TECHNICAL REPORT

Project Name:

Reconstruction of 9-year school "EMIN DURAKU"

Tirana Municipality

Programme Title: ***EU4Schools***

Financed by: ***European Union EU***

Design Team: ***HT Construction (High Tech Construction) Ltd***

TIRANA, November 2021

ELECTRICAL DESIGN REPORT

Table of content:

1. *Introduction*

For the design of the electrical project of the building should be used only products and materials certified “CE”, products of Europian union Standarts, to build a building as functional and modern, as well as meeting the safety norms in accordance with the norms of the Europian Union, in accordance with the functionality of the facility. The reconstruction of this institution will include the design of the following systems:

Engineering Network,

Power Electrical Systems,

Lighting System,

Fire Detection System,

Data - CCTV & TV,

Earthing and Lightning Protection

The design of the electrical systems for the building is designed in full compliance with its construction, architectural and constructive structure, adapting to and responding to the requirements set out in the design task. The construction of the electrical system will be closely related to the interior space and service premises.

The determination of the placed electrical powers is done in accordance with the recomandations given in the literature as well as according to the experience of similar projects. Factor demands (factor “gl” according to VDE Norms) are taken in the following values:

- Lighting ……..... 1
- Mechanical equipments……(0.5-0.8)
- Different plugs……..... 0.4

2. *ENGINEERING NETWORK*

2.1 Electricity Supply of the building

The electricity supply of the building will be made by the public network OSHEE, in the main electrical panel of the building. The supply cable will come from the nearest OSHEE connection point to the main panel with FG16OR16 type cable, with section S = (3x95+1x50+1x50) mm^2.

To realize this system, the installed and required power has been calculated and calculations have been made for the supply of all electrical loads of the building and loads for air conditioning systems, electric boilers, sockets and lighting and all types of pumps that will be placed in it. the future.

Calculation table as follow:

	School
Installed Power	**P_{inst} = 252.82 kW**
Calculated required power	**P_{kerk} = 111.2 kW**
Demand Factor	**K_{kerk} = 0.44**

2.2 Determination of the drop voltage, ΔU %, form the measurement Box to each electrical panel

The determination of the electrical loads is done according to the project, while the expected ones should be done in accordance with the recommendations given in the literature as well as according to the experience of other similar objects. Simultaneous and utilisations factors are given in the table above but in more detail, in the electrical panels schematics.

Determination of voltage deviations, ΔU%, from the measuring box to the each electrical panels are given in the respective schematics.

3. *POWER ELETRICAL SYSTEMS*

3.1 Distribution boards

The main distribution box is supplied by OSHEE. This main distribution box will supply all the other panels, equipments that operate in the bulding as follow:

- Electrical boards of the other floors or laboratories.
- Electrical board of the thechincal room,
- Electrical board of the gym,
- UPS,
- RACK
- Fire alarm panel.

The frame of the boards should be made of glass doors, facilitating the maintenance work, to be completed with the necessary accessories for the safety of cabling and all other equipment. Such a Frame facilitates the operation of the circuit breakers through the indoor air circulation and makes possible the distribution of circuit breakers according to the different phases and requirements of the building.

Figure 1 : Main Distribution board and the panels of the floors or laboratories

1. ***Main Distribution Board K. 0_Sh. ,*** placed in level 0 in the technical electrical room:

- Main circuit breaker In=200A, Icc=**25** kA, 3~ 400V/ 50Hz,
- Main cable supply: FG16OR16 (3x120+1x70+1x70)mm2;
- Over voltage protection 3~ 400V/ 50Hz;
- In and out of cable frombelow or above;
- Cable clamps for connection of all cables.
- IP prtoection: metallic type, IP 65;
- (according tot he schematics).

2. ***Distribution board of the technical room – K. 0_Tek.,*** placed in the technical room:

- 24 module IK08 with tranparent door;
- Main circuit breaker, In=50A, Icc=**6** kA, 3~ 400V/ 50Hz
- Main cable supply: FG16OR16 S=5x16mm^2
- Over voltage protection 3~ 400V/ 50Hz;
- In and out of cables from below or above;
- Cable clamps for connection of all cables.
- IP protection: plastic type, IP65;
- (according to the schematics).

