1. TECHNICAL DESCRIPTION  
Telecommunication Signal Installations

1.1. INTRODUCTION

For the purpose of constructing an airport administration building with a control tower in Kapino polje, Nikšić, a Traffic Technology Preliminary Project has been prepared on the Traffic Control Tower at the Airport "Kapino polje" in Nikšić, as well as a Technology Project on the Administration Building of the Airport "Kapino polje" in Nikšić. Based on the conceptual designs of these projects, it is necessary to set up completely new telecommunications and signal installations.

The following types of installations must be designed for this facility:

- Computer- telephone installation based on a structured cabling system;
- IP telephony;
- Detection and extinguishing system;
- Video surveillance;
- Access control;
- Anti-theft systems;
- DC power supply for equipment;
- AC power supply for equipment;

All other types of installations that are foreseen through the Technology Project are not a subject of this project.

The building is conceived in terms of providing the possibility for evacuation in case of emergency, as an object classified as BD2 (SRPS IEC 60364-5-51 - higher density and good conditions of evacuation). In terms of evacuation, classification is carried out according to external influences SRPS EN 60332-2-1, 2, 2009 and SRPS EN-50525 for cables that do not release toxic substances when incinerated and do not promote the spread of fire. The use of "halogen-free" cables and electrical installation materials, which do not support burning, do not spread fire and do not create toxic gases, has been envisaged for premises classified with BD2 according to external influences and all wiring provided within.

1.2. SYSTEM OF COMMUNICATION AND EXCHANGE OF DATA BASED ON STRUCTURAL NETWORK

1.2.1. Internal telephone installation of the facility

The project task envisages the construction of a telephone-computer installation, which is the basis for building an integrated information system for the entire building. The proposed system provides full efficiency and flexibility, whilst supporting...
contemporary generally accepted standards and recommendations of leading companies in this field.

The structured telephone-computer cable system is composed of a cable hub (BD-1), terminals within individual premises and cables to connect them. This type of cable infrastructure in a star network topology connects terminals in working areas with the main hub, BD -1.

1.2.2. SWITCHBOX WITH CORRESPONDING ELEMENTS

In order to perform the best possible concentration of an integrated telephone-computer installation, a premises has been selected on the first floor where the main hub shall be placed (label BD-1), and which shall be capable of accommodating all active and passive equipment of the telephone-computer system, as well as the UPS device supplying DC power supply for the VHF and UHF devices. This room should provide possibilities for future expansion.

According to preliminary solutions for the aforementioned projects, the 1st floor of the Air Traffic Control Tower should accommodate devices and equipment that are specific and are used exclusively for air traffic control. There are plans to place the equipment in 8 individual rack cabinets during all three phases of construction. The graphic documentation provided shows possible ways of deploying the above mentioned rack cabinets. The rack referred to as BD-1 has been intended for the telephone-computer network, switches and server devices, as well as for the UPS for purposes of DC power supply of VHF and UHF equipment located in the watchtower cabin.

Attention was paid to the accommodation of the said hubs in a suitable and compact place, to the minimum length of the cable connected to the socket, and also to the provision of sufficient space in the foreseen hub for future expansion and placement of active equipment.

The dimensions of the hubs are as follows: height of 42 HU, width and depth of 80 cm, freestanding structure. The width of the cabinet interior is 19 inches, which should contain two rails for mounting accessories in the front and rear. The cabinet should be closed in front by a dark glass door with a key, and from the top there must be a hole for fan exhaust of air, while on the lower side openings for air entrainment and cable entry. The cabinet must have built-in fan panels with thermostat.

"False flooring" has been envisaged in all the upper floors where there is a conductive earthed with two diagonal ends of the SIP. On all upper floors are foreseen for accommodating potential equilising boxes (SIP) that are associated with the main rail for equipotential bonding around the object, which is provided in GP electrical installations.

Powering of all the rack cabinets should be provided from a central UPS located on the ground floor, as provided by the GP wiring project.

Note:

The space in which the rack cabinets are located must be air-conditioned because it also accommodates the DC UPS, as well as other devices and active telecommunications equipment, as provided for in the mechanical project design.
### 1.2.3. CABLE ROUTES AND CABLE CHANNELS

An optimal route for cables has been envisaged for interconnecting hubs with all outlets in the workplace, as follows:

a) Fireproof metal perforated channels type PNK 100x50 mm / E9, which are mounted between "double flooring" on all upper storeys, as well as in the area of the suspended ceiling on the ground floor, have, according to the graphic documentation, been intended for horizontal connection of telephone-computer sockets.

b) PNK channels have been designed for vertical connection between "false floors" on the upper storey, which are placed perpendicular to the wall (make a gap from the wall to partially connect the cables with ties).

Upon completing the installation of all planned cables and concluding tests, vertical PNK channels should be coated with fireproof gypsum boards, fire resistance E 90, and back-rolled and whitewashed.

### 1.2.4. HORIZONTAL CABLE INSTALLATION

#### Realisation of horizontal distribution:

*Horizontal cabling* refers to the portion of the cable system between the floor-hub and the wall outlet. A pair copper cable is set between the hub and socket set. Termination of copper cables on the side of the hub and the wall outlet is carried out using RJ -45 sockets. The maximum length of the copper cables between the storey hub and wall outlet should not exceed 90 meters.

Horizontal cabling includes the largest number of cables within the cable system and takes up the most time to install. Therefore, that is the reason horizontal wiring is a part of the cable system, which carries universality for all types of applications. That basically means that a once horizontally installed cable system may be used for all kinds of applications in the long-run. Switching from one type of application to another (e.g. a certain wall outlet once used for the telephone network transfers to the computer network) is achieved in a few seconds, simply by switching the hub.

![Figure 1: Horizontal cabling according to ISO / IEC 11801](image)

Horizontal cable distribution is carried out with LSOH S/FTP cables of reputable manufacturers.

All horizontal distribution cables are placed according to the criteria of the international standard of structured cabling ISO / IEC 11801, as well as the Commercial Building Telecommunication Cables Standard.
Cabling Category 6 S/FTP according to standard 60603-7-5 with bandwidth up to 250 MHz is intended for implementing the horizontal cable installation. Cables are self-extinguishing according to IEC 60332-1. Category 6 applies to copper cables, appropriate connectors and dividers. S/FTP telecommunications outlets of the structured cabling systems' horizontal cabling are defined as part of the workplace along with plugs of low-voltage electrical installations. S/FTP telecommunications switches shall be installed in the wall, floor (floor boxes) or in a perapet power distribution outlet. Surface-mounted telecommunications outlets are used for connecting IP cameras and wireless access points.

Constant evolution toward higher speeds is one of the biggest problems of today's cable systems. Cabling is the foundation on which rests the rapid development of applications in the coming years. Supporting international standards, Category 6 meets the new requirements for high-speed networks. Horizontal cabling envisages the use of S/FTP cables and shielded (screened) connectors meeting Category 6.

Each horizontal cable must be tagged at both ends. An identification label must exist on each module on the patch panel, namely on any socket module (connection point).

Connecting workstations to electrical outlets, or patch panels with switches should be performed with factory-produced S/FTP patch cords, Cat6. S/FTP patch cords are stranded, flexible cables that are terminated with plastic male ends micro-connector RJ-45.

The route the cables shall take meets the above criteria of international standards of general structured cabling, as well as the standards for propagation of telecommunication cables in commercial buildings EIA/TIA-569.

These standards prescribe a minimum distance from sources of electromagnetic fields. The standard prescribes the minimum distance of parallel telecommunication and power supply cables up to 480V, and consumption (power) of less than 2kVA, 12.7 cm (5 inches). It has been proposed that for consumption of 2-5 kVA, the distance from cables in metal channels should be 15.2 cm (6 inches), from fluorescent lights 30.5 cm (12 inches), and from the electrical motor at least 102 cm.

1.2.5. Fixed FTP cables

Category 6 fixed wall S/FTP cables should be used for connecting the hub with fixed telephone-computer outlets. They are installed partially in anticipated PNK channels, partly by OG clamps, and in the PVC pipe fi 16mm in the vertical wall.

NOTE:
- FTP cable (Foiled Twisted Pair) is an installation cord that consists of four twisted pairs of full section, further wrapped in a metallic foil.
- S/FTP cable (Shielded Foiled Twisted Pair) is unlike FTP cable, it is wrapped both in metal foil and shielded.

