# VOLUME 3

**TECHNICAL SPECIFICATIONS**

**A. ARHITECTURE CONSTRUCTION**

**Position and function**

Special Hospital for Psychiatric Diseases "Dr. Slavoljub Bakalović" is located in Vršac, at address. Podvrsanska no. 13, on cadastral plot number 4973 KO Vršac. The plot is located in the construction area and has an area of 112554m2. Area under buildings, according to real estate sheet no. 13331 as of October 21, 2020, is 17947 m2. In the cadastral register, the plot is registered as other construction land in state ownership.

Access to the plot in question is achieved via plot cat. no. 9842/1 KO Vršac (Podvrsanska street).

Subject extensions is object marked number 20 in list real estate, storeys P+0. U cadastre real estate se this one object leads like the rest buildings - warehouse. Object is in function of the Department of Diagnostics and within it there is an X-ray cabinet and a CT scanner with accompanying content.

For the purposes of modernization and internal reorganization of the medical work, a project for the extension of the existing facility was carried out. Diagnostic imaging and magnetic resonance imaging (MR) represent one of the most modern ways of diagnosing diseases. That is the primary function of the extension.

**Conversion existing object**

In the real estate cadastre, object number 20 is recorded as other buildings - a warehouse. Flooring of the object is P+0. Gross surface of the object is 221 m2 . New function of the object is Department of diagnostics - X-ray cabinet. Within it, there is an X-ray cabinet and a CT scanner with accompanying content. The change of purpose is carried out without carrying out construction works.

As the existing facility does not satisfies current requirements from the field protection since the fire, some of the installations that are being done in the extension are extended to the existing part of the building:

* wall hydrant cabinet with equipment and water supply connection.
* anti-panic lamps with installation
* Fire alarm signaling system

**Extension**

New unit MR planned is like directly connected unit with X-ray department over common communication - incoming hallway. Existing object is located at the end of the entrance hall, and the extension at the other, with a common access road and a canopy. The access plateau and road are used only for medical purposes and possibly personal vehicles that transport patients only to this department.

The planned ground extension with a multi-part gable roof does not affect the existing building in any way and is formed as a dilatational and structurally separate one. The connection of the extension with the existing building is reflected primarily in the functional sense of medical work. Secondary connection is only in certain routes installations that must be added to the existing ones (heating, electro installations, water installation etc). Part installation is planned and like new for both the existing and the new part of the building (hydrant network and fire alarm).

In accordance with the proposed medical-technological solution by the Contacting Authority and potential MRI suppliers, functional are optimized parts the existing one space and equipped for a new function. These works refer to the interior of the reception hall and do not include construction works. New installations are introduced into the existing part of the building: fire alarm, panic lighting and hydrant network.

Traditional and state-of-the-art building materials, ecological, hygienic, sanitary, easily sustainable, non-flammable or highly flammable, long-lasting and bacteriological resistant, were used to create the new MRI space. In doing so, maximum care was taken of the working conditions of the staff and the stay of the patients. The new premises are functionally well connected with the rest of the contents of the existing facility which remain unchanged. The entire extension was conceived as lesser architectural and construction intervention volume and complexity, so it could be implemented even in the near future, while the existing departments perform their functions without hindrance.

**Materialization of extension**

Basic assembly characteristic material buildings includes :

* Reinforced concrete strip foundations and unreinforced foundations of MRI device
* Ground floor system masonry walls stiffened horizontal and vertical cerclages
* Ceiling type fert (lightened reinforced concrete ceiling)
* Two-way wooden construction with roof cover of TR sheet metal
* Partition walls from of brick blocks
* Lowered ceilings
* Outside and internal locksmith from PVC profile with filling from PVC panels or glass 4+12+4 filled with argon

**Walls**

Materialization walls adapted having regard to : function, medical requests, hygienic and sanitary requests, position inside extension like and manner execution of works.