3. Distribution boards of first, second, third floor placed in their respective technical rooms as in project:

- 54 module IK08 with transparent door;
- Main circuit breaker, In=40A, Icc=**6** kA, 3~ 400V/ 50Hz.
- Main cable supply: FG16OR16 S=5x10mm^2
- Completed with all the neccessary accessories, mounting outside the wall;
- In and out of cables from below or above;
- Cable clamps for connection of all cables;
- IP protection: plstic type, IP 40;
- (according to the schematics).

4. Distribution boards of the laboratories ((K. 0_Lab. 1, K. 1_Lab. 1, K. 2_Lab. 1, K. 3_Lab. 1, K. 3_Lab. 2, K. 3_Lab. 3.) placed inside each laboratory:

- 24 module IK08 with transparent door;
- Main circuit breaker, In=25A, Icc=**6** kA, 3~ 400V/ 50Hz,
- Main cable supply : FG16OR16 S=5x4mm^2
- Completed with all the neccessary accessories, mounting outside the wall;

- In and out of cables from below or above;
- Cable clamps for connection of all cables;
- IP protection: plstic type, IP 40;
- (according to the schematics).

5. ***Distribution board of the gym (K. 0_P.)*** i placed in the guardian room as in project:

- 24 module IK08 with transparent door;
- Main circuit breaker, In=32A, Icc=**6** kA, 3~ 400V/ 50Hz,
- Main cable supply: FG16OR16 S=5x6mm^2
- Completed with all the neccessary accessories, mounting outside the wall;
- In and out of cables from below or above;
- Cable clamps for connection of all cables;
- IP protection: plstic type, IP 40;
- (according to the schematics)

Proper assembly of panels allows sufficient space to meet the operating conditions of the circuit breakers and eliminates human errors in their assembly and placement. The use of modular structures is advisable.

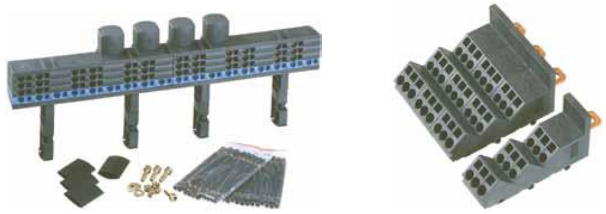


Figure 2 : Ready-made kits and necessary accessories

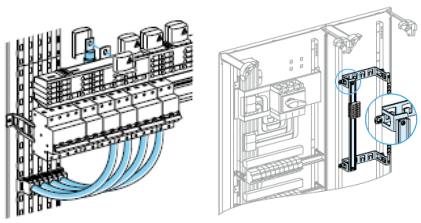


Figura 3 : Frames realixed with made-up and appropriate accessories

3.2 Automatët mbrojtës

Circuit breakers must comply with CEI 60898 and CEI 60947-2 as in figure 4 and figure 5. hese circuit breakers must ensure fast action from overloads and short circuit currents.

Figura 4 : 1P and 1P+N according to CEI 60898

Their characteristics:

- Short circuit currents: 6 kA;
- Nominal current: 6 – 32A;
- Nominal voltage: 230V;
- Circles number: 20 000.

Figura 5 : 1P+N according to CEI 60947-2

Their characteristics:

- Short circuit currents: 6-10 kA
- Nominal current: 10–63A
- Nominal Voltage: 230V
- Characteristic of reaction “C”
- Circles number: 10 000 - 20 000

The residual current circuit breakers according to CEI 61008 ensure the protection against overload, short circuits and flow currents to the ground. In this way they protect the personnel from any possible errors during installation and during the damage of the equipment which have direct contact with it. Categorically all of the above circuits must be protected by differential circuit breakers.

Figure 6 : Residual current devices CEI 6100

Their characteristics as follow:

- Nominal Current: 25 - 100A;
- Nominal voltage: 230/400V;
- Characteristic of reaction “C”
- Number of circles: 2500;

Overvoltage protection devices according to CEI 61643, serve to protect the electrical system from unforeseen surges caused by lightning strikes or even those shocks that come from the OSHEE distribution network itself during various switching and during severe defects in transformer equipment.