Characteristics of FTP cable, Category 6, are as follows:
The Main Project on Telecommunications and Signal Installations for the Airport Administration Building and Accompanying Control Tower, Kapino Polje, Nikšić, Montenegro

<table>
<thead>
<tr>
<th>Frequency (MZ)</th>
<th>Attenuation (dB/100 m)</th>
<th>NEXT (dB)</th>
<th>PSNEXT (dB)</th>
<th>ELFEXT (dB)</th>
<th>PSELFEXT (dB)</th>
<th>RETURN LOSS (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.1</td>
<td>66.0</td>
<td>64.0</td>
<td>66.0</td>
<td>64.0</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>3.8</td>
<td>65.3</td>
<td>63.3</td>
<td>58.0</td>
<td>55.0</td>
<td>23</td>
</tr>
<tr>
<td>10</td>
<td>6.0</td>
<td>59.3</td>
<td>57.3</td>
<td>50.0</td>
<td>47.0</td>
<td>23</td>
</tr>
<tr>
<td>16</td>
<td>7.6</td>
<td>56.2</td>
<td>54.2</td>
<td>45.9</td>
<td>43.0</td>
<td>23</td>
</tr>
<tr>
<td>20</td>
<td>8.5</td>
<td>54.8</td>
<td>52.8</td>
<td>44.0</td>
<td>41.0</td>
<td>23</td>
</tr>
<tr>
<td>31.25</td>
<td>10.7</td>
<td>51.9</td>
<td>49.9</td>
<td>40.1</td>
<td>37.1</td>
<td>23</td>
</tr>
<tr>
<td>62.5</td>
<td>15.5</td>
<td>47.4</td>
<td>45.4</td>
<td>34.1</td>
<td>31.1</td>
<td>23</td>
</tr>
<tr>
<td>100</td>
<td>19.9</td>
<td>44.3</td>
<td>42.3</td>
<td>30.0</td>
<td>27.0</td>
<td>23</td>
</tr>
<tr>
<td>155</td>
<td>25.3</td>
<td>41.4</td>
<td>39.4</td>
<td>26.2</td>
<td>23.2</td>
<td>21.1</td>
</tr>
<tr>
<td>200</td>
<td>29.1</td>
<td>39.8</td>
<td>37.8</td>
<td>24.0</td>
<td>21.0</td>
<td>20.0</td>
</tr>
<tr>
<td>250</td>
<td>33.3</td>
<td>38.3</td>
<td>36.3</td>
<td>22.0</td>
<td>19.0</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Cables must not be under tension greater than allowed and may not be wound up; twisted, crushed... they shall also be in one piece. The minimum bending radius of the cable is at least 8 diameters of the cable, unless the manufacturer specifies otherwise.

Parallel control and crossing over of power cords of 220V, 50Hz and FTP cables should be avoided.

1.2.6. Sockets

All work areas shall have double-socket type 2xRJ-45, single 1xRJ-45, triple and quadruple 3xRJ.45 4xRJ.45, Category 6, as follows:

a) concealed, for installation in plaster walls or concrete walls, which are assembled in modular jacks, and two power sockets, in the wall at a height of 30 cm above the floor, according to the International Standard ISO/IEC 8877, which enables the transfer of data in Class-E, according to the International Standard ISO/IEC 11801. The rear end of the socket has an IDC connector for permanently fixing FTP cables.

To connect individual wires of the FTP cables with the socket, use pinout EIA/TIA568A.

The rack cabinets of the outlets (modules) are installed in distribution (patch) panels.

The layout of telephone RJ-45 jack (module) on the voice panel in closet BD-1 is shown in the graphic documentation.
The layout of duplicate 2xRJ-45 and 3xRJ-45 jacks on the premises is shown in the graphic documentation.

The appearance of rack cabinet BD-1, as well as its availability to patch panels of 1 HU, cable trays (patch guide) of 1 HU and other telecommunications equipment, is given in the illustrations.

1.2.7. Patch cords and cable marking

Patch cords that are one or more metres in length are used for switching in "rack" cabinets. These cables can be factory-produced or made by the Contractor, in which case they must be attested. All 8 conductors at both ends of the flexible FTP patch cord shall end up in RJ-45 connectors. For this purpose, use a dedicated tool, prescribed method and pin assignment according to EIA / TIA 568A standard.

Patch cords must not obstruct access to other elements in a rack cabinet, and must be set throughout panels according to patch guides. They must not be strained, twisted, crushed and so-forth.

Rack cabinets, sockets and cables must be clearly marked with labels printed with markings in the above nomenclature, and according to technical documentation. It is necessary to do a full labelling of elements in the project built drawings and later in the database for the purpose of maintenance.

For patch cords in racks and cables for connecting computers in workspaces, use a rubber cover in color for RJ-45 connectors, according to the appropriate logical layout, which should be introduced in consultation with the supervisor. In addition, cables should be marked visibly on both ends of the line.

**IMPORTANT NOTE:**

*It is desirable that work on laying the installation of the cabling is carried out by an organisation that has a specific certificate from the manufacturer of the equipment that is to be installed, that all cables are examined in relation to every feature of the built-in cable, and that a certificate of quality and a guarantee of at least 20 years are issued for each installed cable.*

1.2.8. SELECTION OF ACTIVE EQUIPMENT

Switchers type PoE, as well as servers and storages for IP telephony and IP video surveillance, are envisaged for networking of computers, as well as for the function of IP telephony and IP video surveillance. Other necessary active equipment should be provided by the Investor, according to needs and organisation, with enough space left in the rack cabinet for the aforementioned to fit. According to the technology project, a total of 8 rack cabinets should be set in the Technical Hall on the first floor. This project was processed only one (BD 1), while the others shall be the subject of the Investor.

1.2.9. Power supply of equipment

Supplying of all active equipment in all switchboards is derived from an enclosure of a common UPS, which is located on the ground floor, according to the wiring project.
Each power connector, as well as all power cords to the active equipment, should be labeled with the name of the device that is connected to this location.

For the purpose of urgently turning off of the power, the main power supply switch panel should be visibly noticeable and easily accessible after the racks are opened.

All the equipment’s metal chassis in the rack should be connected to the chassis of the rack cabinet via point for potential equalisation. Connecting should be achieved as described in the technical manual of the device’s manufacturer, or via cable P/FY 1x2.5 mm², of suitable length, with mounted pedals at each end.

Racks must be earthed on the upper SIP and through it to the rail for equipotential bonding of the facility, via cable N2XH-J 1x16 mm², which is the subject of the energy project.

All built-in metal channels type PNK 100 x 50mm should without fail be grounded with material according to instructions of the equipment’s manufacturer.

1.2.11. Main Telephone Splitter (GTR)

The main phone splitter, according to the above preliminary technological solutions, is not the subject of this project. In this project, there is only mention of the potential microlocation of GTR on the ground floor, as required by the design solutions.

1.3. IP TELEPHONY

The proposed telephone system is completely based on IP protocol (with the possibility of integration with an analogue system). IP telephony uses a standardised solution in the segment of the telephone communication system based on SIP platforms. The telephone system should provide easy user management, intelligent call routing, and integration with advanced services and applications, as well as networking with other systems.

The system for processing calls should be based on SIP (Session Initiation Protocol). The main requirement to be placed before the IP telephony system is to provide a high quality of reproduced speech signal.

System call processing is implemented as an application solution that is installed on separate server units. The design of the IP phone system implies the existence of redundancy at the level of system call processing that ensures high availability and reliability of the IP phone system.

Implementation of a quality IP telephony system demands the fulfilment of requirements relating to certain parameters of QoS (Quality of Service) to ensure the quality of communication: bandwidth, packet loss, packet delay and packet delay variation - the network jitter, echo cancellation, assigning priority to VoIP packets and applying appropriate codec speech.

Intercom fire notification and public sound systems may be integrated with the specified IP phone system, which is not the subject of this project. An IP phone system
has been envisaged, and it shall be housed in rack BD-1. It is similar to CISCO IP PBX system.

1.3.1. Characteristics of the telephone system:
- Capacity - The system must support 50 IP extensions (with all licenses included). The above mentioned number of extensions should be agreed upon with the investor;
- Scalability - The system must be scalable and support possible expansion in the future to 200 IP extensions (no license fee for added users);
- The Server is planned to accommodate a 19 "rack cabinet;
- The system must support SIPv2 protocol and connectivity to the network of telecom operators via a SIP trunking;
- Detailed statistics on calls and possibilities of setting tariffs on calls with the ability to print a listing and report on the amount of calls registered by extension, call number or duration;
- Ability to setup and configure the system through a graphical web interface
- Possibility of remote configuration and monitoring of system;
- The system is preloaded with software for VoiceMail - with all inclusive software licenses;
- The system is preloaded with software for IVR - with all inclusive software licenses;
- The system should support the Auto provisioning option in adding new devices to the network;
- Support for IP intercom and IP audio devices.

1.3.2. Supported phone functions:
- CID – Identification (ID) for incoming calls
- View of names for all internal calls (extensions) on the control panel
- Call Transfer (Blind i Attended transfer)
- Call Parking
- Call Waiting (Call on hold)
- Call Pick-up
- Call Forwarding – Diverting calls to another extension or to a mobile phone in case the extension is currently unavailable
- BLF Support (Busy Lamp Field) –LED indicators that show which extensions are currently busy
- Speed dialing – Abbreviated dialing via programmable buttons on the phone
- Call routing – Automatic routing of calls to the PSTN, SIP or GSM network depending on the number dialed
- Follow me – Diverting all calls from one extension to another extension on the switchboard
- Defining user status – busy, available or offline
The system must support the following protocols: SIP v2.0, RTP, RTCP, SIP, H.323, T.38, MGCP, Megaco, IAX, IAX2, Q.921, Q.931, ETSIQ.sig

The system must support and connect with other control panels that are located in remote locations. IP communications is enabled for PBX systems via LAN and IP telephony devices.

It is necessary to connect the system with a VoIP GSM gateway that allows simultaneous calls over a minimum of 4 GSM channels. The GSM Gateway should support a PoE power supply.

1.3.3. Telephone devices

   IP telephones connections shall be provided to the administration staff. IP phones should be able to power through the LAN network using PoE (Power over Ethernet) technology. IP phones must be set to voice VLAN.