* All constructive the walls are of giter block 25cm and 20cm thick. Facade the walls are also with thermal insulation from hard pressed mineral wool with mineral plaster finish. On a smaller surface, the final covering of the facade is red, embossed facade brick. The foundation walls are made of waterproof concrete. In the interior, these walls are plastered, smoothed and painted.
* Partition walls are built with solid brick or giter block, 12 cm thick, plastered on both sides, finished with ceramic tiles or grout and paint.
* Light panel partitions are formed from double plasterboard or cement plate on a metal structure, with a filling of hard-pressed minetal wool. It was applied only on one part of the facade wall, where the path for bringing in / taking out the MR device is planned, for a major service or possible replacement.
* All linings of installation verticals and manholes in the interior are made of single plasterboard boards on a metal substructure, without filling.

Choice species interior wall lining it depends from purposes premises and can se divide into the following groups:

* In the preparation of the patient and the doctor's room, paint is applied to the plastered and plastered surface. The paint must be hygienically and bacteriologically resistant.
* For specific and more demanding medical spaces, such as the MRI device space, special wall coverings are provided, which must form the so-called "Faraday cage". They must not have any distorting influence regarding the magnetic field formed by the MR device. They are placed on a carefully leveled, masonry base in the form of prefabricated, connected panels. These coverings should be smooth and durable on frequent application chemical funds for washing and disinfection. It is not necessary to plaster walls or ceiling.
* For all sanitary areas and rooms of a similar type, the wall covering are to be class I ceramic tiles, resistant to frequent washing with chemical detergents and disinfectants. Tiles were also applied to all work surfaces and separate, free-standing places for sinks.
* For corridors, communications and other similar rooms, standard plastering, smoothing and painting are applied.
* All other premises are to be painted with semi-dispersive color.

**Floors**

Floors in contact with the ground must be waterproofed and thermally insulated before the final covering is installed. Waterproofing must be done completely, from scratch, connected to the walls and done vertically swaddling everywhere where is necessary. All sanitized nodes should have additional waterproofing of the floor must be carried out over the cement screed. Thermal insulation of the floors should be Styrodur thickness 10 cm. PVC foil protects overall the surface Styrodur from watering when making a cement screed.

A cement screed with a minimum thickness of 6 cm is planned as the basic layer for all floors. The cement screed must be ideally flat and level, lightly reinforced with reinforcing mesh Q138 and must be of adequate strength. This is especially important due to the need for frequent movement of patients lying on stretchers. **In the room of the MRI device, the jacket must not be reinforced classic armature because of magnetic device**. In that room it should be applied synthetic polypropylene fibers for reinforcement (so-called needles). Also, this screed must not have any ferromagnetic content or properties. The same applies to the **non-reinforced concrete floor slab in the MRI room**.

Special constructive reinforcements in the floor they work se only below device MR, where se forms bearing foot according to the instructions of the equipment manufacturer, according to the weight of the device, the method and position of the MR supports. Structural reinforcements must be unreinforced, both in the floor slab and on the screed. Firmness of non reinforced concrete and screed in floor plate in MRI premises should be MB40. The embankment is 0-31 ballast and concrete with a strength of 50 MPa which extends under the entire floor of the MR room.

Choice species the floor it depends from purposes premises and it can be divided on next groups:

* Vinyl homogenous floors, electrically conductive and antistatic, with graphite points and a certain wear resistance coefficient and resistant to chemical detergents and disinfectants. These floors are planned in all medical rooms where there is concentration medical device significant, a sterility mandatory (room MRI). These floors must be glued to a specially prepared substrate with an adhesive that also has electroconductive properties. The grounding methodology of these floors is done through non-magnetic, copper strips.
* Vinyl homogenous floors, with the maximum wear resistance coefficient, are used for all rooms where there is not a large concentration of medical devices, but therefore the frequency of people's movement is high (corridors). The floors of these rooms must be extremely resistant to frequency of use, dynamic loads and resistant to chemical agents for washing and disinfection.
* Vinyl homogenous floors with a higher wear resistance coefficient are used for all medical applications premises and medical rooms with a smaller one concentration medical device and lower frequency of patient movement. The floors of this group must be resistant to chemical agents for washing and disinfection.
* Ceramic tiles as a final coating are applied in all sanitary rooms, where is washing and disinfection mandatory. Ceramic tile should yes be first class with increased wear resistance and impact resistance (increased hardness). The tiles are glued joint to joint without joints, ie with minimal joints.
* Epoxy-based cast floors are used in all technical, mechanical and electrical rooms where basic hygiene maintenance and resistance to wetting of the floor covering is required. It is provided in the technical rooms of MRI, electrical and the room with the device for increasing the water pressure. These floors must be non-flammable and resistant to sparking. Epoxy floors in industry se apply in to all spaces in which require high mechanical resistance, resistance to various types of chemicals, as well as in roasters with tall requests in view hygiene. Also, this one species the floor is extremely convenient for application in spaces in which se warehouse flammable and explosive material. The epoxy floor must also be resistant to chemical detergents and disinfectants. The compressive strength of the floor should be greater than 90MPa, the flexural strength should be greater than 30MPa, and the resistance on abrasion according to Taber - 70.