Figure 7 : overvoltage protection according to CEI 61643

Their characteristics as follow:

- Nominal voltage: 230/400V;
- Frequency: 50Hz;
- Disconnecting power: 25kA;
- Reaction time: 25ns;

- Nominal working temperature: -25, +60C;

3.3 UPS 3 kVA

From the UPS will be supplied all the equipments that are sensitive to the absence of the electricity from the grid such as data rack, cctv, emergency lighting, fire detection panel etc
The UPS will be single phase by 3Kva with an autonomy of 10 minutes. Their characteristics as follow:

Input:

1. Nominal voltage: U=230V; 1P +Neuter
2. Nominal frequency f=50 Hz;
3. Voltage variation : ± 15%;
4. Stability I_{CC} = 16kA;
5. Cos fi: 0,9;
6. Battery voltage: 110V (DC);

Output:

1. Nominal voltage: S=3 kVA;
2. Output voltage: 230V,1P + N;
3. Voltage stability ±1%;
4. Voltage mechanical stability: ±3% (within 2 msec);
5. Frequency: f=50 Hz;
6. Frequency stability ±0,5% (in absence of the grid)

3.4 Power sockets

Power sockets will be of type 10A and 16A. They should be flat mounted and should have a color that goes with the light switch covers. Sockets are 230V, 10A or 16A, with earthing.

Electrical installation of power and extra low voltage that pass through the floor are made with flexible pipe, while those that pass through the walls and ceiling are of light series. Floor pipes are placed under the floor layers and in the walls inside the plaster and are made before the walls are plastered. The pipes must all be non-combustible. The project foreseen

differential protection with differential relay 0.03A Rt <4 and protection from short circuit and overloads with circuit breakers. Supply lines have three conductors (brown = phase, blue = zero, yellow / green = grounding). The characteristics of circuit breakers must be strictly applied according to class A. B. C. D. thermal characteristics of the moment of inertia) to guarantee selectivity. The conductors to be used will be flexible. The installation of the elements will be done as follows:

- The height of the distribution board will be 160cm from the floor.
- The height of the switches will be 110cm from the floor.
- The height of the distribution boxes will be 30 cm from the floor.
- The height of the sockets will be 45cm from the floor.

As for the system of power outlets, they are placed in drawings based on the planimetry and interior design of the premises. All plugs are of shuko type and equipped with earthing. Single-phase voltage sockets as shown in the figure below are mounted in all premises of the building. All plugs are 16A.

The section of the socket lines, from the panel to the distribution box entering the classroom or service areas, will be: S = 3x2.5 mm2 / Plastic Pipe-20 flexible fire protection. The same will be the section within the classroom or service environment. The lines are supplied from circuit breakers according to the division into the respective lines shown in the drawing. All plugs will have a protection system, so that children will not be able to insert metal objects inside the socket

Figure 8 : Schucko plugs

3.5 Cables and conductors

Technical characteristics of FG16OR16 cable type

Conductors and cables must have high requirements for the type of insulation, winding, and conductors specified. The insulation type must be resistant to moisture and heat, suitable for a maximum operating temperature of up to 70 degrees Celsius. Cables must be one piece without connection between them unless the distances are greater than the maximum length of the cable.

The bends of the cables should not be less than those specified by the manufacturer for the specified cable type. All conductors must be made of copper. They must be complete as required. Minimum conductor sections: all sockets: 2.5mm² / indoor lighting installations 1.5mm², 400V / 230V

The cables used will be of type FG16(O)R16, according to CEI standard 20-13, flexible copper cable with G7 rubber insulation, outer cover with thermoplastic material of quality M1 green, HF with very low emission of toxic gases . They are used in electrical installations with fire hazard where it is essential to protect people from toxic gases, such as schools, hospitals, hotels, cinemas, theaters, supermarkets, offices, public spaces, etc.

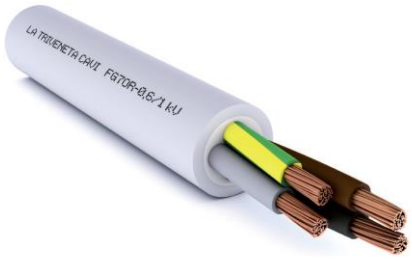


Figure 9 : FG16OR16 cable

FG16OR16 cable is a flexible, insulated, woven shielded HEPR cable, consisting of red copper conductors, with PVC protection, anti-corrosion and halogen free. It is suitable for power transmission and power control in industry and construction. Suitable for fixed indoor and outdoor installations, installations on bridges, pipes, etc.