1.3.4. Technical description of the IP phone - basic characteristics:

*Cisco Unified IP Phone 7965G*

Display: 5-inch (12.5 cm) graphical TFT color display, 16-bit color depth, 320 x 240 effective pixel resolution, with backlight, Codec support: G.711a, G.711H, G.729a, G.729ab, G.722, and iLBC audio, compression codecs are supported

Ethernet Switch: Internal 2-port Cisco Ethernet switch allows for a direct connection, to a 10/100/1000 BASE-T Ethernet network through an RJ-45 interface with single, LAN connectivity for both the phone and a co-located PC. System administrator can designate separate VLANs (802.1Q) for the PC and phone, providing improved, security and reliability of voice and data traffic
QoS: Supports differentiated services code point (DSCP) and 802.1Q/p standards

All IP phones are connected to the system via the computer network’s RJ-45 jack. A separate VLAN should be created for the IP telephony system. Also, using a dual-port switch integrated within the IP phone, it is possible to connect both a telephone and computer on one RJ-45 connector. Recommended phones are Cisco Unified IP Phones 7965G IP. The advanced features of this phone are forwarding calls; call waiting and conference call, which are all functions that shall be useful for making business calls.

1.4. FIRE ALARM SYSTEM

1.4.1. TECHNICAL DESCRIPTION OF THE AUTOMATIC FIRE ALARM SYSTEM

1.4.1.1. Purpose of the fire alarm system

The detection and fire alarm system is an integral part of the fire protection system whose purpose is early detection of fire in its earliest stages, appropriate notification of local and distant emergencies and localisation of fires. Early detection of a fire shortens the time for its free development, which significantly reduces the danger of a serious fire and reduces damage to the building and its contents.

1.4.1.2. Components of the system for automatic detection

The fire alarm system consists of a central unit, automatic detectors, hand-held detectors, sound signals, and installation lines.

The central unit or panel for fire detection and fire alarm (hereinafter referred to as the control panel), shall be located in a room in the terminal building designated by the investor, where climatic conditions meet technical requirements for accommodation of the control panel, as a 24-hour service.

Automatic fire detection is achieved through 49 automatic analogue addressable fire detectors, which are mounted on ceilings, suspended ceilings, as well as in the space between the "double floors", all according to the disposition of the graphical documentation.

Fire detectors in the central fire alarm system are linked to an analogue addressable loop.

The choice of the type, number and deployment- layout of analogue-addressable fire detectors is such that it corresponds to the coverage of the protected area within the system, with maximum respect to the geometry of that area, positive current regulations and recommendations of the equipment’s manufacturers.
A total of 7 hand fire detectors for indoor use should also be provided and placed along evacuation routes (entry/exit doors, stairs and hallways) at a height of 150 cm from the ground, connected to an addressable loop.

The project envisages 9 alarm sirens mounted on walls above a height of 2.2 m. Alarm sirens are connected with the control panel’s outputs.

Distribution of addressable loop installations should be performed via cables without halogen elements, JH (St) H 2x2x0.8mm for automatic and hand-held alarms and JH (St) H 2x2x0.8mm / FE180 / E30 for sirens. Installing cables should be done partly in a PVC pipe fi 13mm, concealed fashion, partly in PNK channels for the purpose of telecommunications.

The control panel is powered via a fire resistant and non-combustible cable with halogen elements N2XH-J 3x1.5mm² from the nearest RO energy switchboard that is connected to an agragat in the terminal building via a separate 10A circuit breaker. In the event of a power supply voltage failure, the system has a rechargeable battery as a backup power source that provides autonomy to the system for 72 hours in standby mode and 30 minutes in alarm mode.

The Contractor shall perform all work in line with this project and in accordance with applicable technical regulations.

1.4.1.3. How the alarm system functions

An analogue-addressable system for automatic fire detection shall be applied. Detectors supervise a certain area and when alarmed signal the position of the controlled area to the panel promptly notifying locally and through IVR and other responsible persons who need to take appropriate procedure while the spread of fire is still in its early stages. Optical and heat detectors are also used as automatic detectors. Installation of detectors is done on ceiling surfaces in dropped ceilings.

The control panel is equipped with an operating console with which it is possible to fully monitor and manage the operations of the fire alarm system by means of touch screen and special keys and so-forth.

The importance of human participation in the process of alerting is extremely high, and hereafter it shall be briefly described.

By triggering the automatic fire detector, a light and sound internal alarm is emitted on the operational console to alert the duty officer who is next to the control
panel. By pressing one button, the duty officer confirms receiving the information from the fire detection system, thus initiating the programmed "survey period". Specifically, upon confirmation, the duty officer at the operational console registers the location of the alerted detector, investigates the scene and finds the detector that was activated. In the event of a fire, he/she must press the nearest manual call point because alarms from manual call points have no delay and immediately cause a general alarm in the facility and provide access to fire extinguishing, in accordance with the procedure described below.

In the event that the automatic detector reacted to some disturbing influences, the duty officer returns to the operating console, reverses the "internal" alarm and the system continues to operate normally. What is also important, no one becomes needlessly upset.

The messaging switchboard operates in two modes as follows: "DAY" and "Night". During the regime of "DAY", which is during working hours, the alarms are treated in two ways: automatic alarms and fire alarm manual call. During the regime of "Night", which is out of working hours, the phase delay is discharged, ie. all alarms are treated as a fire alarm manual call.

1.4.1.4. DIAGRAM OF ALARMING:

The attached block diagram shows the organisation of alarms and intervention plan:
1.4.1.5. Possible causes of fire, combustible materials and types of fire development

As possible causes of fire come to mind:

- Failure of electric power equipment
- Manipulation error
- Lack of attention of a facility's staff
- Failure of the facility's electrical installations or equipment
- Arson

The facility consists of the following flammable substances:
- switchgear, electrical installations, IT and telecommunications equipment
- Paper, wood, textile, plastic and other materials

For this type of building, based on the foregoing, we can expect a rapid development of fire.

1.4.1.6. Selection of fire detector

When a fire breaks out in this type of object, there are flames, high concentrations of smoke, a rapid increase in temperature, and infrared and ultraviolet radiation. Choosing the appropriate type of detector depends on which type of side effects is defined.

1.4.1.7. Elements of the fire alarm system

Given the nature and importance of the subject area and the danger of fire which the staff and assets of the facility are exposed to, the Investor has chosen to install a stable analogue-addressable system for automatic fire detection. This project shall be included in the system of technical security.

This project shall give detailed characteristics of the system, the schedule of automatic and manual fire alarms, tripping alarms and sirens, detailed technical requirements and safety precautions that must be applied during the construction of the installation, its commissioning and during operation.

1.4.1.8. Selection of control panel

Bearing in mind the terms of reference, the layout and importance of substantive content, which is located in certain areas, an analogue-addressable panel B6-X2-CP with two loops has been envisaged. The switchboard is addressable, very easy to use, reliable and easy to install and put into operation.

Switchboard B6-X2-CP is the latest analogue addressable fire alarm panel. B6-X2-CP is designed and manufactured according to EN54 standards Parts 2 and 4. It is characterised by a very modern design, easy installation and configuration of the system, simple address programming elements, software elements addressing system, the possibility of surface-mounting or flush-mounting, has 2 outputs for controlling sirens, the possibility of networking up to 16 serial outputs, RS485 and RS232 serial outputs, and so-forth.
The panel has a display with six lines of 40 characters each. Fire panel B6-X2-CP equipped with a high level of intelligence, analogue addressable sensors and auxiliary devices, should be installed to ensure compatibility and provision of all solutions for the required system’s design. The projected plant contains a network card for connecting operating panels according to TCP/IP protocol.

Using the protocol for B6-X2-CP, the control panel offers a wide range of options, some of which are:

- Microprocessor control and redundant monitoring topology system
- Permanent automatic routine testing of all components and software systems
- Acoustic and optical warning in case of alarm and error
- Memory storage of alarm and operating conditions of the system
- The possibility of manual testing the panel and its functions
- The choice of language used in the control panel (labeling and display indication), constant possibility of changing between 4 languages
- External device bus for up to 15 pointer and control devices
- Serial printer data with UPS power, memory of events and filter for messages
- Loading of system configuration using flexible flash memory technology
- Power backup in case of interruption of network power supply for a maximum of 72 hours

Technical characteristics of the analogue-addressable panel B6-X2-CP:

<table>
<thead>
<tr>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>B6-X2-CP</td>
</tr>
</tbody>
</table>

Technical description
The Main Project on Telecommunications and Signal Installations for the Airport Administration Building and Accompanying Control Tower, Kapino Polje, Nikšić, Montenegro

<table>
<thead>
<tr>
<th>Standard</th>
<th>EN54: Pt2 &amp; 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>Display six lines of 40 characters</td>
</tr>
<tr>
<td>LED indication</td>
<td>YES</td>
</tr>
<tr>
<td>Configuration</td>
<td></td>
</tr>
<tr>
<td>Number of loops</td>
<td>2</td>
</tr>
<tr>
<td>Addressing elements of the loop</td>
<td>Automatic – control panel</td>
</tr>
<tr>
<td>Number of alarm outputs</td>
<td>4</td>
</tr>
<tr>
<td>Maximum length of loop</td>
<td>3500m</td>
</tr>
<tr>
<td>System</td>
<td></td>
</tr>
<tr>
<td>Max current of loop</td>
<td>232mA</td>
</tr>
<tr>
<td>Outputs</td>
<td></td>
</tr>
<tr>
<td>Siren outputs</td>
<td>2</td>
</tr>
<tr>
<td>Max current / output</td>
<td>4 A</td>
</tr>
<tr>
<td>Relay output</td>
<td>5 (3A@24V DC)</td>
</tr>
<tr>
<td>Aux napajanje</td>
<td>od 26, 3V DC (50°) to 28, 3V DC (0°)</td>
</tr>
<tr>
<td>RS485 port</td>
<td>do 1.2km (used for the parallel console)</td>
</tr>
<tr>
<td>Ambience</td>
<td></td>
</tr>
<tr>
<td>Main power source</td>
<td>230VAC (+15%, -20%) / 160W / 47-63Hz</td>
</tr>
<tr>
<td>Power backup</td>
<td>2 kom 12V DC/15 ....18 Ah</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Steel housing</td>
</tr>
<tr>
<td>Colour</td>
<td>Crvena, RAL3000</td>
</tr>
<tr>
<td>Dimension</td>
<td>140(D) x 400(V) x 445(Š) mm</td>
</tr>
<tr>
<td>Weight + backup power</td>
<td>19 kg (with batteries)</td>
</tr>
</tbody>
</table>

**Wiring diagram of analogue-addressable elements in a X-LINE loop**
Selection of automatic detectors

The basic fire detector shall be combined (multisensor) for detection of smoke or heat, such as combined smoke and heat analogue-addressable fire detector series MTD 533X. The detector is software programmed for detection of smoke (responds to visible light and dark fumes) and it should be installed in all subject areas, except the area of 20kV and 10kV switchgear, the transformer house, space battery packs with entrance hall, where the detector is software programmable as thermal.

