\geq$  90%
- Operating ambient temperature range: -20 to +50°C
- Storage ambient temperature range: -30 to +60°C
- Operating ambient humidity range: 10-80% RH
- Storage ambient humidity range: 10-90% RH
- Dimensions: Ø310mm x H119mm
- Weight: 3.67kg
- Approvals: CE, RoHS
- Warranty: 5 years

C. Industrial LED lighting, 43W, IP65, with opal diffuser



Figure 16 : Industrial LED lighting 43W, IP 65

Technical features

- Mounting: Surfaced / Suspended (S/S)
- Light source: LED
- Optical system: Opal diffuser (OPD)
- Light distribution: Direct
- Wiring: Electronic control gear DALI (EDA)
- Materials: Clips: PC / stainless steel  
Diffuser: PC  
Housing: grey injected polycarbonate
- Accessories: Rope suspension
- Voltage: 220-240 V, 50-60 Hz
- Power factor:  $> 0,95$
- Net lumen output: (Ta=25°C) 4000 lm
- Luminous flux tolerance:  $\pm 10 \%$
- Power consumption: 43 W
- System efficacy: 116 lm/W
- Correlated colour temperature: 3000 K
- Colour rendering index: 80 Ra
- Colour tolerance: 3 SDCM
- EEC: A++ / A+ / A
- Protection class: I
- Thermal management: Passive
- Service lifetime: (Ta=25°C) 50,000 hours / L80 / B10
- Ambient operating temperature: From -20 °C to +40 °C
- IP protection degree: IP65
- Mechanical impact resistance: IK08
- Dimensions (L x W x H): 1270 x 100 x 100 mm
- Weight: 2,3 kg.

D. Round LED luminaires, surface ceiling/wall mounting, 18W, IP44

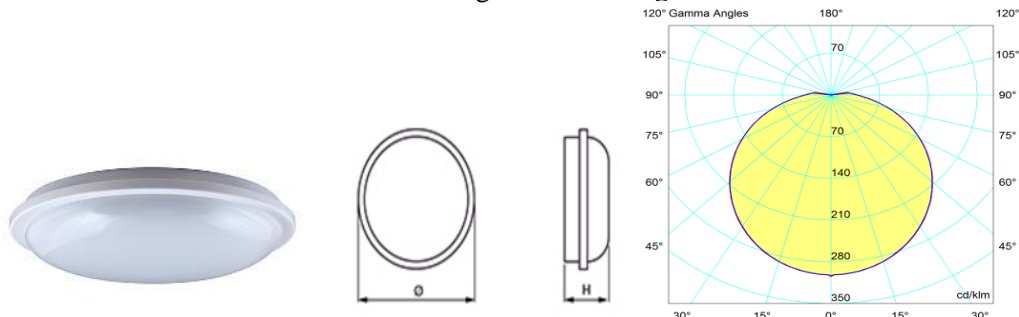


Figure 17 : Round LED luminaires, 18W, IP44 and photometric diagram

Technical features:

- Reference: EN60598-1; EN60598-2-22; EN 62471;
- Model: Plafond, wall/ceiling;
- Mounting: Surface mounting;
- Light source: LED lighting;
- Optical system: Opal diffuser;
- Light distribution: Direct
- Materials: Aluminium Bianco;
- Surface finish: White RAL 9003 (W03);
- Source Voltage: 220-240 [V];
- Frequency [Hz]: 50 [Hz];
- Power Factor (cos (fi): 0.95;
- Luminaire Power : 18[W];
- Luminaire Flux [lm]: 1650 [lm];
- Luminous Efficacy: 84 [lm/W];
- Temperature colour: 4000 [K]
- UGR: <19'
- IK rating: 07;
- Operating Temp. [°C]: (-20°C ÷ 40) [°C]
- Fire Resistance : 850 [°C];
- Ballast : Constant current LED Smart driver (programmable)
- EEC: A++ / A+ / A
- Insulation class: II
- IP protection degree: IP44
- Dimensions: Ø=220 B=70 mm
- Weight: 0.27 kg
- Average Life [h]: 30,000 h
- Areas of application: Secondary area

E. Round LED Surface Luminaires, surface ceiling/wall mounting, 25W, IP65



Figure 18 : Round LED luminaires, 25W

Technical features:

- Reference: EN60598-1; EN60598-2-22; EN 62471;
- Model: Ceiling Surfaced ;
- Mounting: Surface mounting;
- Light source: LED lighting;
- Optical system: Opal diffuser;
- Light distribution: Direct
- Materials: Aluminium Bianco;
- Surface finish: White RAL 9003 (W03);

- Source Voltage 220-240 [V];
- Frequency [Hz]: 50 [Hz];
- Power Factor (cos (fi): 0.95;
- Luminaire Power : 25 [W];
- Luminaire Flux [lm]: 2300 [lm];
- Luminous Efficacy: 92 [lm/W]
- Temperature colour: 4000 [K]
- UGR: <19
- IK rating: 07;
- Operating Temp. [°C]: (-20°C ÷ 35) [°C]
- Fire Resistance : 650 [°C];
- Ballast : Constant current LED Smart driver (programmable)
- EEC: A++ / A+ / A
- Insulation class: II
- IP protection degree: IP65
- Dimensions: Ø=300 B=40 mm
- Weight: 1 kg
- Average Life [h]: 40,000 h

F. Cylindrical surface ceiling mounted, LED luminaires, 25W, IP54



Figure 19 : Cylindrical LED luminaires, 25W, IP54

Technical features:

- Model: LED Surface mounted downlight
- Mounting: Surface mounting;
- Input Voltage: 240V AC;
- Power: 25W;
- IP rating: IP54;
- Lumens (lm): 2300lm;
- Temperature color: 4000 [K];
- LED type COB
- Frequency [Hz]: 50 [Hz];
- CRI ≥80;
- Beam angle: 60°
- Lifespan (hours) : 50 000 hours.

G. Evacuation luminaires (EXIT), LED 4W IP40, with battery Ni-Cd- autonomy 3hours

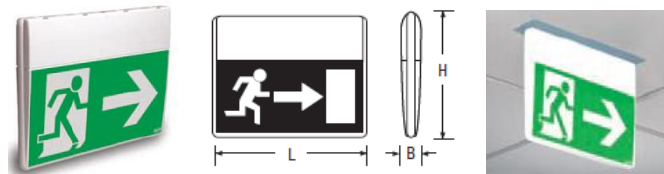


Figure 20 : Evacuation luminaires (EXIT), LED 8W IP40

Technical features

- Reference: EN 60598-1, EN 60598-2-22, UNI EN 1838, UNI 11222
- Model: Emergency EXIT;
- Mounting: Surface mounting;
- Light source: LED lighting;



- Optical system: Opal diffuser;
- Light distribution: Direct
- Materials: ABS;
- Surface finish: White RAL 9003 (W03);
- Source Voltage 220-240 [V];
- Frequency [Hz]: 50 [Hz];
- Power Factor (cos (fi): 0.95;
- Luminaire Power: 8 [W];
- Battery Life: 3 [hour];
- Battery: Ni-Cd 4,8V 1,7Ah;
- Luminaire Flux [lm]: 1250 [lm];
- Luminous Efficacy: 84 [lm/W];
- Temperature colour: 4000 [K];
- Visibility Distance: 35 [m]; (EN1838)
- IK rating: 05;
- Operating Temp. [°C]: (0 ÷ 40) [°C];
- Fire Resistance : 850 [°C];
- EEC: A++ / A+ / A;
- Insulation class: II
- IP protection degree: IP40
- Dimensions: L=355 x B=38 x H=273
- Weight: 1.4 kg
- Average Life [h]: 30,000 h
- Areas of application: Secondary area
- Service lifetime: 100,000 h, with high efficiency
- Areas of application: Offices, Public Areas, Shops, Safety Sign.