All floors of medical and other rooms where hygienic maintenance is imperative must have rounded holkers and a rounded connection at the points of connection with the wall, at all protrusions, niches, etc.

**Ceilings**

All ceilings are to be of the assembly-demountable type suspended ceilings. That's it necessary because need of space in between lowered ceiling and mezzanine constructions for the distribution of infrastructure, as well as to provide access to installations due to maintenance and service. Height lowered ceiling from floor is minimum 2.80m to 3.00m. In the smaller cubicles of sanitary units, the ceilings can be lowered to a height of 2.60 m in order to avoid the psychological effect of the shaft.

With all suspended ceilings, walls in the intermediate space and the ceiling must be hygienically treated - plastered and painted/disinfected with pure milk of lime in two coats or with an adequate antibacterial paint.

The choice of suspended ceilings depends on the function of the space, as well as on medical-technological ones demands specific ones content premises. Considering that object is ground level type and above MRI premises there is no other content, specially coating ceiling "Faraday cage" can be avoided, depending on the power of the device. Then it can be apply ordinary down ceiling, along with condition that there is no ferromagnetic content and influence (eg with an aluminum construction that must be connected to the ground).

All ceilings can be divided into following groups :

* Ceilings of the "Amstrong" type made of 60x60cm boards on a metal substructure. This one type ceiling applies se in corridors, medical room, room for preparation patients and sanitary facilities.
* Hygienic panel ceiling with mineral wool core with washable finish and visible substructure. The substructure must be made of aluminum or other non-magnetic material. Dimensions plate are 60x60cm or 120x6cm. Ceiling panels are factory painted with antibacterial paint. This type of ceiling is used in the MRI device room if the height of the suspended ceiling meets the tolerance distance of the device. In the opposite case, a Faraday cage is formed on the ceiling as well. Plastering of the ceiling is not necessary.
* Plastered and painted ceilings se apply in technical premises, that is, there where there are no special functional conditions and where no people live.

**The windows and doors**

All new windows should be made from PVC profile. Windows are to be glazed with thermo-insulating, transparent glass with argon filling.

Planned height of doors is min 2.15-2.20 m because of transport times equipment and device. The height of the door opening must be 215 cm. The width of the door depends on the purpose of the room. Opened width is 120cm, and a minimum of 100cm, is recommended for all doors on the way to the MRI room (for delivery of container for supplement helium and because of easier manipulation of hospital beds). All newly designed doors are made of aluminium profiles filled with glass or PVC panels. All doors are made with bumpers in the lower and middle zones to protect against the impact of hospital beds, transport carts, etc.

**Entrance sliding door is to be connected on fire alarm signalling system.**

Special door and windows for assembly of Faraday's cage are to be installed in the room with the MRI device.