Automatic analogue-addressable Multi-criteria fire detector series MTD 533X

Combined smoke and temperature analogue-addressable fire detector series MTD 533X is designed for early detection of smoldering or open fire with or without
smoke. Depending on the type of system and application area, the detector can be software programmed and used as a smoke, heat, or combined smoke/heat detector. For areas where heavy exploitation conditions exist, version MTD 533X CP is available with increased protection against humidity. It is supplied with a protective cap to protect against dust. The technical characteristics of these detectors are as follows:

- A detector for all applications
- Fire alarm activated by smoke, temperature or smoke and temperature
- Smoke sensor CUBUS® algorithm for automatic adjustment of environmental conditions, without the need for manual defining parameters
- Setting sensitivity to smoke and temperature in accordance with EN 54
- Evaluation of smoke on the basis of the temperature
- Evaluation of early warning at 30% and 75% of alarm threshold
- Detection of pollution on 2 levels
- Built-in short circuit isolator
- There is a built-in LED for visual indication of alarming detectors, visible 360°
- Setting alarm thresholds to compensate for environmental impacts
- Alarm filtering to reduce the number of false alarms
- Alarm output for external alarm indication
- Possibility of reading time of detectors’ use and levels

Technical characteristics of the analogue-addressable multi-criteria detector MTD 533X:

<table>
<thead>
<tr>
<th>Model</th>
<th>MTD 533X cat. No 30-5000003-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity to smoke</td>
<td>According to norm EN 54-7</td>
</tr>
</tbody>
</table>
### The Main Project on Telecommunications and Signal Installations for the Airport Administration Building and Accompanying Control Tower, Kapino Polje, Nikšić, Montenegro

<table>
<thead>
<tr>
<th>Sensitivity to heat</th>
<th>Accordint to standard EN 54-5 (A1, A2, B (Index S+R))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of coverage</td>
<td>100 m²</td>
</tr>
<tr>
<td>Cable</td>
<td>Min. 2x2x0,8 mm²</td>
</tr>
<tr>
<td>Light indication</td>
<td>Visibility 360°</td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mounting CAB300 bases</td>
</tr>
<tr>
<td>Compatibility</td>
<td>CF series control panel</td>
</tr>
<tr>
<td>Addressing</td>
<td>Automatic addressing</td>
</tr>
<tr>
<td>Detection</td>
<td>Tyndall-Effect / NTC</td>
</tr>
<tr>
<td></td>
<td>Alarms are activated due to the presence of smoke, heat or a combination of smoke and temperature</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>12do 30V DC (no deviation modulation)</td>
</tr>
<tr>
<td>Output:</td>
<td>X-LINE: 5 V, loop: 6,8 V</td>
</tr>
<tr>
<td>Max quiescent current</td>
<td>120 μA</td>
</tr>
<tr>
<td>Max current in alarm</td>
<td>min 0,5 mA, max 10 mA</td>
</tr>
<tr>
<td>Activated alarm LED</td>
<td>max 2,5 mA</td>
</tr>
</tbody>
</table>

### Ambience

<table>
<thead>
<tr>
<th>Applications</th>
<th>Internal use IP 44 (with stand USB 501-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-20°C to +60°C</td>
</tr>
<tr>
<td>Moisture</td>
<td>10 do 95%</td>
</tr>
<tr>
<td>rel/F Air speed:</td>
<td>max. 20 m/s</td>
</tr>
<tr>
<td>VdS-approval:</td>
<td>G210115</td>
</tr>
<tr>
<td>CPD-approval:</td>
<td>0786-CPD-20993</td>
</tr>
</tbody>
</table>

### Housing

<table>
<thead>
<tr>
<th>Material</th>
<th>ABS/PS,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (without stand)</td>
<td>118mm (diameter) x 67mm (height)</td>
</tr>
<tr>
<td>Colour</td>
<td>Bela, RAL 9003</td>
</tr>
<tr>
<td>Weight</td>
<td>125 g (without stand)</td>
</tr>
</tbody>
</table>

---

![Diagram of the equipment](image-url)
The choice of detector stand

With regards to the base of automatic detectors, type 501 has been adopted, which is used for Integral IP series of analogue-addressable panels. The mentioned stand is constructively installed with earthing terminals. The stand (base of detector) has the ability to lock the detector, and can be mounted on a beam or ceiling.

The lay-out, dimensions and connection diagram of standard stands for USB 501 automatic detectors with a parallel indicator.
Choice of manual fire alarm

In addition to automatic fire detectors for rapidly alerting in case of fire, addressable manually trigerring fire alarms MCP 545X series have also been envisaged. Activation of a manual fire alarm, the alarm signal is unconditionally transferred to output devices. They are located in a strong plastic housing and are activated by breaking the glass. Additionally, this type of manual alarm has a key for activating the detector without destruction, i.e. breakage of glass for the purpose of testing functionality.

Addressable manual call point MCP 545X series are designed to manually activate a fire alarm over an analogue addressable control panel. The manual calls are produced according to standard EN54-11 (typeA). When configuring the fire alarm panel, the manual alarm is automatically given an address. Like other elements of the addressable loop, handheld detectors have an integrated short circuit isolator, so that during a short circuit it may provide stable operation of the system. Anticipated handheld detector MCP 545X-3R type mounted on the front wall is resistant to external influences. Activation of manual call is done by lifting the transparent plastic cover and breaking the protective glass that has been carefully constructed to break to avoid injury. For areas where glass is forbidden, a version of the manual alarm with flexible plastic is used, which after activation returns to its original position. At the front of the manual call MCP 545X series is an easily visible LED that lights up when a call point is activated.

Testing manual call is carried out with ease via a plastic test key that allows the glass to fall out of its normal position and activate the switch mechanism. Manual call MCP 545X series are modular and made of Fiberglass reinforced plastics in the degree of
The Main Project on Telecommunications and Signal Installations for the Airport Administration Building and Accompanying Control Tower, Kapino Polje, Nikšić, Montenegro

protection IP67. In order to avoid the potential for unintended activation of a manual call point, they are fitted with a polycarbonate cover.

Additional (optional) equipment for manual call point

<table>
<thead>
<tr>
<th>Box</th>
<th>Frame</th>
<th>Distancer</th>
<th>Cover</th>
<th>Test keys</th>
</tr>
</thead>
</table>

Layout and dimensions of addressable manual call point 545X MCP-1 and 2:

Technical characteristics of the addressable manual fire detector MCP 545X-1,2 and 3:
Selection of Fire Alarm Sounder

Inside of the facility, 3 alarm sounders were envisaged as the output devices for audible signalling of fire alarms, in addition to 1 sounder for outdoors audible signalling, which will thus provide for audibility of sound alarm throughout the facility. For indoor alarm sounding, I have chosen the CS200-SV sounder model, manufactured in compliance with the EN 54-3 standard; this model is constructed for interior wall mounting, and is of IP21 protection rating. The device is of the red colour, and it can produce 32 different tones by means of the DIP switch block with 5 switches. For each tone selected, another tone can be selected and set as an additional alarm sounder, and the output sound volume of (100dB(A) @ 1m (tone 3)), is adjusted by using a rotating volume control switch. The sounder uses the operation voltage of 18 to 28V DC. Owing
to its construction, dimensions and elegant design, the fire alarm sounder will fit perfectly into the overall interior design of the facility.

Technical specifications of the addressable interior CS200-SV alarm sounder:

<table>
<thead>
<tr>
<th>Model</th>
<th>CS200-SV cat. No. FG020387</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>18 to 28V DC</td>
</tr>
<tr>
<td>Wiring system</td>
<td>Rail terminal, max. 2.5 mm$^2$</td>
</tr>
<tr>
<td>Sound output</td>
<td></td>
</tr>
<tr>
<td>Current consumption in the sounder</td>
<td>16 mA over 24 VDC (tone 3)</td>
</tr>
<tr>
<td>Number of tones</td>
<td>32 (DIN - from 1200 to 500 Hz)</td>
</tr>
<tr>
<td>Working temperature</td>
<td>-10°C to +55°C</td>
</tr>
<tr>
<td>Construction</td>
<td>ABS</td>
</tr>
<tr>
<td>Colour</td>
<td>Red</td>
</tr>
<tr>
<td>Application</td>
<td>Interior surface mounting IP21c</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>0-95% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Dimensions (in mm)</td>
<td>Ø96 x 62 mm</td>
</tr>
</tbody>
</table>
The Main Project on Telecommunications and Signal Installations for the Airport Administration Building and Accompanying Control Tower, Kapino Polje, Nikšić, Montenegro

<table>
<thead>
<tr>
<th>Model</th>
<th>CS200-SV cat. No. FG020387</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>240 g</td>
</tr>
</tbody>
</table>

In addition to the above, one sounder has been envisaged for outdoors fire alarm sounding, which is to be mounted next to the entrance doors into the command centre facility of the 20 kV distribution transformer building. For this purpose, I have chosen the VTB-32E-DB-RB/AL alarm sounder, catalogue model No. FG020343. The alarm sounder’s sound volume ranges from 78dB to 98dB @ 1m @ 90° (depending on the sound selected) and it is designed to be mounted on the exterior wall (IP65). The alarm sounder uses the operation voltage of 12 to 30V DC.