H. Emergency luminaires (EXIT), LED 8W IP40, with battery Ni-Cd- autonomy 3hours  
Technical features

- Available for maintained and non-maintained operation. The selection is made during first commissioning;
- Integrated self-testing functionality;
- Integrated voltage switching;
- Integrated mains monitoring;
- Installation: quick fixing plate-body;
- Compliant with IEC EN 60598-2-22 standard;
- ENEC certification;
- Protection rating: IP65, IK07;
- Insulation class: II I;
- Installation even on flammable surfaces;
- Fire behaviour (IEC 60695-2-10), incandescent wire: 850°C;
- Operating temperature: 0...40°C;
- Case of self-extinguishing polycarbonate 94V-2 (UL 94);
- Long-lasting LED light source (>10 years expected in typical environment temp\*);
- Power supply: 216 V DC / 230 V AC;
- Products are delivered with an additional removable aesthetic frame (OVA53156);
- Vetro-signal OVA53159 is delivered with 5 removable pictograms (Left/Right/Up/Down/Opaline).


Exiway Smartled	Protection rating		Flux (lm)	Equivalent lamp power (W)	Luminary source	Consumption		Glasses	Cat. no.
	IP	IK				(VA)	(W)		
	IP65	IK07	300	8-11	LED	9.2	4.5	Transparent	OVA46020
			650	24	LED	13.8	7.5	Transparent	OVA46021
			1000	24	LED	18.9	10.5	Transparent	OVA46022

Figure 21 : Emergency luminaires, LED 8W, IP65

Switches according to the position where it will be used and how they start up and shut down of the share:

- One-way single pole switch 16A, 230V
  - Three-way switch 16A, 230V
- A direct switch commonly used in small environments where we have a small number of illuminators.
  - Two direction breakers commonly used in those places where we have a large number of illuminators who can meet even such partial way.
  - Three ways switches are more used in those places where we have two entry/exit, as they turn on the lights at one entrance / exit and can turn off them in the entrance/exit other or may be used across corridors.

### 3. OUTSIDE LIGHTING NETWORK

For the outside lighting we have used the following lighting:

- LED lighting 53W, IP65



Figure 22 : LED Lighting 53W, IP-65, for outside lighting

Technical features:

- Light Source: LED Technology 4000K.
- Housing/cover: In die-cast aluminum
- Diffuser: In vandal resistant and V2 self-extinguishing polycarbonate, UV Stabilized, anti-yellowing, smooth and clear.
- Painting: the standard liquid immersion coating consists of a first metal surface pre-treatment stage, a successive epoxy cathodolysis corrosion and salt resistant coating, and a final layer of bi-component acrylic liquid UV-stabilized coating
- Standard supply: opal glass and aluminum cover interior
- Mounting: On pole Ø 76/60 mm or arm
- Regulations: Produced according to applicable EN60598-1 CEI 34-21 standards, IP65, IK09 degree of protection according to EN 60529 standards.
- Equipment: Fiberglass nylon cable gland Ø1/2 gas thread (cable min Ø9 max Ø12). Environment-friendly gasket. Removable control gear tray with lamp holder, in fiberglass nylon. Complete with socket-plug. temperature control device inside the lamp with automatic recovery. Safety diode to protect against voltage peaks pursuant to EN61547. Dedicated electronic device to protect the LED module.
- Photobiological safety class: exempt group EN62471.
- Ta-20+40°C life 50.000h to 80% L80B20
- Light System: Direct;
- Voltage: 220-240 V, 50-60 Hz;

- Installed power: 53 W;
- Net lumen output: 3700 lm;
- IP Protection Degree: IP 65;
- Insulation class: II;
- Class Protection: IK 09;
- Dimension: Ø585, 550mm
- Surface finish: Grey 9007;
- Weight: 1.4 kg

I. LED projector 100W, IP66 for outdoor facade lighting



Figure 23 : LED floodlight 100W, IP66, for outdoor lighting

Technical features:

- Light Source: LED Technology 4000K.
- Housing/cover: in die-cast aluminum with cooling fins
- Diffuser: 5mm thick tempered glass, resistant to thermal shocks and impacts
- Painting: the standard powder coating consists of a first metal surface pretreatment stage and of single layer of UV-stabilized, corrosion and salt resistant polyester powder coating.
- Regulations: Produced according to applicable EN60598-1 CEI 34-21 standards, IP65, IK09 degree of protection according to EN 60529 standards.
- Equipment: Equipment: external connector for quick installation. Silicone rubber gasket; external screws and bolts in stainless steel; air recirculation valve. Electronic safety device to protect the LED module and the related ballast compliant with EN 61547. It works in two modes: - differential mode: surge between power cables and between the phase and neutral. - common mode: surge between power, L/N and ground cables or between the fixture's body if it is of class II and installed on a metal pole. Upon request: protection up to 10KV. Coating. compliant with UNI EN ISO 9227 Corrosion tests in artificial atmospheres for aggressive environments.
- Power factor:  $\geq 0.9$
- Luminous flux maintenance .80%: 80000h (L80B20)
- Light System: symmetric wide beam;
- Voltage: 220-240 V, 50-60 Hz;
- Installed power: 100W;
- Net lumen output: 10000 lm;
- IP Protection Degree: IP 66;
- Insulation class: II
- Class Protection: IK 08;
- Dimension: L333xW85xH568mm
- Surface finish: Graphite;
- Weight: 5.3 kg

#### J. Lighting pole H=4.8m

Tapered steel lighting pole. With hole for insertion of power supply cable, pole head connection,  $\phi 60$ . For the version with base, 4 log bolts to be sunk into the ground, bolts and lids must be purchased. Size of inspection window 45x186 (h 4000), supplied with protection fuse holder, 2 fuses, 16A, removable terminal block, 4 poles/3 holes = 10sqmm and shunt 2,5sqmm. Standard insulation class II. When using Insulation Class I fixtures, appropriate grounding connections should be included in the system. NOTE. Before selecting the appropriate pole, make all necessary wind pressure resistance tests, pursuant to the Standards or Legislative Decrees in force in the countries where the pole will be mounted and based on the assumed loads specified in Standard EN 40-3-1. An accurate and suitable protection or insulation of the surfaces involved is recommended to avoid any direct contact with the new masonry or concrete screed.