Standarts:

- CEI 20-13, CEI 20-11, CEI 20-29, IEC 60502-1, CEI UNEL 35375, CEI UNEL 35377
- CEI 20-22 II, CEI EN 60332-1-2.
- CEI EN 50267-2-1

Karakteristika teknike:

- Nominal voltage: Uo/U=0.6/1 kV
- Maximal voltage: U= 1.8kV
- Conductor: flexible coper .
- Insulation: HEPR, Type G7, halogen free.
- Colors of the cable:
- Two wire: blue-brown
- Three wire: blue-brown-green/yellow or brown-black-grey
- Four wire: brown-black-grey-green/yellow or blue-brown-black-grey-grey-black.
- Maximum ambient temperature: +90˚C in the conductor
- Minimum ambient temperature: -15˚C in the conductor
- Maximum temperature for short circuit conditions: +250˚C in the conductor
- Minimal bending radius: 4 x External Diameter.

Technical characteristics of the conductor type N0-7V-K

Conductors for closed areas installations. Fire retardant, low smoke corrosive gases, PVC insulation quality R2 with double insulation up to 6mm. Cooper conuctor class 5.

Figure 100 : N07V-K copper conductor

- Stndart reference:
  - CEI UNEL 35752
  - CEI 20-22/2
  - CEI EN 60332-1-2
  - CEI EN 50267-2-1
  - 2006/95/EC
  - RoHS 2011/65/CE

- General :
  - PVC insulation, quality R2 (with double layers up to 6mm)
  - Flexible conductor as per class 5 of the copper

- 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 characteristics:

These cables and conductors are suitable for protected installation with voltage operation up to 1000V. They can be installed in pipes, fixed in closed systems. Do not install in hot areas.

- Usage
  - Minimal bending radius for cable diameter D (in mm):
  - Fixed placement: D <12 = 3D D <20 = 4D
  - Free mass: D <12 = 5D D <20 = 6D
  - Maximum tensile stress: 50 N / mm2.

- Main colors
  - Sinle core: black
  - Doble core: blue-brown
  - Three cores: brown-black-grey Y/G
  - Four cores: blue-brown-black-grey Y/G
  - Five cores: Y / G-blue-brown-black
  - Multi cores: black with numbers

- Notes

  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°)	(mm²)	(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 of copper wire type N07V-K

Neutral conductors must have smaller section that the phase ones. For the cables with section > 16 mm^2, neutral section according to CEI can be reduced up to half of the section of the phases. According to VDE the neutral section must be always the same as the Cable trays, rigid pipes, flexible pipes and accessories phases.

3.6 cable trays, rigid pipes, flexible pipes and accessories

The electrical system must be implemented according to :

- size, brand, characteristics and quality of the material shown in the projects
- instructions of MP. during the performance of works;
- compliance with applicable laws;

The materials and equipments to be used in the construction of the system must have all the qualities of strength, durability, insulation and good operation; and must also be such as to resist mechanical, corrosive, thermal and moisture actions for those who must be in contact with them during work. Also, under the responsibility of the contractor are the respective assemblies and disassembles of the installation parts for the realization of tests and verifications.

All equipments, frames, collected plants, switches, buttons, plugs, etc .., must be placed in the work through the boxes installed with cement mortar m-1: 2, with dosage per m2: cement 400 kg 527, washed sand m3 0.89 and

water, taking special care that the installation of the above boxes is done level with the wall in relation to the plastered and coated surfaces, in order not to verify excessive exit or insertion of these boxes.

The flexible pipe must be inserted into the boxes containing the controls or sockets, so as not to damage the cables entering the box in any way. It is absolutely forbidden to use plaster with mortar or other similar materials for placing boxes, closing open channels and any other masonry work necessary for the plant.
Electrical installations will be done with pipes under the mortar

Plaster installation accessories are:

• Flexible PVC pipes of different dimensions depending on the dimension and the number of wires / cables that will be inserted in it.

• Boxes for fixing sockets or switches. All of these are placed before plastering is done.

To carry out the electrical installations inserted under the plaster, the following work order must be followed:

• Opening the channels in the wall with such a dimension that the flexible pipe is placed freely and with such a depth that it does not rise above the level of the final plaster.