Technical specifications of the VTB-32E alarm sounder with beacon for exterior use are as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>VTB-32E-DB-RB/AL, Cat. No. FG020343</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound output</td>
<td>from 78dB to 98dB @ 1m @ 90° (depending on the sound)</td>
</tr>
</tbody>
</table>
Signal frequency: from 440 to 2900 Hz
Construction: ABS
Colour: Red
Dimensions: (D) 93.6mm x (H) 106.9 mm
Operating voltage: 18-35 V DC
Current consumption in the sounder: 41 mA max. (depending on the sound)
Number of tones: 32
Temperature range: -20°C to +70°C
Application and protection rating: Exterior mounting, IP65 protection rating
Relative humidity: 0-95% relative humidity, non-condensing
Weight: 258 g
CPD - certificate of conformity: 0359-CPD-0060

Spatial distribution of the specific locations for fire detectors in the facility has been determined based on the analysis performed, by taking into account the following parameters:

- Principle used in monitoring of individual rooms in the facility,
- Ceiling heights in individual rooms,
- Number of air exchange cycles in the protected area,
- Surface area of the room,
- Product data sheets provided by the equipment manufacturer.

Based on the above, it has been concluded that one optical and smoke detector should be used to monitor the surface area of 50 to 70 m², and that one thermo-differential detector should be used to monitor the surface area of 25 to 40 m².

Surface area per individual call points (Am) has been defined as a function of the room height and fire hazard.
In determining the precise positions for call points' mounting, it is necessary to strictly comply with all the technical requirements for mounting of the fire signalling installations.

To connect the fire detectors' to the signalling lines, the installation halogen-free cables JH(St)H – 2x2x0.8 mm will be used.

All the call points envisaged in the Project Design are of the same dimensions and are to be mounted on the standard base.

**1.4.1.9. ADDRESSABLE MODULES**

Addressable command modules FLM-420/4-CON and FMX-IFB 55-5 are fire alarm system command interface unit that allow fire detection devices to be connected to the SecuriLine loop. It provides for connections for a single loop of elements with synchronized activation, management of the output elements and monitoring of the fire alarm status on the loop and the occurrence of any wire interruptions or short-circuits.

Modules are mounted in separate installation housings. Their features include sending of the command signal for ventilation system management and sending of the command signal for elevator lowering on a safe level in case of an alarm signalling.

All the addressable modules have the integrated loop insulators, which ensure that the unobstructed operation of the call points is maintained in the event of a short circuit or line interruption.

**1.4.1.9. FIRE SIGNALLING INSTALLATION**

Fire signalling installation in individual facilities will be performed by using the telecommunication installation halogen-free cables J-H(St)H - 2x2x0.8mm.

To connect the alarm sounders, the cable of the J-H(St)H 2x2x0.8 mm2 /FE180/E30 type will be used.

To connect the downward executive functions from the fire control panel, the cable of the NHXCHX - J 3x1.5 mm2 /FE180/E90 type will be used.

A TBox telephone alarm transmitter is installed on the fire signalling control panel; this device sends each of the two independent alarm messages to 4 pre-programmed telephone numbers in the event of a fire alarm. The telephone connection has been brought from the telephone switcher to the fire control panel and it has been connected to the TBox.
In places where the installation cables run from one into another fire sector, the cables should be coat protected with the surface fire retardant cable coating, 1 meter on each side from the demarcation line between these fire sectors.

**Important Note:**
1. Prior to mounting or installing of the fire signalling system, the Supplier shall acquire relevant domestic certificates of compliance for all the installation and mounting materials, and/or the corresponding domestically attested certificates, in cases where the imported installation materials (cables) and/or imported mounting materials are used.
2. Special attention should be paid to the points in which the cables run through the parts of the facility that belong to separate fire sectors. In all the places where the cables run through bordering construction elements between individual fire sectors, openings for cables must be coated with fire retardant materials of the same fire resistance rating as that of the bordering construction elements, and they must be sealed by using the adequate fire retardant material, in compliance with the graphic specifications provided in the documentation.

It has been envisaged to use the wall mounting fire signalling control panel and it shall be wall mounted at 1.5 m from the floor to the control panel axis.

### 1.5. OPERATIONAL FUNCTIONALITIES OF THE FIRE SIGNALLING CONTROL PANEL

In case of a fire signalling by an automatic fire alarm or by a manual call point in the facility, the relay outputs of the BG-X2-CP fire panel will provide for the following functionalities:
- Activation of the alarm sounders,
- Switching off of the ventilation and air conditioning systems, by means of power supply interruption in the distribution cabinets,
- Transmission of the alarm signal by means of the pre-recorded speech message.

**Important Note:**
*When the fire extinguishing is completed, the power supply cabinet (cabinets) for the ventilation and air conditioning systems must be manually reconnected.*

### 1.6. ELEMENTS USED IN CALCULATIONS OF THE EXACT LOCATIONS OF THE CALL POINTS
Surface area of each room (in m$^2$) is divided by 60 m$^2$ (maximum monitoring surface area coverage for a single optical signalling device) to arrive at the minimum number of required signalling devices for the room/space in question (rounded to the following, larger whole number). The selection of the type and spatial distribution of the fire signalling devices has been performed based on the content and purpose of the room/space in question. Optical smoke detectors are selected in most of the cases, since these are the best option for the rooms in question. The number and spatial distribution of smoke signalling devices in individual rooms were determined based on the surface area of their coverage (monitoring area) per individual smoke signalling device. The monitoring area depends on the fire hazard level for the room in question, and on the height and form of the ceiling of the room as well. A diagram is used to determine the monitoring area of the room with a flat ceiling.

For the majority of different application purposes for individual rooms, the first and the second fire risk levels are used for determining the monitoring area. In this Project Design, the monitoring area per individual fire signalling device of $A_m = 50$ m$^2$ has been calculated.
The automatic fire signalling devices must be mounted perpendicularly to the floor, and in places where the signalling devices cannot be mounted directly on the ceiling, bearers should be used.

1.7. S U M M A R Y

The Project Design for the fixed fire alarm installations includes the following elements:

- Specific types of automatic fire signalling devices have been selected, which are, based on their technical specifications, best suited option for the monitoring surface area in question,
- The automatic fire alarms have been envisaged to be mounted in places where these can provide for maximum efficiency of fire monitoring,

Depending on the specific fire risk levels, and taking into account the specific purpose, equipment levels and value of the specific rooms and the contents thereof, in compliance with the shape and the dimensions of the individual rooms, the monitoring area has been determined,

- Specific types of automatic fire alarms and specific locations where these are to be mounted have been selected in such a manner as to reduce the occurrence of false alarms to the absolute minimum,
- The exact location of a fire accident (where the automatic fire alarms will be activated) can be determined straightforwardly, simply and quickly,
- Electrical power supply for this system is reliable and provided for from two independent power supply sources, which shall provide for the autonomous system operations and transmission of the alarm signal to the responsible persons in charge and to the relevant fire fighting services.

The designed fixed fire alarm installations consist of the electrical installation for power supply to the equipment and for transmission of the alarm signal, and of a series of devices; some of these devices are considered to be the basic ones, since they are regularly included in each system, while the rest of them are considered to be of supplementary character, due to their specific purpose or due to the fact that these are used to boost the efficiency of the fixed fire alarm installations.

The basic elements of the fixed fire alarm installation included in the Project Design are as follows:

- Low voltage electrical installation,
- Fire signalling control panel – the central monitoring and management device,
- Automatic fire signalling devices,
- Manual fire call points,
- Main power supply sources,
- Backup power supply source.

Specific elements of the fixed fire alarm installations are as follows:

- Addressable modules in fire signalling loops,
- Alarm sounders.
To provide for the efficiency of the fire signalling system, the following shall be necessary:

- To perform the works in a quality manner and in compliance with the Project Design documentation,
- To provide for the regular maintenance and functional testing of the system,
- To provide for a detailed intervention plan in case of an accident and fire alarm activation.

In addition to all the above stated, and in addition to the use of the adequate fire detecting devices, the early fire signalling shall be efficient in exploitation only if the fixed fire signalling installations should is integrated with the corresponding fire monitoring and with an early fire alarm organization and adequate intervention plan, which is beyond the control of this Project Design.

1.8. ALARM CONCEPT

The alarm concept must be designed separately for each individual FP system.

- It is of utmost importance that the information of a fire alarm should be transmitted to the relevant groups and individuals in charge as quickly as possible, in compliance with their respective functions and mandates in the facility in question.