Technical features:

- Dimension total: 4800mm,  $\phi$  120mm
- Height aboveground: 4000mm
- Height underground: 800mm
- Insulation class: II
- Surface finish: Grey 9007
- Weight: 44 kg

## 4. IT & TELEPHONY NETWORK

The project of IT and Telephone Network consists of installation of LAN and Telephone network in full compliance with the design task. Based on the norms of reference the entire premises must be equipped with IT and Telephone outlet RJ45, to make a system of communication and data transmission as well as possible.

Rack-s installed in the building are as follows:

- **RACK - (School building)**  
Standard Floor standing Rack/Cabinet/ Enclosure– 19", 32U (W600xD800xH1460)  
The computer rack contains:
  - 4 x Patch panel for IT network with 24 RJ-45 ports, FTP Cat 6;
  - 1 x Patch panel for CCTV network with 24 RJ-45 ports, FTP Cat 6;
  - 1 x Patch panel for telephony network with 24 RJ-45 ports, FTP Cat 6;
  - 4 x Internet switch with 24 RJ-45 port + 2 optical port, FTP Cat.6;
  - 5 x Patch Guide RJ45 FTP Cat6;
  - 1 x Supply module with 8 " Universal 2P+T " sockets 230V, 16A + PE;
  - 1 x ventilation group with 2 fan module;
  - 1 x Telephone Switchboard PBX;
  - 1 x Switch, 24Port, POE, Managed;
  - 1 x NVR 24 Channel CCTV System;
  - 1 x Grounding Bar.
- **RACK - (Gym building)**  
Standard Floor standing Rack/Cabinet/ Enclosure– 19", 8U (W600xD450xH360)  
The computer rack contains:
  - 1 x Patch Guide RJ45 FTP Cat6;

- 1 x Supply module with 8 " Universal 2P+T " sockets 230V, 16A + PE;
  - 1 x ventilation group with 2 fan module;
  - 1 x Switch, 16Port, POE, Managed;
  - 1 x Grounding Bar.
- **RACK - (Kindergarten building)**  
Standard Floor standing Rack/Cabinet/ Enclosure– 19", 15U (W600xD600xW760)  
The computer rack contains:
- 2 x Patch panel for IT network with 24 RJ-45 ports, FTP Cat 6;
  - 1 x Internet switch with 24 RJ-45 port + 2 optical port, FTP Cat.6;
  - 2 x Patch Guide RJ45 FTP Cat6;
  - 2 x Supply module with 8 " Universal 2P+T " sockets 230V, 16A + PE;
  - 1 x ventilation group with 2 fan module;
  - 1 x Switch, 16Port, POE, Managed;
  - 1 x NVR 12 Channel CCTV System;
  - 1 x Grounding Bar.
- **Technical features for RACK Cabinet**
- Installation Ready
  - Reliable structure with welded Frameworks
  - Elegant design with Tempered Glass door
  - Wide Front Door swing angle over 180 degrees
  - Easily removable side panels with lock
  - Hassle-free installation method (Patent)
  - Additional wheels and legs for further stand-alone
  - Integration (Optional)
  - Up to IP20 protection
  - Load rating at 60kg
  - Top and Bottom modular cable entrance
  - Colour- Fully powder coated
  - (RAL7035 Light Grey/ RAL9004 Black)
- **Compliance:**  
Comply with ANSI/ EIA RS-310-D, DIN414197 part 1, IEC297-2, DIN41494 part 7, GB/T3047.2-92 standard.

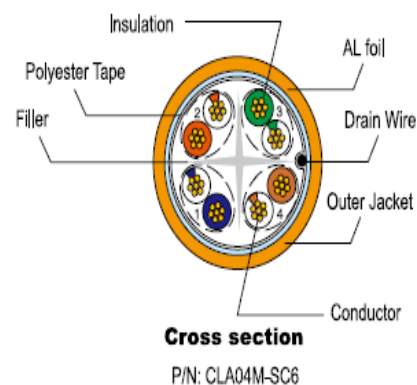
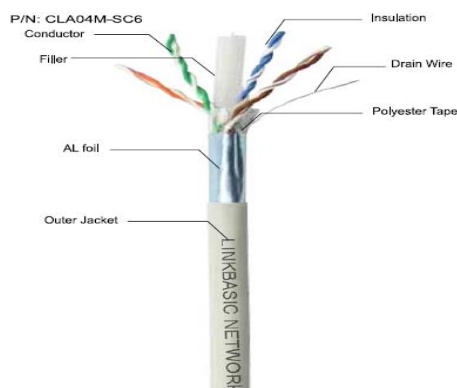


Figure 24 : FTP CAT6 cable

- **Description:**
- Rated temperature: 70°C
  - Reference standard:

- Transmission: ISO/IEC11801, EN50173, IEC61156-5; EN50288-5-1;ANSI/TIA568-C2
- Fire: IEC 60332-1-2; EN 60332-1-2 (IEC 60332-3-25 for special fire retardant “Exhalent sheath);
- Smoke (LSZH only): IEC 60754-1 and -2, IEC 61034-1 and IEC 61034-2;
- Solid bare copper conductor;
- Color-coded PE insulation;
- Rip cord (optional);
- PVC or LSZH jacket;
- Packaging: Reel, Reel in Box.

■ Construction:

Structure	Construction	FTP
	Number of Pairs	4对
	AWG	23AWG
	Conductor Dimension (mm)	7×0.18
	Solid or Stranded; Bare or Tinned	Solid Bare Copper
Insulation	insulation material	HDPE
	Insulation Dimension (mm)	1.15
	Number Colour (Ring or Strip marking)	1.White/Blue(Ring) & Blue,2.White/Orange(Nng) & Oange,3.White/Gem(Rhg) & Green,4.White/Brown(Ping) & Btuwn
	Cross Filler	Yes
Shield	Individual Shield & Material	No
	Outer Shield & Material	Yes (AL Foil)
	Drain Wire	Yes (Tinned Copper)
Outer Jacket	Outer Jacket Material	PVC或 LSZH
	Outer Jacket Ripcord	Based On Customer Requirements
	Overall Nominal Diameter (mm)	7.2±0.3

■ Electrical Specification:

MAX. Mutual Capacitance @ kHz	≤5.6 nF 11 DOM
MAX. Capacitance unbalance (pF/ 100m)	≤330pF /100M(Per TIA/EIA-568B.2),≤160pF /100M(Per IEC 61156)
Nominal Velocity of Propagation	65%
Max. Delay Skew (ns/100m)	45ns/100M
Max. Conductor DC Resistance @ 20 Deg. C	7.32Ω /100M (23AWG)
Max. DC Resistance unbalance @ 20 Deg. C	≤5%(per TIA/EIA-568B.2),≤2%(per IEC 61156-5)
Mni. Insulation resistance (MΩ/ k m)	5000
Max. Operating Voltage-UL	300V

■ Mechanical Specification:

Operating Temp. Range	-20~70℃
Max. Recommended	110N
Pulling Tension Min. Bend Radius (Install)	8 x O.D.
Flame Test	CMR

All signals from internet outlets will be collected in a RACK who decided to establish in the electrical technical environment. In one PVC flexible pipe  $\varnothing=25\text{mm}$  should not be used for more than two internet cables.