• Flexible pipes and PVC boxes are placed which are provisionally fixed with plaster (later the channels are closed with plastering mortar)

• After the plastering is done, the wires or cables are inserted, by means of their guide, which should enter freely and leave a sufficient amount on both sides to perform the connections and mountings.

• Ducts and placement of PVC flexible pipes should be done at a distance of 0.4 m below the level of the ceiling in a straight horizontal line and the descents for switches or sockets should be made straight vertical and not angled or arched.

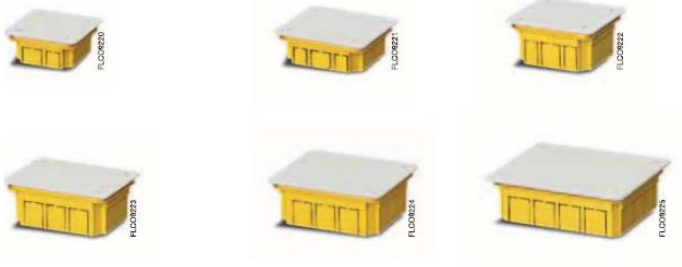
• The distribution boxes depending on the system to be used are for under plastering or over plastering so the way of fixing them is either with plaster or with screws with upa.

• The size of the distribution boxes varies according to the case and the need. They are circular, square or rectangular in shape and their closing caps are fixed with screws.

It is important that the connection of wires / cables inside the distribution boxes is done by means of connecting terminals / connecting caps, and not by adesive. The duct system as well as the flexible pipe system with flexible pipes must meet all the technical conditions of the electrical installations.

Thechnical characteristics of the distribution boxes:

- thermoplastics materials, self-extinguish and resistant to non normal heat and fire up to 650 ° C in accordance with IEC 60695-2-11
- cover in RAL 9016 with screw included FLCO9915
- working temperature -5 ° C up to +60 ° C
- cable accessories for connection according to CEI EN 60670-1 and CEI EN 60670-22



Code	Dimensions (mm) WxHxD	Box/pack No items
00 070	92x92x45	1/105
00 071	120x100x50	1/72
00 072	120x100x70	1/48
00 073	152x100x70	1/42
00 074	160x130x70	1/32

Code	Dimensions (mm) WxHxD	Box/pack No items
00 075	196x152x70	1/19
00 076	294x152x70	1/15
00 077	392x152x70	1/11
00 078	480x160x70	1/10

The separator code 00 090 can be inserted for all articles.

Figure 12 : technical characteristics of the boxes

4. *LIGHTING*

4.1 Normal lighting

The lighting intensity was calculated for all rooms. Based on the European standard EN 12464, the placement and number of lights for each environment is foreseen, in order to achieve the necessary lighting intensity.

According to EN 12464, the power of lighting according to the premises must be strictly observed as follows:

Rooms	Illumination
Pre-school rooms	500 lux
Corridor	200 lux
Toilets	100 lux
Technical Room	200 lux
Sports Environment	750 lux

The type of luminaire used are:

- LED Lighting 2x36W IP65, for ceiling
- LED Lighting 1x36W IP65, for ceiling
- LED Lighting 1x58W IP65, for ceiling
- LED Lighting 4x18W IP40, for ceiling
- LED Lighting 2x26W IP40, for ceiling
- LED Lighting 250W suspended for gym IP65
- LED Lighting 2x12W IP65, wall washer
- LED Lighting 1x12W IP65, wall washer

LED Panel, 4x18W:

Figure 13: LED 4x18W

LED Lighting - 2x36W, IP65

Figure 14 : LED 2x36W, IP-65

LED Lighting, 1 x 58 - IP65

Figure 15: LED 1x58W, IP-65

LED Lighting 2x26W, IP65

Figure 16 : LED 2x26W, IP-65

LED Lighting 1x250W, IP 65

Figure 17 : LED 1x250W, IP-65

LED lighting for the facade

Figure 18: LED 2x12W, IP-65

The lighting system in the rooms will be realized with conductor N07V-K 3x1.5mm2.