The range of the Project requests is as follows:

- Discrete fire alarming – relevant fire alarm information is provided to the dedicated FP staff,
- Fire alarming/evacuation of occupants who are familiar with the spatial arrangement of the facility in which they are located,
- Fire alarming/evacuation of occupants who are not familiar with the spatial arrangement of the facility in which they are located,
- Evacuation of the entire area.

The applied fire alarm concept prevents the activation of the fire fighting units in cases of minor fire incidents.

The fire alarm concept has been based on the alarm organization that includes two operational regimes:

- Presence of the on-call staff, or the "daylight" regime,
- Absence of the on-call staff, or the "night-time" regime.

Response and reaction of the on-call staff to the notifications sent by the FP control panel are monitored by means of:

- Two independent timers measuring the response time (V1 and V2);
- The alarm concept is an integral part of the fire signalling control panel concepts.
The basic principles of the alarm concept used:

- During the daytime regime, in case of a fire alarm, the staff on duty shall identify the exact location of the fire incident, appraise the situation and reach the decision on whether to activate the general fire alarm or to verify and reset the system.
- During the night-time regime, all the signals received are immediately translated into the general alarm and they directly activate the remote fire signalling.
- Actuation of the manual call points, regardless of whether these should happen during the daytime or night-time regime, shall immediately activate the general fire alarm.

Determining the organization of fire alarms' activation:

It is possible to choose between a number of different alarm options that can be selected for individual zones of the facility.

- Times V1 and V2 must be programmed separately;
- Time V2 can be additionally programmed separately and specifically for individual facility zones;
- The overall organization of alarm activation and the remote alarm functions are to be programmed by using a special software application on a portable laptop computer.

### 1.9. FIRE FIGHTING SYSTEM IN THE UPS AND RACK ROOM

It has been envisaged to use the following fire fighting equipment in the UPS room on the ground floor of the technical block of rooms in the facility, as well as in the technical room on the 1st floor:

- Mobile fire fighting equipment, and
The Main Project on Telecommunications and Signal Installations for the Airport Administration Building and Accompanying Control Tower, Kapino Polje, Nikšić, Montenegro

- Fire fighting installations consisting of the automatic devices containing the NOVEC fire protection fluid that vaporises to gas during discharge, in the UPS room and in the technical room on the 1st floor.

1.9.1. Mobile Fire Fighting Equipment

For fire extinguishing in the initial phase, hand-held portable fire extinguishers filled with pressurized S-9 dry powder have been envisaged.

1.9.2. Fire Extinguishing Installation with Automatic Fire Extinguishers Containing the NOVEC Fire Extinguishing Gas

The fire in the UPS room and on the 1st floor shall be put out by using the NOVEC fire extinguishing gas, which belongs to the category of the environmentally clean fire extinguishing agents. The 90 bars pressurized gas is stored in the storage containers of the fire extinguisher system. Fire suppression is used in total flooding systems, which means that the room is filled up to a specified percentage by volume, when the achieved fire suppression agent concentration can efficiently extinguish the fire. The NOVEC fire extinguishing agent does not leave any residue on the equipment where the fire is extinguished, either during or after the fire suppression activity, and is compliant with the NFPA 2001 E 2003 standard.

The automatic fire extinguisher consists of the following elements:

- Cylinder body; the cylinder body is manufactured by deep drawing of two pieces of pickled sheets with welded seam;

- Cylinder valve; the cylinder valve is manufactured from forged or drawn brass. A ½” sprinkler discharge nozzle is fitted on the lower part of the valve body. On the sides of the valve body, a NOVEC fire extinguishing agent charging valve and manometer for cylinder pressure monitoring are fitted. Near the sprinkler top, a connection for electrical valve actuation and deactivation is located;

- Cylinder bracket is manufactured to suit the form and the weight of the cylinder; it is made of structural steel and designed for mounting on the ceiling or on some other construction element.

Fire extinguishing cylinders are actuated by fire detection and alarm system (two zones’ interdependence). In addition to the automatic actuation feature, the device can be actuated manually, by using the manual buttons, in case that the persons in charge of maintenance and supervision of the fire extinguishing equipment should be present in these premises when the fire breaks out.

The basic fire protection concept involving the automatic fire extinguishing device relies on the automatic signalling of the fire size from the zone protected by the fire extinguishing device. The signal thus sent is analysed and assessed in the fire control panel; optical and acoustic signal is then activated in the control panel and in the protected zone. Upon expiry of the 30 seconds' long evacuation time (at the maximum), the command signal is forwarded from the control panel (24 V) to activate the fire extinguishing device. This signal is transmitted to the relevant devices filled with NOVEC.
fire suppression agent, that is, to the specific agent release valves of the fire extinguishers (cylinders).

Fire extinguishing is activated by means of an electric power signal that is sent to the actuator by means of a small explosive charge. This breaks the glass capsule of the sprinkler and to the release of the NOVEC agent, which is then filling the interior of the protected room.

In compliance with the expected fire risk level, optical call points are selected for fire signalling, which are mounted on the ceilings and in the empty spaces of the technical floor.

To eliminate false alarms and any unnecessary installation actuations, the automatic fire detectors/manual call points in two separate interconnected signalling lines cover all the fire extinguishing zones.

By activating the call points in one signalling line, only the internal fire alarm in the control panel for fire signalling is activated, in addition to the optical alarm device in the room in which the fire broke out. In case that the fire should spread and that the call points in the second signalling line are activated, the fire extinguishing alarm is activated. This alarm has the time delay (of 60 seconds), and after the delay it begins to feed the gas in the fire extinguishing zone, to acoustically alarm the staff and to turn on all the illuminated message displays with the inscription: "GAS" on them.

In addition to the automatic actuation, manual actuation of these devices has been provided for as well, by using the manual actuation buttons.

In the event that it is necessary to block the fire extinguishing devices, this can be done during the delay time, and the blocking button is provided for this purpose (the fire blockage); as an alternative, the option of manual actuation by using the manual actuation button has been additionally provided for (the manual fire notification device) for manual activation in individual fire extinguishing zones.

1.9.3. AUTOMATIC FIRE DETECTION SYSTEM AND FIRE EXTINGUISHING ACTUATION

In the UPS and technical room on the 1st floor, the system for automatic fire detection and fire extinguisher actuation is envisaged. The system for automatic fire detection and fire extinguisher actuation consists of the following elements:

- Fire alarm sub-panel for fire detection and fire extinguisher actuation,
- Automatic fire detectors,
- Buttons for manual actuation of the fire extinguisher,
- Buttons for manual deactivation of the fire extinguisher,
- Addressable module,
• Yellow beacons,
• Alarm sounders with beacons of the red colour,
• Illuminated message displays,
• Magnetic contact, and
• Cable installations.

Sub-fire alarm panel for fire detection and extinguishing detects fire and automatically actuates fire extinguishing. Fire is detected in two zones to reduce the possibilities of false alarm triggers, and thus the unnecessary fire extinguishing as well. The fire alarm sub-panel is a collective system that is connected into an addressable loop through addressable modules to collect required information in the main system control panel. A fire alarm sub-panel can be optionally connected to the fire loop that covers this part of the facility.

The fire alarm sub-panel consists of the connection lines for automatic fire detectors, connection lines for fire extinguishing actuation and deactivation buttons, connections for alarm sounders, beacons, illuminated message displays, as well as connections for fire detection devices.

The fire alarm sub-panel is powered from the 220V, 50Hz power grid, but is additionally has its own, backup power supply providing for 72 hours’ independence of the sub-panel operation in the event of the primary power failure under normal conditions and 30 minutes’ independence under the fire alarm conditions. The sub-panel has modules that provide power supply for fire detectors in the fire detection lines, power supply for alarm sounders, beacons and illuminated message displays.

The fire detection and extinguishing sub-panel must comply with all the national and international standards and relevant certificates of compliance must be provided for it.

In the fire detection room, conventional optical fire detectors are located. These detectors register smoke in the room, that is, it can register smoke in the initial stages of fire. The detectors are fitted with the system for automatic adjustments of its sensitivity to dirt by means of drift compensation. Detectors are mounted into the suspended ceiling and on the ceiling of the hall, and in the double floor as well. The detectors mounted in the suspended ceiling of the hall are fitted with a parallel indicator that indicates the specific detector under the alarm conditions.

Manual fire extinguishing actuation buttons are mounted in front of the hall at 1.5m from the floor level. The button is of the collective type and connected to the fire extinguishing sub-panel.

The buttons for manual fire suppression are mounted in the hall, at 1.5m from the floor level. The button is of the collective type and it is connected to the fire extinguishing sub-panel.
The addressable module connects the fire extinguishing sub-panel into an addressable loop of the existing fire detection system.

The yellow beacons are actuated by the alarm in one detection zone. These beacons are used for visual signalling of fire detection in a single zone. The alarm sounders are powered from the sub-panel.

Alarm sounders with red beacons are used for audible and visual notification of fire. In the event of fire detection in both the zones, the alarm sounders and the red beacons are activated. The alarm sounders’ maximum sound level is 100dB over 24V. The alarm sounders and the beacon are powered from the sub-panel.

Illuminated message displays are mounted both in front of the hall and in the corridor. The illuminated display indicates that fire extinguishing is in progress.

Magnetic door contacts are to be mounted on the doors of the room and these are used to indicate whether the doors are opened or not.