- Computer sockets RJ45, FTP CAT.6 should be supplied directly from the rack with FTP CAT6 cable. Every internet socket has a dedicated and uncut feeding cable.
- RJ45 internet sockets are installed at the same height with power sockets and recommended to be installed at the height  $H=30\text{cm}$  from the floor plan level.
- The supplying lines from the rack passed through floor plan, inserted in PVC flexible pipe, fire retardant emitting, heavy type  $\varnothing=25\text{mm}$ .

All computers must be equipped with standard patch cords cable with RJ45 connectors.

## 5. FIRE DETECTION SYSTEM

During the project of the system fire detection, we were referred to the standards below:

- a. Laws and applied standards in Albania
- b. European Norms

EN 54	Fire alarm and detection system
ISO 7240	Fire alarm and detection system, safety security
ISO 8421-3	Protection against fire
BS 5839	Fire alarm and detection for buildings

General description:

Fire alarm system or fire protection is a personnel system that warns of the presence of fire or smoke in the building. The system is designed in full compliance with the requirements of UNI 9795 standard. All equipment fire-signalling system must be produced in accordance with European standard EN 54 standard.

Addressable fire alarm system for school building consists:

- A. Addressable Fire alarm control panel;
- B. Addressable Smoke detectors;
- C. Addressable Manual push buttons;
- D. Addressable Indoor sirens;
- E. Addressable Outdoor sirens;
- F. Addressable Fire alarm cable.

### A. Addressable Fire Alarm Control Panel

Analogue central unit, with 16 bit microprocessor, to manage fire systems with single detection line, with 1 loop.

Technical features of fire alarm control panel (F.A.C.P):

- It is possible to connect up to 128 out of smoke detectors, gas detectors, heat detectors, pushbuttons actuators and interfaces to control external equipment can be connected.
- Detection line can be programmed in following configurations:
  - 4 open lines (max 32 devices per line)
  - 1 loop line (max 128 devices)
- 1 RS232 output towards PC
- LCD display with 8 lines by 40 characters
- Event log: 1000 events
- Signalling outputs:
  - Alarm Relay 1 or 3 (1A@30 VDC), NO/NC contact
  - Alarm Relay 2 (5A@30 VDC)



- Failure or exclusion Relay (5A @ 30 VDC) NO/NC contact
- Network in Relay (1A @ 30 VDC) NO/NC contact
- Controlled siren output for optical/acoustic indicators
- Controlled output for self-powered sirens
- In compliance with EN54/2-4
- Input voltage: 230 VDC 50 Hz
- Output voltage: 27 VDC 500 mA
- Battery management, check and charge: 700 mA
- Assignable batteries: max 2 x 12V – 15 Ah
- Operation temperature: -5 to + 50°C
- Base made in metal sheet and front side made in ABS.
- Dimensions (H x L x D): 450 x 350 x 160 mm.

#### B. Addressable Optical Smoke Detector

Low profile smoke optical addressed analogue detector.

- Visual operation signal is provided by two red led lamps placed on the cap, which flashes at each call from the central unit.
  - The alarm signal from the central unit puts led lamps on steady.
  - Operation principle: Tyndall effect
  - Supply voltage: 18 VDC modulated
  - Absorption: 280µA at rest
  - Alarm repetition: O.C. 100 mA max
  - Visual alarm repetition: 2 red led lamps
  - Dimensions: Ø 100 x H 45 mm
  - Magnetic test
  - Operation temperature: –20 to +55 °C
  - Relative humidity: 95% max noncondensing
  - EN 54 parts 7 certified
  - Associable to following bases: ZB/200, ZB/201, ZB/204
- #### C. Addressable Optical Heat Detector

Low profile smoke optical addressed analogue detector.

- Visual operation signal is provided by two red led lamps placed on the cap, which flashes at each call from the central unit.
- The alarm signal from the central unit puts led lamps on steady.
- Operation principle: Tyndall effect heat probe
- Supply voltage: 18 VDC modulated
- Absorption: 280 µA at rest
- Alarm repetition: O.C. 100 mA max
- Visual alarm repetition: 2 red LED lamps
- Dimensions: Ø 100 x H 45 mm
- Magnetic test
- Operation temperature: –20 to +55 °C
- Relative humidity: 95% max none condensing
- Protection degree: IP 43
- Associable to following bases: ZB/200, ZB/201, ZB/204

#### D. Red alarm Addressable pushbutton with breaking

Red alarm analogue pushbutton with recommissioning.

- Fire alarm pushbuttons are used for signalling an alarm manually. To use the break glass pushbutton model just press the glass in the middle in order to break it and to operate the internal

switch. These pushbuttons are provided with a special tool to be used to perform the TEST, to open the cover and to replace the glass. The alarm state is shown by the switching on of a red LED.

- Compliant with Standards: EN54 part 11
- Visual alarm repetition: red led
- Dimensions (H x L x D): 110 x 110 x 42 mm
- Weight: 100 g
- Average absorption: 100  $\mu$ A @ 18 VDC
- Actuation Type: Recommissioning

#### E. Addressable Indoor fire alarm sirens

- Electronic bell with sophisticated appearance and innovative technology for fire alarm systems and other warnings.
- Combining a miniaturized solenoid to a built-in control circuit, excellent acoustic performance, minimum current consumption and high reliability are allowed.
- Power supply doubled pins and cap latching make the bell particularly easy to be installed.
- IP 55 protection degree allows bell outdoor use; however, the bell can also be mounted in indoor environments.
- Power supply: 24 VDC
- Average absorption: 30 mA
- Operation temperature: -10°C ÷ +55°C
- Sound pressure at 1-meter distance: 93-95 dB
- Protection degree: IP 55

#### F. Addressable Outdoor fire alarm sirens

Provided with signalling flash with incandescent lamp, Outdoor red self-powered siren made in die-cast aluminium.

- Operation voltage: 24 VDC
- Protection degree: IP 43
- Sound pressure: 104 dB (A) at 3 meters distance
- Operation temperature: -25° C / +55° C
- Assignable accumulator: 12 V 2, 1 Ah
- Dimensions (H x L x D): 265x210x65 mm

Conventional fire alarm system for gym school building consists:

- G. Conventional fire alarm control panel;
- H. Conventional smoke detectors;
- I. Conventional manual push buttons;
- J. Conventional Indoor sirens;
- K. Conventional Outdoor sirens;
- L. Fire alarm cable.

#### G. Conventional Fire Alarm Control Panel

Compact central unit, with microprocessor, suitable for small size building, Conventional, with 2 zones.

Technical features of conventional fire alarm control panel (F.A.C.P):

- Composed of a red plastic enclosure made in ABS for wall mounting.
- Italian or English language front side.