The location of the lighting switches is shown according to the design and sketches made by the electrical design engineer and mounted at a height of 110 cm from the floor. For toilets for people with disabilities, the keys will be mounted at a height of 70 cm. In general, lighting switches throughout the building should be suitable for flat mounting (under plastering). The switches are divided according to the place where they will be used and the way of switching on and off: Simple switch one polar 250V, 10A;Two way switch 250V, 16A;

Calculation are given in ***ANEKS 1.***

4.2 Emergency lighting

Design parameters

According to Europian Norms:

- Exit Routes DIN EN 1838
- Emergency lighting according to EN 60598-1, EN 60598-2-22

Functional description

All products must be equipped with the CE mark and supplied by companies certified according to ISO 9001. According to DIN EN 1838 the continuous minimum level of illumination in the escape routes will be ensured to be 1 lux. The following areas are respected in the design of the emergency lighting system:

- Exit routes (corridors, stairs, etc.) and exit signs, where lighting of 1 lux should be achieved along the exit route;
- Open areas> 60m2 require anti-panic lighting with a minimum lighting of 0.5 lux
- Stairs should receive direct light from emergency luminaires, so that the minimum illumination is 1 lux
- Emergency lighting must be installed at every change of direction.

The emergency system is realized by placing in all corridors, exits and on the street crossings in case of evacuation, emergency lights for indicating the direction of exit. These luminaires are battery-powered, with 3-hour autonomy.

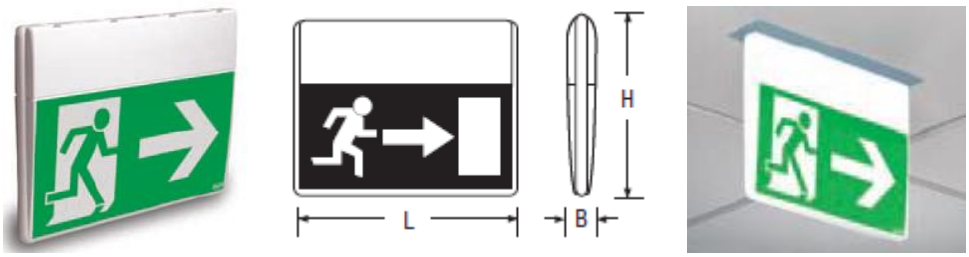


Figure 119 : Emergency light with battery kit

Technical specifications:

- **Mounting:** installed in the ceiling or floor
- **Lighting source :** LED;
- **Power supply :** 220-240 V, 50-60 Hz;
- **Power :** 1x3W;
- **Baterry Ni-Cd:** 10.8V/3Ah
- **Fluksi i ndricimit** 30lm;
- **IPprotection:** IP 20;
- **Mechanocal protection:** IK 07;
- **Wheight :** 1.2kg;
- **Dim.diameter:** 352 60 x 228 mm ;
- **Autonomy:** 3hours ;
- **Life long:** 100,000 h.

Emergency and emergency lights must be with Ni - Cd batteries. Their placement will be done in such a way as to provide a lighting degree of 5lux, and the independence of their operation for the interruption of the network must be at least 3 hours. Safety lighting (stair signs, exit directions) will be with 4W LED lamps.

5. *FIRE DETECTION SYSTEM*

The Fire alarm or fire protection system is a system that warns personnel of the presence of fire or smoke in the building. Below are references to the standards that were taken into account during the design of the fire detection system.

These refer to:

- Laws and norms applied in Albania
- European norms

EN 54	Fire detection system
ISO 7240	Fire detection system, security request
ISO 8421-3	Pprotection against fire
BS 5839	Fire detection system for buildings

This system consists of:

- Fire alarm system
- Smoke detectors
- Manual call points
- Indoor sirens;
- Connecting cables of detector and siren loops

Control equipment. The contractor must cover, install, test, connect and guarantee a high quality operation of the fire alarm device and alarm system including loudspeakers, lighting fixtures, alarm equipment, glass break contacts, fire alarm panels, the battery charger, and the associated relays, will be secured and connected in accordance with the specifications, according to the positions shown in the drawings.

The fire alarm system for all premises of the building is designed in full compliance with the requirements of standard BS 5891-1, (British Standard - British standard for the design of fire alarm systems) where:

- Fire alarm center (Centrali Sh.) is with 1 or 2 loops, depending on the customer, of intelligent addressable type, category Lz, with communication module RS-232, with internet ports, configuration card, event logger, programmable and with battery for 72 hours of independence and must be equipped with LCD screen.