The following cable types shall be used for cable installations:

• J-H(St)H 2x2x0.8mm cable is used to connect the automatic manual fire detectors and magnet contacts to the fire extinguishing sub-control panel,
• NHXHX 2x1.5mm 2 FE180/E90 cable is used to connect the alarm sounders, beacons and illuminated displays to the sub-control panel, and
• J-H(St)H 4x2x0.8mm FE180/E90 cable (flame retardant, with 180 min insulation integrity and 90 min functionality) is used to relay the signal for fire extinguishing activation from the sub-panel to the fire extinguishing gas containing cylinders.

Cable installations are to be laid in bearers in the room, and cable bearers used for supporting other telecommunication installations are to be used.

When the fire is detected in one zone, the yellow beacon is activated. When the fire is additionally detected in the second zone, fire alarm sounders with red beacons are activated, in addition to the illuminated message displays.

1.9.4. Aspirating Line Fire Detector

ASD Securiton 516-1, with one sensor. Its work is based on the principle that air suction pipes continuously supply air from the protected area into a processing unit, where the air is analysed by an optical smoke detector.

ASD 516-1 system consists of two parts:
• an air suction pipe, 25 mm in diameter, with small suction openings through which the air is sampled
• a processing unit comprising of an optical smoke sensor, a fan, and an assessment unit.
ASD 516-1 constantly monitors the airflow in the suction pipes, thus controlling both the condition of the air sampling pipes and the level of contamination in the sampling openings. A fan aspirates air from the protected area and then transfers it via pipes into the processing unit.

The air inside the processing unit is continuously evaluated by a sensor that can detect the slightest increase in the concentration of smoke in it. Inside the processing unit, there are sensitive smoke detectors of the SSD 516-1 Securiton type (sensitivity 1.2% / m), that immediately react to the slightest appearance of and/or increase in the concentration of smoke.

If the air contains any smoke particles, the smoke particles will reflect light onto the optical sensor. The detected signal is amplified, and, when it reaches the determined threshold, alarm is transmitted to the central fire extinguishing unit and a LED display is instantly turned on at the detection chamber. The LED display at the detection chamber indicates the type of error occurred at one of the surveillance system points, such as: a crack in a suction pipe, a stop of air flow in a suction tube, a jam/blockage in a suction pipe, a fan failure, a change in the airflow speed, power outage in the smoke detector.

Technical specifications:
- Operating voltage: 20 to 30 VDC
- Operating current: 185 mA maximum
- Current for the alarm: 195 mA maximum
- Alarm threshold: 1.2% / m
- Operating temperature: 0 to + 50 °C
- Degree of protection (with stand): IP 53
- Dimensions WxHxL: 360x285x126 mm
- Weight: 2.7 kg maximum

The 25 mm diameter suction pipe is made of plastic, which does not conduct electricity, and the detection chamber is situated at a height of 1.5m above the floor level, so that the regular functioning check-ups and maintenance can be easily performed.

Pipes with air aspiration openings are mounted on the ceiling.

The indication of the operating condition of the aspirating line system will be transmitted to the fire alarm system using addressable module.

1.9.5. AIR SUCTION SYSTEMS

Air suction system represents a part of the aspirating fire alarm system that is introduced in those areas where using standard solutions is deemed inadequate or difficult to implement (due to specific conditions of the area that needs to be secured by a fire alarm, including difficult access to the space, or the need to preserve the sterility of the space, etc.).

The operation of the air suction fire alarm system is based on analysing the air sampled from the protected area. The air suction pipe (Ø25mm) conducts the sampled air to a
detection chamber where two smoke detectors are located. Smoke detectors perform real-time verification of the possible concentration of smoke in the sampled air. There are four LED diodes on the chassis of the detection chamber, that signal the following: the stand-by mode, errors in the flow of air, and two diodes signal alarm. The detector chamber is connected to the addressable loop in the same way as any other detector systems.

The air suction system enables:
Early detection of fire in:
- A space which cannot be accessed easily
- Double floors and ceiling voids
- Cabinets containing control equipment and switches
- IT equipment
- Operation Rooms and
- Sterile rooms

A quick location of the fire is achieved using alarm indicators at the detector.

The locations of detection units are selected to achieve optimal operation and maintenance.

The air monitored in the air suction pipe system 30m² / 60m² surface monitoring per air sampling opening. One-pipe system and two-pipe system.

The chamber of the air suction system draws air from a cabinet or a room through a system of pipes. The air is transferred to the smoke detector where it is analysed for traces of smoke. If the concentration of smoke reaches a certain threshold, the smoke detector activates the alarm. The alarm signal is displayed at the active detector and is transmitted to the central fire alarm unit. If additional smoke detector is built inside the detector container, it is possible to achieve dual-zone dependency.
The aspirated air passes under the active detector and goes out. However, it can also be returned to the monitored area back through the pipe (for example, by varying air pressure).

High precision airflow monitoring system monitors the system of pipes and can detect an interruption of airflow in the pipes and blockages of air suction openings in up to 50% of the openings, which is then signaled as an error. Moreover, poor performances of the fan, or a malfunction, are also detected.

Active detector consists of a closed housing with a built-in fan and one or two airflow monitoring devices. The front panel contains a backlit display for alarm(s) and errors. Testing connectors and airflow monitoring devices are accessible from the outside.

The active detector is permanently mounted on walls or inside cabinets. Removable cover of the housing allows full access to the smoke detector, terminals and programmable units.

1.9.6. Technical specifications

<table>
<thead>
<tr>
<th></th>
<th>single-zone</th>
<th>dual-zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>14...30VDC</td>
<td>14...30VDC</td>
</tr>
<tr>
<td>Operating current spending</td>
<td>160mA</td>
<td>260mA</td>
</tr>
<tr>
<td>Pipes system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- It is possible to connect</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>- Length</td>
<td>max. 100m</td>
<td>max. 300m</td>
</tr>
<tr>
<td>- The outer diameter</td>
<td>25mm (PG29)</td>
<td>25mm (PG29)</td>
</tr>
<tr>
<td>Air sampling openings</td>
<td>max. 12</td>
<td>max. 24</td>
</tr>
<tr>
<td>Monitored area per opening</td>
<td>30m² / 60m²*</td>
<td>30m² / 60m²*</td>
</tr>
<tr>
<td>Air flow monitoring</td>
<td>16...50%</td>
<td>5...50%</td>
</tr>
<tr>
<td>Service life of the fan</td>
<td>min. 65000h/40°C</td>
<td>min. 65000h/40°C</td>
</tr>
<tr>
<td>Operating temperature of the active detector</td>
<td>-30...+60°C</td>
<td>-30...+60°C</td>
</tr>
<tr>
<td>The difference in temperature Active detector/Sampling opening</td>
<td>max. 10K</td>
<td>max. 10K</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40...+75°C</td>
<td>-40...+75°C</td>
</tr>
<tr>
<td>Relative humidity category DIN40040</td>
<td>DIN F (max. 95%)</td>
<td>DIN F (max. 95%)</td>
</tr>
<tr>
<td>Cross-section of the installation cable</td>
<td>max. 2.5mm²</td>
<td>max. 2.5mm²</td>
</tr>
</tbody>
</table>

AWG 14
Air suction systems are to be installed in the technical room on the first floor, for fire detection and extinguishing.

8 pieces of rack cabinets are planned to be installed in the final phase of constructing the airport with control tower. Air suction pipes will be placed diagonally in the rack cabinets, and connected to the two air suction aspirators of the ASD 516.1 type, in order to achieve dual zone dependence in the occurrence of fire. In case of a fire outbreak inside a rack, if both air suction aspirators start reacting, it is a positive sign that there is fire, and the substation gives the executive signal to open the valve on the bottle with Novec. The fire extinguishing is done through the nozzle.

NOTE:
In order for a fire in a room to be extinguished with the NOVEC gas, the doors in the room must be closed. Otherwise, UPS spaces and rack cabinets represent separate fire sectors, so the door must have a fire resistance of 90 minutes. (E 90).

1.10. DC POWER SUPPLY

In order for the units and their antennas in the cabin of the control tower, of the (CM-300 (V1) UHF and CM-350 (V1) UHF Air Traffic Control Radios) type or CM-300/350 (V1) UHF Radios type, to have the flow of electrical current, it is necessary to provide a DC electrical power of 26 VDC. A UPS device is foreseen for the DC electrical power flow, which is to be placed at the bottom of the rack cabinet with the BD mark. Above the unit itself, a panel to accommodate DIN rail for the mounting of two-pole DC fuses of 10 A is foreseen, with the switching capacity of 10 kA.

From the BD-1 rack to double outlets that are placed under the desks of air traffic controllers a cable of the N2XH-J 3x1.5mm2 type is to be laid.

In the technical hall (on the 1st floor), installation of the ATIS PLUS device is foreseen, as seen in the graphic documentation. From the nearest floor-level UPS control cabinet, the cable of the N2XH-J 3 x 1.5mm2 type is to be laid all the way to the wall sockets under the ATIS devices. The laying of antenna cables should be done as is instructed by the equipment manufacturer. The same applies to the flow of electrical power to the antennas.

As for the cabin of the control tower, double power sockets are foreseen, of the 230 VAC, 16A type, so as to enable the flow of electrical power to the following equipment: 1xPC, a printer, a scanner, 2xmonitors, a clock, 2x battery chargers.

1.11. VIDEO SURVEILLANCE
Interior and exterior video surveillance systems are to be installed. The video surveillance system consists of the required number of IP cameras. An FTP cable leads from the BD-1 rack, located on the first floor, to the IP cameras.