- The unit has four independent detection lines, with maximum capacity of 30 devices per line. Each detection line corresponds to a single zone and can be set to either single or double permission.
- The central unit is also equipped with a dry contact relay output for failure, a controlled line for bells and sirens and an output for electromagnets control.
- The central unit is equipped with an electronic circuit to recharge and control the batteries.
- Leak towards the earth signaling on central unit panel.
- Mechanical key to enable programming functions and/or commands (silencing, resetting, cutting off, etc.)
- Facility for adding, into the central unit, an optional module allowing to have either 8 zone relay outputs or a module allowing to control a solenoid valve (MOD54E).
- Number of zones: 2, independent
- Max number of detectors per zone: 30 (Smoke, heat, pushbuttons)
- In compliance with EN 54 parts 2 – 4
- Supply voltage: 230 Vac 50 Hz
- Output voltage: 23 Vdc – 27.6 Vdc
- Max current: 500 mA
- Assignable batteries: 2 x 12V – 7.5 Ah
- Failure central repetition: 1 A 30Vdc relay
- Controlled siren output
- Output for electromagnets
- Relative Humidity: 95 % Max RH noncondensing
- Operation temperature: -5° to +50° C
- Protection degree: IP 32
- Dimensions (HxLxD): 386 x 269 x 96 mm
- Weight (not including batteries): 2,7 Kg
- Accessories: control module for siren line (INT-SONG/54 or SONG/54) Control board for solenoid valve (MOD/54-E), Board with 4 relays for line alarms (MOD/54-R)

#### H. Conventional Smoke Detector

- Correct operation signaling is from a flashing green led placed on the cap.
- Alarm signaling is from a red led placed on the cap.
- On the detector there are two open collector outputs, one for correct operation signaling, and the other for alarm signaling.
- A detector characteristic feature is its intervention threshold self-adjusting capability on its being put on.
- Correct operation green led
- Alarm red led
- Alarm output: 100 mA (O.C.)
- Operation principle: Tyndall effect
- Supply voltage: 11 – 30 Vdc
- Alarm repetition: O.C. 100 mA max
- Operation repetition: O.C. 10 mA max
- Absorption: 100  $\mu$ A 18 Vdc at rest, 22 mA 18 Vdc on alarm status
- Magnetic test
- Operation temperature: da -20 a +50 °C
- Relative humidity: 95% max noncondensing
- EN 54 part 7 certified.
- Associable to following bases: ZB/200, ZB/201, ZB/204
- Dimensions (HxLxD): Ø 100 x H 45 mm C

#### I. Conventional red alarm conventional pushbutton with breaking

- Visual alarm repetition: red led

- Alarm absorption: 20 mA @ 18 Vdc
- Actuation Type: Breaking
- EN54 part 1
- Weight: 100 g
- Dimensions (HxLxD): 110 x 110 x 42 mm

#### J. Indoor fire alarm sirens

- Electronic bell with sophisticated appearance and innovative technology for fire alarm systems and other warnings.
- Combining a miniaturized solenoid to a built-in control circuit, excellent acoustic performance, minimum current consumption, and high reliability are allowed.
- Power supply doubled pins and cap latching make the bell particularly easy to be installed.
- IP 55 protection degree allows bell outdoor use; however, the bell can also be mounted in indoor environments.
- Power supply: 24 Vdc
- Average absorption: 30 mA
- Operation temperature: -10°C ÷ +55°C
- Sound pressure at 1meter distance: 93-95 dB
- Protection degree: IP 55

#### K. Conventional Outdoor fire alarm sirens

Provided with signaling flash with incandescent lamp, Outdoor red self-powered siren made in die-cast aluminum.

- Operation voltage: 24 Vdc
- Protection degree: IP 43
- Sound pressure: 104 dB (A) at 3 mt distance
- Operation temperature: -25° C / +55° C
- Assignable accumulator: 12 V 2,1 Ah
- Dimensions (HxLxD): 265x210x65 mm

*Control Equipment.* Contractor should cover, installation, test, and provides a high quality connection for the operation of the fire signal device and alarm system including speakers, lights, alarm equipment, contact breaking glass panels fire alarm, battery charger, and associated relays, will be provided and connected in accordance with the specifications, according to the positions shown on the drawings. Installation will be done with JY(St)-Y 2x1 mm<sup>2</sup> cable for smoke detectors and sirens and 2x1 mm, for fire alarm sirens.

All the signalizations will be equipped with an arrow indicating the place of fire. Leading signals will also provide links between terminals to help command signal units in the previous drawings.

## 6. CCTV SURVEILLANCE SYSTEM

The camera monitoring system as an important element in the security of the object should secure not only the quality in the service that it provides but also the continuity and security while working.

This system consists of:

1. 1 x NVR 24 Channels
2. 1 x Monitor 32’’
3. 1 x HDD 4TB
4. Indoor camera, IP POE Dome type, 5Mpx, IP43
5. Outdoor camera, IP POE Bullet type, 5Mpx, IP66
6. Cable infrastructure with FTP Cat.6 Cable

In this modern system of control and monitoring, that consists of High-Resolution cameras, Wide Dynamic Range and Day and Night, we receive clear and stable views for 24/7. Through CCD technology these cameras reach a photographing speed up to 30 images per second with a resolution up to 5 megapixels. It's recommended that for special parts of the building the use of IP cameras, that through LAN or the Internet can be monitored and controlled online.

The camera control of the object will be done not only inside but outside it too.

The indoor cameras are placed in the entrance.

- Indoor Camera, IP POE Dome type 5Mpx, IP43



Figure 25: Indoor camera, dome type

Technical Specifications:

Image Sensor:	1/2.9" Progressive Scan CMOS
Signal System:	PAL/NTSC
Min. Illumination:	Colour: 0.01 lux @(F1.2, AGC ON), 0.028 Lux @(F2.0, AGC ON), 0 lux with IR
Shutter time:	1/3 s to 1/100,000 s
Slow shutter:	Support
	2.8 mm, horizontal field of view: 97°
	4 mm, horizontal field of view: 78°
Lens:	6 mm, horizontal field of view: 60°
	8 mm, horizontal field of view: 39.5°
	12 mm, horizontal field of view: 19°
Lens Mount:	M12
Adjustment Range:	Pan: 0° to 355°, tilt: 0° to 75°, rotate: 0° to 355°
Day& Night:	IR cut filter with auto switch
Wide Dynamic Range:	120 dB