**Installations**

For this facility following installations are planned:

* Hydrotechnical installations: installation of water supply and sewerage for newly formed sanitary facilities and water points; water for secondary MR cooling; hydrant network that will cover both the existing and the newly designed part of the building. Domestic hot water is obtained from local electricity boiler. Water and sewage connections are made to the already existing installation in the building or on the plot.
* Electric power installations (strong current): lightning protection installation; equipotential bonding installation, installation for small and medium power devices, distribution cabinets as well as special MRI equipment. Measurement of electrical energy consumption is existing. All power cables and water installations are to be installed in space above lowered ceiling, and on the walls under the plaster. Protection of cables and conductors against short circuit and overload is implemented by means of fuses of suitable sizes which are placed in the distribution cabinet. Lighting of the rooms as well as panic lighting is planned.
* Electrical installations (weak current): hospital signaling, automatic fire alarm, system ambient sound system, structural cable system - computer, intercom, telephone. The fire alarm installation is also being designed for the existing part of the building. Other installations are connected to existing installations.
* Thermomechanical installations: installation of heating, air conditioning and ventilation. Heating installation is radiator with connecting on existing hospital heating pipeline. Cooling medical rooms and corridors are provided with a multi split AC system. The bathroom is ventilated by an exhaust fan placed on facade the wall. Air conditioning of MRI room, command room and technical room is to be with special chiller or ventilation device type air to air, in accordance with the MR manufacturer's recommendations.

**Outside arrangement**

For planned extension provided for is the following :

* Pedestrian pathway
* Accessible plateau for entry of equipment
* Plateau for chiller device (for MRI) with fenced area for quench
* Access road
* Plateau with canopy
* The pavement and the first two plateaus are made of concrete "behaton" tiles on a layer of sand. The space for the excess discharge of cooled helium (the so-called quench) must be surrounded by a protective fence with a warning and no-access sign.
* Access road and plateau of canopy is to be made of asphalt or concrete.
* The "traffic road" is a one-way road and is used exclusively for the access of vehicles that bring patients to this department (X-ray, CAT scan or MR). The vehicle stops so in way that last part ambulatory car - part for loading/unloading patient is below canopies. One parking space for a vehicle waiting for a patient is also planned.

**Notes**

Individual segments of localities, connections and other special installations, their routes, parts route, capacity installation, external shafts and similar are not defined or there is no data that can be accepted as accurate and reliable.The specifics of the project and various technical details of the MR device and its overall equipment depend to a large extent on the device model itself, so that specific data from the equipment manufacturer must also be included during the execution of the works.

MRI supplier provides Faraday cage, chiller, ventilation and other specific equipment for MRI type to be delivered. Work contractor finishes all the rooms except for the MRI room, which he leaves in the gray phase with an opening for the entry of equipment.

**B.TECHNICAL DESCRIPTION OF THE BUILDING STRUCTURE**

**Construction**: The load-bearing structure is a system with massive walls, fert roof, strip foundations and two-way wooden construction. The newly designed building is separated from the existing one by a 3 cm wide dilation.

**Roof construction** : Rooftop blanket is steel plasticized TR tin coated felt on the bottom side. The roof structure is made of sawn fir wood of class II. The required cross-section dimensions are given on the drawings and in the calculation. From the cerclage, armature fi6 ("mustache") is left at 60 cm, for tying roof wedding hall; this is necessary to ensure the continuity of the static connection between individual elements and to ensure the construction against the effects of wind. All the interconnections between wooden ones elements are realized are usual carpentry ties that must be performed according to the rules of the profession. The connections in the roof tie are additionally secured with M12 screws with washers fi 50, 4 mm thick

**Walls, concrete cerclages and beams:** The bearing walls are thick 25cm and 20cm, made of brick block in extended cement mortar and stiffened with horizontal and vertical cerclages. Vertical cerclage, horizontal cerclage in level of over window beam and inclined cerclages are made from concrete MB20 or MB30, a horizontal cerclage and beams in level mezzanine ceilings are to be made from of concrete brands MB30, reinforcing armature according to calculation. Because of height walls there is additional horizontal cerclage at the height of the lintel of doors and windows.

Partition walls are from brick products built in extended mortar, stiffened with horizontal reinforced concrete cerclage in height lintel. Cerclage is dimension 12/20cm reinforced with +-2 Ø10 U Ø6/25cm. Partition walls must be connected to load-bearing walls.