.

Figure 2012 : Fire alarm center

- Smoke detectors will be installed of ulti sensitiv type intelligent addresable with communication module.

Figura 21 : Smoke dedectors/ multisensitive addressed

- Manual push buttons are intelligent addressable type, located at a height of H = + 1.4m from the floor. Buttons for direct alarm activation which will also be analog addressable and reset in case of alarm. The pushbuttons must be IP44 for indoor environments.

Figure 22 : Manual pulsant and signal lamps

- Fire alarm sirens, with lights with flashing lamps are of intelligent addressable type, with intensity 120 dB. Indoor fire alarm sirens are placed at a height of H = + 2.1m from the floor

Figure 23 : Fire alarm siren

Indoor sirens will be analogue addressable while the outside ones will be conventioanl ones connected in the system through the loop with a modul that converts the line from analogue to conventional. This system must use fire cable, red with section 2x1.5mm2 and rigid pipes must be used in cases of external installations or heavy flexible pipes for those installations that are internal to the walls.

Smoke alarms. These will act in order to maintain balance between the open and closed chamber, so when smoke penetrates into the open chamber it will have contact with the circuit and activate the signal. Each signal will be designed to cover an area of 100 m2. All smoke signals must be installed so that they can be replaced with substitutes. In a Smoke (Fire) Alarm system, for any eventual defect of a Smoke Detector, a certain loop, only this loop is isolated and notified, while all other loops are working

All the sensors will be equipped with isolator in order to insure the working of the system if in any case there is something wrong with the loop.

6. *SISTEMI DATA- CCTV dhe TV*

6.1 DATA

The project foresee the installation of the internet system. Facilities that must be equipped with RJ45 internet sockets, in order to realize a communication and data transmission system as best as possible.

All signals from internet outlets will be collected in a RACK which is decided to be placed in the technical room. In RACK will be mounted, all elements of the data system and the camera system, which will make it possible to receive camera footage, as well as their distribution as needed. CCTV Network will be monitored from also from the guardian room.

IT sockets will be installed in the premises as shown in the electrical project.

All RACK-s will be:

- Metal type, with reinforced glass door and key;
- Complete with all auxiliary accessories;
- With cable guides, and management of incoming and outgoing cables;
- With built-in ventilation group
- 1 power module with 8 plugs 230V, 16A, 2P + T.

Computer sockets are supplied with uninterruptible fUTP CAT 6 cable directly from RACK, in strong flexible PVC pipes d = 16mm in the parts placed inside the wall.

In a Ø160mm pipe do not use more than one internet cable. Data sockets are placed at the same height as the 1.1 m high voltage sockets.

Figure 24 : FTP CAT 6 cable and RJ-45

6.2 CCTV & TV

The camera surveillance system as an important element for the safety of the facility should ensure not only the quality of service it provides but also continuity and safety at work. This quality is realized through the camera monitoring system.

This system is composed by:

- Network Video Rekorder NVR-IP 32ch
- Monitor 22inch
- Inside cameras IP, type dome, 5Mpx
- Outside cameras IP, IP66, 5Mpx
- Cables, FTP CAT.6

Monitoring system CCTV :

- NVR(Network video Rekorder) 32 channels 1080P FULL HD, 4K
- Indoor camera IP, 5-Mpx, 30 metra IR Exir Dome Outdoor IR30 metra, 2048x1536: 12.5fps(P)/15fps(N), 2.8mm/F2.0 lens (4mm, 6mm optional).
- Outdoor camera IP, 55-Mpx resolution, Low illumination, lens:4mm
  3D DNR & DWDR & BLC, System Compatibility: ONVIF, PSIA, CGI, ISAPI
  IP66 rating, Image Sensor:1/3" Progressive Scan CMOS, IR range: up to 50m.
- HDD 4TB 3,5 inch. Kapaciteti 4000GB, Sata. Purple HDD (designed for Security, for working 7/24. Mounting accessories fort he cameras.

In this modern control and surveillance system, in the components which include High Resolution cameras, Wide Dinamic Range and Day and Night, clear and stable images are realized 24 hours a day, seven days a week.

Internal and external cameras have been installed throughout the building to enable the monitoring of the premises of the facility, to increase security and protection of the building. Through the Internet they achieve

their control and monitoring online. Camera control will be performed as indoor control and outdoor control. A 24-channel DVR has been selected.