**Image**

Max. Image Resolution:	2944 × 1656
Sub Stream:	50Hz: 25fps (640 × 480, 640 × 360, 320 × 240) 60Hz: 30fps (640 × 480, 640 × 360, 320 × 240)
Frame Rate:	50Hz: 20 fps (2944 × 1656), 25 fps (2560 × 1440, 1920 × 1080, 1280 × 720) 60Hz: 20 fps (2944 × 1656), 30fps (2560 × 1440, 1920 × 1080, 1280 × 720)
Third Stream:	50Hz: 25fps (1280 × 720, 640 × 360, 352 × 288) 60Hz: 30fps (1280 × 720, 640 × 360, 352 × 240)
Image Enhancement:	BLC/3D DNR/BLC
Image Settings:	Rotate Mode, Saturation, Brightness, Contrast, Sharpness adjustable by client software or web browser
ROI:	Support 1 fixed region for mainstream and sub stream separately
Day/Night Switch:	Day/Night/Auto/Schedule/Triggered by Alarm In(-S)

**Network**

Network Storage:	microSD/SDHC/SDXC card (128G), local storage and NAS (NFS, SMB/CIFS),
------------------	---

	ANR
Protocols:	TCP/IP, UDP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP, SMTP, SNMP, IGMP, 802.1X, QoS, IPv6
General Function:	One-key reset, Anti-Flicker, heartbeat, mirror, password protection, privacy mask, Watermark, IP address filtering
System Compatibility:	ONVIF (Profile S, Profile G), ISAPI

#### General

Operating Conditions:	-30 °C ~ 60 °C (-22 °F ~ 140 °F) Humidity 95% or less (non-condensing)
Power Supply:	12 VDC $\pm$ 25%, PoE (802.3af Class3)
Power Consumption:	12 VDC $\pm$ 25%, 6.2 W PoE(802.3af, class 3), 9 W
Impact Protection:	IK10
Weather Proof:	IP67
IR Range:	Up to 30m
Dimensions:	Camera: $\Phi$ 111 $\times$ 82.4 mm ( $\Phi$ 4.4" $\times$ 3.2") Package: 134 $\times$ 134 $\times$ 108 mm (5.27" $\times$ 5.27" $\times$ 4.25")
Weight:	Camera: 500 g (1.1 lb.)

#### - Outdoor Cameras, IP POE bullet type, 5Mpx, IP66



Figure 26: Type of outdoor camera

#### Technical Specifications:

Image Sensor:	1/2.9" Progressive Scan CMOS
Signal System:	PAL/NTSC
Min. Illumination:	Color: 0.01 lux @(F1.2, AGC ON), 0.028 lux @(F2.0, AGC ON), 0 lux with IR
Shutter time:	1/3 s to 1/100,000 s
Slow shutter:	Support
Lens:	2.8 mm, horizontal field of view: 97° 4 mm, horizontal field of view: 78° 6 mm, horizontal field of view: 60° 8 mm, horizontal field of view: 39.5° 12 mm, horizontal field of view: 19°
Lens Mount:	M12
Adjustment Range:	Pan: 0° to 360°, tilt: 0° to 90°, rotate: 0° to 360°
Day & Night:	IR cut filter with auto switch
Wide Dynamic Range:	120 dB
Digital noise reduction:	3D DNR
Focus:	Fixed

#### Image

Max. Image Resolution:	2944 × 1656
Sub Stream:	50Hz: 25fps (640 × 480, 640 × 360, 320 × 240) 60Hz: 30fps (640 × 480, 640 × 360, 320 × 240)
Frame Rate:	50Hz: 20 fps (2944 × 1656), 25 fps (2560 × 1440, 1920 × 1080, 1280 × 720) 60Hz: 20 fps (2944 × 1656), 30fps (2560 × 1440, 1920 × 1080, 1280 × 720)
Third Stream:	50Hz: 25fps (1280 × 720, 640 × 360, 352 × 288) 60Hz: 30fps (1280 × 720, 640 × 360, 352 × 240)
Image Enhancement:	BLC/3D DNR/BLC
Image Settings:	Rotate Mode, Saturation, Brightness, Contrast, Sharpness adjustable by client software or web browser
ROI:	Support 1 fixed region for mainstream and sub stream separately
Day/Night Switch:	Day/Night/Auto/Schedule

#### General

Operating Conditions:	-30 °C ~ 60 °C (-22 °F ~ 140 °F) Humidity 95% or less (non-condensing)
Power Supply:	12 VDC ± 25%, PoE (802.3af Class3)
Power Consumption:	12 VDC ± 25%, 6W PoE (802.3af, class 3), 7W
Weatherproof:	IP67
IR Range:	Up to 30m
Dimensions:	Camera: Φ70 × 155.03 mm (Φ2.76" × 6.1") Package: 216 × 121 × 118 mm (8.5" × 4.76" × 4.65")
Weight:	Camera: 410 g (0.9 lb.)

#### NVC Technical Specifications:



Figure 27 : Type of NVR IP 24Channel camera

Input	24 IP Channels
Compression	H.264, MPEG-4, Motion JPEG
Output	1 VGA, 2 HDMI
Compression	G.711, G.726, AAC, PCM
Input	1 Channel, RCA Port
Output	1 Channel, RCA Port
Input	8
Output	4
Split(VGA/HDMI)	1x1,2x2, 3x3, 4x4, 5+1, 7+1, 4+3, 8+2, 12+1 and Sequential
Split(Through LAN)	24 Channel @ 1080P/720P/D1
Resolution (VGA/HDMI)	6 Ch.@1080P, 9 Ch.@ 720P
Privacy Masking	Yes (as per Camera Support)
Digital Zoom on Live	Yes
Snapshot	Yes
Multiple Camera Viewing	Through Cascading (up to 20 Devices)



Frame Rate	25fps @ D1 Per Channel
Image Resolution	1080P, 720P, D1(Max-1080P for all channels)
Pre-Record	Up to 30 Sec
Post-Record	10-300 Sec
Storage	Adaptive Recording: Automatically adjusts frame parameters based on motion in a scene to save storage on recording.
Synchronous Playback	4 Channel
Search Mode	Date and Time, Camera, Bookmark and Recording Type
Playback Modes	Fast Forward, Slow Forward, Slow Reverse, Fast Reverse at Different Speed Control and Next-Previous Frame
Backup	Manual Backup over USB and NAS, 1-Touch Manual Backup, Scheduled Backup over USB and NAS/FTP
Network Functions	TCP, DHCP, PPPOE DNS, DDNS, Matrix DNS Server, FTP, SMTP, NTP, RTP/RTSP, HTTP, CIFS and UPnP
Remote Operation	Monitor, PTZ Control, Playback, System Setting, File Download, Log Information and Upgrade
Communication Interface	2xGigabit RJ45 Ethernet Interface
Throughput	144 Mbps (48 Mbps Downlink/96 Mbps Uplink)
USB	4 Ports (1xMouse, 2xScheduled and Manual Backup)
	Single Disk, RAID0, RAID1
SATA Interface	2 SATA Ports (6TB Per Port)
NAS	2 (16TB Per NAS)
USB	1 TB USB Drive (GPT Partition Table)
Processor	High Performance Embedded Microprocessor
OS	Linux
Control Mode	Mouse, IR Remote Control, CMS and Web Client
Power Input	12VDC@5A
Power Consumption	Less than 60W
Operating Temperature	-100C to +500C (140F to 1220F)
Humidity Range	5% to 95% RH Non-Condensing
Dimensions (W x H x D)	445.5 X 50 X196.25mm.