12 cameras are foreseen for the external video surveillance, to be mounted on the corners of the entrances into the airport building, as shown in the graphic documentation. The cameras are installed in specific housings with carriers, which are mounted on the outside wall, on the stairways and on each floor on the outside, and are placed in such locations as to cover the entire area around the building. The cameras are supplied with 230V and 50Hz, since they contain heaters and fans to maintain the specified operating temperature (-10 to +50 °C).

The type of cameras to be procured are the colour IP Megapixel cameras for outdoor installation JVC VN-T216V PRU (IR-LED) LoLux HD 1080p IR LED-supported vandal proof IP66 outdoor mini dome, 1 / 2.7 "CMOS sensor, 3-9mm VF Lens, 0.3 lux, or 0.0 lux (IR-Ledon) Day /Night,H.264highprofile,(H.264, JPEG) 30ips full frame, dual stream, IR-LED unit 15m, SD card, alarm, mot. det.PoE / 24VAC with a wall mounting bracket BK 216VPWB.

As for the indoor surveillance system, the cameras to be procured are of the IP Megapixel colour surveillance cameras covering communication, of the type JVCVN-T216U LOLLUX HD 1080p mini dome, 1 / 2.7 "CMOS sensor, 3-9mm VF Lens, 0.3 lux, easy d / n, H.264 high profile (H.264, JPEG) 30ips full frame, dual stream, SD card, alarm, mot.det.PoE / 12VDC / 24VAC.

In addition, a storage is to be acquired so as to store video materials and to save recordings on the Hard drive up to 4 x 2.5-inch or 3.5-inch SATA I / II / SATA 6Gb / s HDD or SSD up to 12TB raw capacity HDD drives hot swappable 24 x 7 NAS Edition Drives Total capacity 12 TB Raid Level 0/1/5/5 + HS / 6/10 / JBOD Interfaces USB 2.0 / USB 3.0 / eSATA / Ethernet / VGA for maintenance, HDMI (not enabled), Data Sheet: Subject to change w / o notification Technical specification Firmware based on 3.7.4, Processor: Intel Atom D270x 2.1GHz Memory: 1 GB DDRII RAM 512 MB Flash on DOM, fAN 2 x quiet cooling fan (4cm), NIC Intel 82574L Gigabit LAN x2 , FormFactor: 1U rackmount iSCSI Target / Initiator Yes Failover / Load Balancing Yes VMWare / Citrix / Thin Provisioning HyperV Yes One-button back up + Client back up software Yes Yes Remote Replication, FTP and File Server Web Server Yes Yes Printer Server SQL Server Yes Yes Remote Surveillance Station Access and Management System Multimedia Server Yes Yes Required Download Station interface Ethernet plug S26341-F103-L894.

Fujitsu storage to save the recordings is to be acquired, of the Hard Drive Up to 4 x 2.5-inch or 3.5-inch SATA I / II / SATA 6Gb / s HDD or SSD up to 12TB raw capacity HDD drives hot swappable 24 x 7 Edition NAS Drives Total capacity 12 TB Raid Level 0/1/5/5 + HS / 6/10 / JBOD Interfaces USB 2.0 / USB 3.0 / eSATA / Ethernet / VGA for maintenance, HDMI (not enabled) DATA SHEET: Subject to change w / o notification Technical specification Firmware based on 3.7 .4, Processor: Intel Atom D270x 2.1GHz Memory: 1
GB DDRII RAM512 MB Flash on DOM, fAN 2 x quiet cooling fan (4cm), Intel 82574L NIC x2 GigabitLAN, Form Factor: 1U rackmount SCSI Target / Initiator Yes Failover / load Balancing Yes VMware / Citrix / Thin Provisioning HyperV Yes Yes One-button back up + Client back-up software Yes Yes Remote Replication, FTP and File Server Web Server Yes Yes Printer Server SQL Server Yes Yes Yes Remote Surveillance Station Access and Management System Yes Multimedia Server Download Station Yes Yes Yes Remote Replication, FTP and File Server Web Server Yes Yes Yes Printer Server SQL Server Yes Yes Yes Remote Surveillance Station Access and Management System Yes Multimedia Server Download Station Yes Yes Required interface Ethernet plug S26341-F103-L894

As concerns the presentation of the recorded material, a client computer is intended, to view and export video material, with the following features: Client computer with Intel Core software i5-3340, 3,10GHz, 6MB, Intel H61 chipset, Gigabit Ethernet, Audio, PCI-Express, SATA3, USB3 .04GBDDR3 AMD Radeon HD 7770 1GB DDR5 HDMI / DVI-I / DP 500GB HDD, PATA DVD ± R / RW 24x SATA DualLayer ESPRIMO P410 E85 + Win 7 Pro. Also, two monitors 42 "and 32 " are to be procured for the security room where PPC is located, together with the access control equipment and alarm systems.

The cameras will be connected with S / FTP cables, and will be in part placed in plastic PVC pipes Ø19mm, in the section that is located in the premises, and in part in the PNK channels for the needs of telecommunications. Cable S / FTP end on a separate patch panel in the rack cabinet BD -1. Since these are IP cameras, they will be are attached on PoE switchers, inside the rack cabinet. Introduction of a separate VLAN, that would be used only for video surveillance, can be carried out with the consent of the Investor.

1.12 ACCESS CONTROL SYSTEM

The Project foresees the installation of an access control system using contactless identification cards. This system is to complement the anti-burglary system and provides an entry ban into top priority facilities such as the UPS room, the rack cabinet room on the first floor, the entrance into the building. The entry or passage is blocked using the electric lock on the doors. The system consists of:
- Controller for the control of four readers in a housing with a built-in block for power supply
- Extender in a common housing with a built-in block for the power supply and a controller,
- Controllers, extenders, and power supply are stored in the cabinets of the type AEC AMC2-UL2,
- One rack can hold a controller and an expander with power supply blocks for each,
- A terminal – a proximity reader of contactless identification cards,
- Electrical locks,
- Magnetic contacts and
- A button that unblocks the door.

Exiting the room, or unblocking of a door from the inside, is done by pressing a button mounted next to the door. It unblocks electrical locks and prevents the setting off of an alarm otherwise triggered by a magnetic contact installed in the door. The project
foresees for the access control concentrator to include a power supply unit and a rechargeable battery, so as to ensure the continuous functioning of the system in the case of a power outage.

Access control system is connected to the central computer via FTP cable. The central PC of the access control system is located in the security room. The appropriate software will be installed to secure the full operation of the system.

The system should have the option to be connected to a remote surveillance (DOC center).

Complete installation should be done using the S/FTP cables. The installation to connect all units to a controller should be done with the type Cat. 7 S/FTP 4x2x0.5.

Installations of the access control system are to be laid in part inside the PNK cabinets and in part in the installation pipes.

### 1.13. ANTI-BURGLARY ALARM

The Project foresees the installation of an anti-burglary alarm signal system. The alarm panel is to be installed in the security room where a security guard is constantly present on duty, trained to use central.

**NOTE:**

The following devices are to be installed in the security room:

- PPC (fire central),
- Video surveillance PC and monitors
- Anti-burglary system equipment,
- Access control system equipment.

Under the Technology Project, the security room is intended to be in the area of the terminal. Due to the phased construction of facilities, it is the Investor’s responsibility to find a suitable place to temporarily accommodate all or parts of the aforementioned equipment.

The Project envisages a modern system with microprocessor-controlled central command switchboard. The system consists of a central unit, command-and-control terminals (LCD keyboard-encoder), zonal extensions, detectors, automatic telephone pagers and alarm sirens.

The alarm panel with a single device type will be located in the main rack in the security room, together with power supply. The rack cabinet is of the ICP-MAP0110 type.

Each of the gateway devices ICP-MAP0120 is used for one addressable loop, onto which a maximum of 127 addressable elements can be connected, including: magnetic contacts, motion detectors, extender of the type with conventional sirens. Two gateway units are foreseen, because a future expansion of the terminal is expected.

Connection between the said cabinets, into which the foreseen equipment will be placed, and the command keyboard, will be achieved using cables type JH (St) H 2x2x1,5mm.
Forming the loop from the module ICP-MAP0120 is achieved with cables of the JH (St) H 2x2x0,8mm type.
The power supply cable route follows the route of other telecommunication cables.
The entire system management and control is carried out through a LCD keypad, that is to stand next to the alarm control panel itself.
Within the facility, the following types of detectors are envisaged:
- addressable PIR motion detector
- dual spatial PIR + MW detectors with an anti-masking feature.
The following units are envisaged to be used to set the alarm off in case of a breaking and entering into the facility:
- An alarm siren for indoor use.
- A modem for automatic telephone dialing.
System installations will in part be placed in the PNK cabinet, and in part in the installation pipes of required diameters depending on the airport facilities' operating mode (daytime, nighttime, working hours, locked facility). In this way, individual partitions can be constantly active, whereas others can be partially active.
In the case of an entry of a person into a premise in the zone that features a delayed alarm response, an internal alarm is triggered in the security room. Within a certain period of time, it is necessary to deactivate the system by typing a predefined code on the keypad of the terminal. Typing the correct password results in the interruption of the silent alarm and withdrawal of lines connected to detectors within that partition. If this procedure fails, or if an unauthorized person enters the zone without a delayed alarm response, an alarm siren will be automatically activated.
Simultaneously, a signal of a state of alarm is forwarded to automatic telephone dialers to call pre-programmed telephone numbers and play a voice message.

NOTE:
- Other telecommunications equipment required for the operation of air traffic control, to be purchased by the Investor, and another part of the equipment, to be installed by the Serbia and Montenegro Area Flight Control, are not subject of this Project.