Indoor and outdoor cameras are installed in the CCTV camera system design.

Figure 25: Full HD 5Mpx, High-Resolution,camera / indoor

Figure 136: Full HD 5Mpx camera/ outdoor

7. *EARTHING AND LIGHTNING PROTECTION*

The project of the protective earthing system and the protection of the building from atmospheric discharges has been realized in full compliance with the IEC 62305 standard. The atmospheric protection system is very necessary, due to the atmospheric conditions and the geographical location in which our country is located.

According to the international standard IEC 62305, it defines four classes of protection systems (I, II, III, IV), which correspond to a series of building rules and are related to four levels of protection (I, II, III, IV). At first glance a global defense effectiveness respectively 98% (level I), 95% (level II), 90% (level III), 80% (level IV).

Each protection class is assigned to a group a set of minimum and maximum values of the parameters related to the amplitudes of lightning currents for each of the protection levels. The maximum values of lightning current amplitudes are defined respectively as 200 kA (99% of lightning) level I protection, 150 kA (97% of lightning) level II protection, 100 kA (91% of lightning) level III & IV of defense.

The minimum values of lightning amplitudes are related to the application of the rotating sphere method in the design of lightning protection systems they are fixed:

- 3kA level I (99% of strikes, R=20m);
- 5kA level II (97% of strikes, R=30m);
- 5kA level III (91% of strikes, R=45m);
- 5kA level IV (84% of strikes, R=60m);

Lightning protection system must be designed as a combined one:
1- with square grid, the surface of which meets the condition S <= 25m2
2- standart lightning rod h= 0,6 m, that are mounted in the perimetral area of the top of the building.

Lightning rod are installed with accessories type “T”.
The galvanized round conductor Ø8mm is fixed in the parapet with accessories type “T”.
At the junctions of the strip on the terrace, the assembly is done with cross clamps

The lightning protection system in the terrace ensure the protection of all metlic equpments and structures from lightning strikes such as TV antenas, HVAC units, etc.
The outlets to be connected, which discharge to the lightning network, are secured with flexible Cu cable through secure electrical connections with clamps or welding.

1. School: As shown in the drawing, from the quadratic network created at the foundations (clamp connection) emerge the earthing shafts to the breaker box for measuring the earthing resistance, which is placed at 0.6 m above the pavement outside the wall (where there are such, as in the drawing), where the sign of the "earth" is placed, and from this box from inside the column caught behind its metal structure, marked with L 2, rise without detachment hot galvanized round conductor ϕ 8mm up to in 2 ml above the terrace to connect to the square grid of the terrace.

2. Closed gym: As shown in the drawing, from the positions where the earthing electrodes are embedded in the ground (clamp connection) hot galvanized round conductor ϕ 8mm come out to the breaker box for measuring the earthing resistance, which is placed in the quota 0.6 m above pavement outside the wall, where the "ground" sign is placed, and from this box outside the body of the building caught with "Click" clamps every 10 cm, marked with L 1, the hot galvanized round conductor ϕ 8mm are raised without detachment up to the lightning rods on the roof. The lightning rods are also connected to the hot galvanized round conductor ϕ 8mm which is fixed with "click" roof supports at the roof top.

3. Outdoor sports field: As grounding of the outdoor sports field, serve the lighting poles which are grounded through the connection with electrodes.

Before the installation is considered complete, the earthing resistance must be measured. Permissible values are those less than 5 Ohm. Otherwise the earthing electrodes must be added until this condition is met.

Figur 27 : Earthing and lightning details

Also the connection between the network of lightning rods on the terrace and the earthing system will be made by vertical dischargers (galvanized galvanized strip 30x3mm), which descend from the terrace and are directed to the earthing electrodes located on the entire perimeter of the building.
All metal equipment, electrical panels, ducts and any other part of the system which is not normally energized, but which may accidentally drop in voltage for various reasons, must be earthed (and connected) to this equipotential "plate".
The definition of lightning protection tent is given on the drawing sheet ***nr. E 29 - Detaje teknike.***

Vaso PAPAMIHALI

Electrical Engineer

HT Construction (High Tech Construction) Ltd

Lic. E.1188/1