## 7. AUDIO SYSTEM

The Audio system (Public Address system) is designed for the protection and security of the evacuation of the building in case of fire, according to European norms EN 54-16 and EN54-4, providing notification in all indoor areas of the school building, to enable the notification of persons for their evacuation in case of fire. This system will contain the following elements:

This system will contain the following elements:

- Input devices (static microphones for public announcement of all areas)
- Control equipment (4-zone main central mixer for audio system control)
- Multi-channel power amplifier (250W, with voltage 100V)
- Output devices (6W metallic loudspeaker, fire dome and 20W sound projectors equipped with 100V transformer).
- Connection cables (Audio cable S=2x1.5mm<sup>2</sup>, FRS15 FE 180 PH 90).

The public voice notification system is designed in separate zones, each of one can be notified separately. Where each area is equipped with speakers certified according to EN54-24 standard.

Emergency voice alarm and public address system will contain:

- a. Wall RACK 19 "15U, with dim.600x600x760mm, for the installation of all equipment and components of the Audio system;
- b. Central control unit of the Audio system, certified according to the standard EN 54-16 and EN 60849, 4 zones and with the possibility of expansion, 4 audio inputs, 4 audio outputs, with the possibility of network communication with the fire alarm control panel or expansion (according to the system of selected);
- c. 4-channel Power Amplifier (Multi-channel Power Amplifier) 250W, 100V, EN 54-16 certified and EN 60849;
- d. Microphone for public announcement, certified according to the standard EN 54-16 and EN 60849, with the possibility of controlling all areas (4 areas), at the reception (according to the selected system);
- e. Recessed metallic loudspeaker, with fire dome case, completed with transformer 100V, 6W, certified according to standard EN54-16 (according to the selected system);
- f. Surface sound projector, fire dome, IP66 complete with transformer 100V, 20W, certified according to standard EN54-16 (according to the selected system);
- g. End of line device for audio zone line control, according to the certification of EN 54-16 z accessories according to the certification of standard EN 54-16 and EN 54-4.
- h. Power module for all elements of the public voice and audio notification system, together with the battery pack, Complete with all accessories according to the certification of standard EN 54-16 and EN 54-4

All equipment will be assembled in a RACK Audio, installed in the server room on the first floor, next to the informatic cabinet. The emergency evacuation and public address system shall be installed inside the school building, on the corridors, as well as at the outside of the school. This system will be used for emergency notification in the school premises, as well as for various notifications.

Also, this system can be used by school staff to give different announcements and different messages, according to separate areas with separate messages, or at the request for its use.

## **8. EARTHING AND LIGTING PROTECTION SYSTEM**

The project of grounding system and building's protection of atmospheric discharges is done basing on the demands and relying completely on IEC standards. Atmospheric protection system is very important because of the atmospheric conditions and geographic location of Albania.

Lightning Protection Systems shall be in accordance with the latest relevant norms

- EN IEC 62305-2:2006 the need to install a lightning protection system.
- EN IEC 62305 / EN IEC 61643 Class of al lightning protection system.
- EN IEC 62305-3:2006 Design of al lightning protection system

The building will be protected from direct and indirect (electromagnetic inductions) discharges. To protect the building from atmospheric discharges on the roof will installed air terminal net.

The protection from the second effects of electrical and telephonic lines will be done, besides those that are described i the VDE norms, also through suitable dischargers.

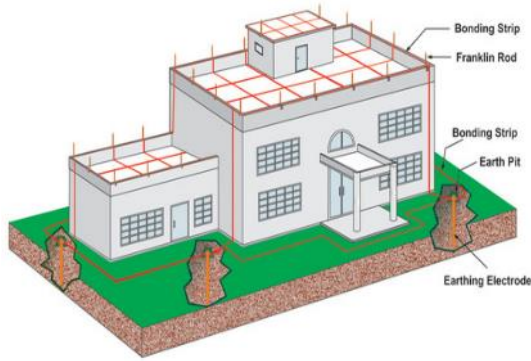


Figure 28: Constructive details of grounding system and lightning rods

All the metal equipment's, components longer than 1 m, and chiller metal constructions placed on the terrace will be connected to the lightning protection system. All the components that are higher than the surface of the terrace is protected directly thanks to the masts of atmospheric discharges. Also, the connection between lightning rods in the terrace and the grounding system will be made through the vertical dischargers that go down from the terrace to the contour net of grounding constructed in the base plan as shown in the electrical project.

#### a. System description

- The works and materials specified in this section are related to the manufacture, delivery, and erection and commissioning of the Lightning Protection Systems, including all necessary materials, equipment and installations.
- The work consists of installation of Lightning Protection Systems including all necessary associated works and materials in order to complete all installations to fully operational condition as specified and shown on the related design documents.
- Grounding under foundation network should be constructed with galvanized steel stripe 30x5mm. At the crossing part, branches and connections of grounding galvanized steel strips will be used connection clamps.
- Inside the concrete of the ground floor beams foundation hot dip galvanized steel tape electrode 30x5 mm shall be embedded at both directions. This conductor will be installed at level -0.15m, inside foundation beams as is shown in the drawings. These tapes shall be connected to the reinforcement steel of the foundation beams, via special clamp-fasteners to the reinforcement at intervals of approximately 1.5 m. the connection points shall be uniformly distributed. Sub grounding earthing network will be installed under foundation of the building, on the layer of sub filling of the site. This conductor is hot dip galvanized steel tape electrode 30x5mm as shown in the drawings. This conductor will be terminated at earthing equipotential busbar at level +0.5m, outside surface of the marked column as is shown in the drawings. With these conductor earthing rods 50x50x5mm, L=2.0m shall be connected.
- Inside the concrete of each column, but also inside concrete walls hot dip galvanized steel vertical tape (risers) 30x5mm shall be embedded. the risers shall be connected to the foundation grounding tape of the ground floor slab. moreover, risers shall be connected to the reinforcement steel of the column, via special clamp-fasteners to the reinforcement at intervals of approximately 1 m. the connection points shall be uniformly distributed.
- On the surface of market column outside the building, an earthing receptacle shall be mounted. Similarly, for the concrete walls, where no columns are formed, the earthing receptacles shall be installed at points dictated by the foundation grounding system. Inside the column or the concrete wall, the earthing receptacle shall be connected to the riser of the foundation grounding system via special cross and "t" connector clamps. Installation height for the earthing receptacle: 50 cm above the final floor level.
- Earthing receptacles shall be also installed on the outside surface of the columns.
- The risers of the foundation grounding system terminate 0.50 m below the roof level. from that point and on the lightning system conductors shall be connected.

- In general, the conductors of the subsurface meshed earthing system run at a depth of about 0.50 m below the site final level and form a closed loop around each building, at a distance about 1 m from building outline. In case that these conductors run across concrete structures (e.g. cable channels) shall be installed under the foundation level of these structures.
- At the points marked in this drawing earthing receptacles shall be installed (at the outer side of the columns). The inner part of the earthing receptacles shall be embedded in concrete and shall be conductively connected to the riser of the foundation grounding system. The outer surface of the earthing receptacle shall be flush mounted on the outer surface of the column and shall be connected to a nearby equipotential earthing bar, which shall be the common point for connection with the outdoor and the indoor grounding system, as well as to the lightning protection system (where applicable). Moreover, the earthing receptacle shall be used for the bonding of the nearby metallic parts outside of the building with the grounding system.
- Air terminal net on the roof will be constructed with galvanized steel stripe 30x5mm. Every 1m extension, the galvanized steel stripe of air terminal net is fixed in concrete cube coated with PVC 10x10x15cm.
- If the measurement of earthing resistance is greater than  $1\Omega$ , it must be added the number of earthing electrodes, until this condition is fulfilled
- The conductors will be cut, at proper distances and will be connected through special hot-dipped galvanized connectors in order to avoid deformations because of thermal expansion.
- All metallic structures located on the roof (R-TV antennas mast, HVAC equipment, etc.) will be connected to the roof-conductors.
- Down-conductors will be installed at distances not greater than 15 m from each other, to form a FARADAY Cage. At least, four (4) down conductors will be installed at each building.
- At each building, all down conductors will relate to the foundation grounding system.

*b. Submittals*

- Submit shop drawings showing layout of horizontal conductors, vertical conductors, and down-conductors and bonding connections to structure and other metal objects. Include terminal, electrode and conductor sizes and connection/termination details.
- Submit product data showing dimensions and materials of each component.
- Submit manufacturer's installation instructions.
- Accurately record actual locations of bonding connections and routing of system conductors.

*c. Products*

- All of the materials used for an LPS should follow the requirements of the European and International series of standards EN IEC 62305 and EN 50164.

*d. Roof conductors*

- Provide hot-dip galvanized steel strips 30x5mm in order to construct a Faraday cage. Roof conductors shall be put in the perimeter of the roof, at the edges and as shown in the drawings making a roof grid so as every point of the roof shall not exceed 2,5 m from a lightning conductor.
- The conductors shall be fixed with special supports, for such purposes, which shall be, manufactured items. Galvanized steel supports properly for the tile roof shall be used.
- Special fittings shall be used of roof conductor in order to avoid deformations because of thermal expansion. All metal equipment located on the roof or external the building. (Pipes, stairs, lodgement) shall be connected equipotential to the roof down conductors.

*e. Down conductors*

- Down conductors shall be made of hot-dip galvanized steel strips 30x5mm.
- Down conductors shall be connected to the grounding system.

*f. Installation*

- The down-conductors will be installed so that, as far as practicable, they form a direct continuation of the air-termination conductors.

- Down-conductors will be installed straight and vertical such that they provide the shortest and most direct path to earth.
- Down-conductors shall not be installed in gutters or down-spouts even if they are covered by insulating material.
- When dealing with the dispersion of the lightning current (high frequency behaviour) into the ground, whilst minimizing any potentially dangerous over voltages, the shape and dimensions of the earth-termination system are the important criteria.

*g. Field quality control*

- Inspect bonding of system conductors and connections for tightness and proper installation.
- The resistance to earth shall be measured before completion of the work. The resistance to earth may not exceed the value of 1  $\Omega$  (ohms).

## 9. M.V / L.V 20/0.4 kV Transformer Room

The electric transformer room contains:

1. One dry transformer 315kVA, 20/0.4kV, with MV and LV terminals.
2. Medium Voltage incoming line 20kV, with SF6 gas that includes:
  - a. Two switchboard with SF6 gas load switch disconnector, earthing knife which will be together with the conductors and busbars, and MV terminals.
  - b. One SF6 gas load switch disconnector transformer, earthing knife, MV fuses, and busbars with terminals.
  - c. Low Voltage Panel
  - d. MV and LV cable
  - e. Dielectric carpet
  - f. Interior earthing system

### 1.Dry Transformer:

*Technical specifications:*

- <b>Type:</b>	Dry Transformer
- <b>Power:</b>	315 kVA
- <b>Primary Voltage:</b>	20 kV
- <b>Secondary Voltage:</b>	0.4 kV
- <b>Off load tap changer:</b>	+/-2 x 2.5 %
- <b>Frequency:</b>	50 Hz
- <b>Impedance voltage at rated current:</b>	4%
- <b>No-load losses <math>P_0</math>:</b>	900 W
- <b>Load losses 75 °C:</b>	5180 W
- <b>Noise level:</b>	57 dB
- <b>Insulation levels – primary side:</b>	50/95 kV
- <b>Insulation levels – secondary side:</b>	3/-

*Dimensions:*

- <b>Length:</b>	1240 mm
- <b>Height:</b>	1570 mm
- <b>Depth:</b>	840 mm
- <b>Unit total weight:</b>	1210kg

## **2. Incoming/outgoing switchboard with SF6 gas load switch disconnecter and MV fuses.**

### Description:

All the equipment's shall be installed in metallic box:

- c. Line switchboard with SF6 gas that contains the SF6 gas load switch disconnecter, earthing, MV terminals.
- d. SF6 gas load switch disconnecter transformer, earthing knife, MV fuses. Switchboard contains the SF6 gas load switch disconnecter, earthing, MV terminals.

### Technical specifications:

Line switchboard with SF6 gas load switch disconnecter:

- **Highest System Voltage:** 24kV
- **Nominal Voltage:** 20kV
- **Impulsive voltage value resistant against discharges:** 125kV
- **Stability voltage for 50 Hz frequency:** 50kV
- **IP protection degree:** IP 3X

### Dimensions:

- **Height:** 2200 mm max
- **Depth:** 1100 mm max
- **Width:** 500 mm max

## **3. Transformer switchboard (cubicle) with SF6 load switch disconnecter and fuses.**

The load disconnecter shall bear and interrupt every current from zero up to MV nominal current. This specification is relevant for three-phase alternative current load disconnecter.

### Technical specifications:

- **Highest System Voltage:** 24kV
- **Nominal Voltage:** 20kV
- **Frequency:** 50Hz
- **Number of phases:** 3

### Dimensions:

- **Height:** 2200 mm max
- **Depth:** 1100 mm max
- **Width:** 600 mm max

## **4. Medium Voltage Fuses.**

### Technical specifications:

- **Highest System Voltage:** 24kV
- **Nominal Voltage:** 20kV
- **Number of phases:** 3
- **Stability voltage for 50 Hz frequency:** 50kV
- **Impulsive voltage value resistant against discharges:** 125kV

Medium Voltage Fuses shall protect the power transformer from the Icc. The fuses shall fulfill the following requirements:

- Stability against fault currents.
- Stability against environment conditions.
- The fuses parts should have long lifespan.

Supplier shall present the current-time characteristic, which shows dependence between the fuses current and the time of fuses operation and the melting yarn shall not melt for one hour for a current 130% of nominal value. For 200% current of nominal values, the melting shall happen on a period less than an hour.