**Mezzanine construction** : mezzanine construction is type fert, thickness 20 cm. Predicted are fert beams on axis distance from 40 cm and basic armature frame/binary from bars fi 7, MA500/560 and additional reinforcement from ribbed iron rebar RA 400/500. Filling of baked clay blocks h = 16cm, with concreting of the slab d=4cm. In the drawings, the directions of laying the beams are marked with arrows. Reinforce the fert plate with mesh Q131. The concrete is MB30. For ceilings with a span of up to 5 m, give an overhang of l/300, and for ceilings with a span of over 5 m, the overhang is l/200. For ceilings with a span of more than 3 m, a stiffening rib is carried out transversely to the fert beams.

**Foundation construction:** Strip foundations and foundation counter-beams are provided for each other connected fundamental walls and fundamental beams. All foundations is made with concrete MB20 and arming armature according to calculation. At this location bearing soil layer to is not found up to depth from 8 m and it is recommended is replacement soil with gravel. Wide excavation to a depth of 60cm is planned (20cm removal of humus and vegetation and 40cm excavation for taking off very loose soil), then excavation for thorough strips and additional 50 cm for replacing the soil with naturally granulated gravel that is compacted to a compressibility modulus of Ms=20MPa. If the soil differs from the assumed one, the foundations should be redesigned.

Given that the building is being built directly next to the neighboring building, it is necessary to harmonize the depth of the foundation of the building with the depth of the foundation of the neighboring buildings. In case the neighboring building has a shallow foundation (depth less than 0.50m) on a brick foundation, then it is necessary to fill it with concrete. Foundation of the neighboring building to projected elevations the bottom of the foundation. In the case of a greater depth of the adjacent foundation than the depth given in the project, the building should be founded at a deeper level. Excavation and concreting work must be carried out on a camp basis.

**Special requirements:**

It works correct functioning device magnetic resonances they have to se to fulfill next

requests :

**In the room with MRI device, the jacket must not be reinforced because of the magnetic device**. In that one the room it can be applied synthetic polypropylene fibers for reinforcement (so called needles). Also concrete screed should have none ferromagnetic contents or features. That the same applies to the non-reinforced concrete floor slab in the MRI room.

Special structural reinforcements in the floor are made only under the MRI device, where the bearing foot is formed according to the instructions of the equipment manufacturer, according to the weight of the device, the method and position of the supports. Constructive reinforcements must not be reinforced with ferromagnetic materials, both in the floor slab and and on screed. Firmness of unarmored concrete and screed in floor plate of MRI room should match MB40. Embankment is crushed stone 0-31 strength pressured at 50 MPa which spreads se below of the entire floor of the MR room.

For the entry of the MRI device, an opening of dimensions 240x240cm (WxH from finished floor) is left in the side facade wall, which is closed with an assembly-demountable lining or a lining that is easily dismantled in order to leave the possibility of replacing larger parts of the MRI or replacing the entire MRI device with a new one

Based on instructions of MRI supplier openings and channels for installations are made, as well as the foundation for the device itself.

**C. TECHNICAL DESCRIPTION OF MACHINE INSTALLATIONS**

**General**

The scope of the project of mechanical installations of the extension includes:

* + central heating,
  + partial air conditioning with split systems,
  + room air conditioning with MRI device,
  + forced ventilation of the toilet and
  + cooling of the MRI device

**Central heating of the extension part**

In the existing part, there is a hot water heating installation with cast and aluminum radiators as heating elements and a pipe network made of steel pipes. It is foreseen to connect the installation of the extended part to the existing installation.

Aluminum radiators, nominal heights 500 and 800 (hallway), are provided as heating elements. Pipe distribution is made of welded steel pipes according to SRPS EN 10217-2 or equivalent and dimensions according to SRPS EN 10220 or equivalent. The pipe distribution is led along the wall - "under the ceiling" with a rise towards the point of connection to the existing installation where it is planned to install central venting vessels.

After construction, the pipeline is painted twice with the finishing paint. The connection of the radiator is through the vertical from the horizontal distribution and through thermostatic radiator valves with the possibility of presetting (visible reading). The thermostatic valves are equipped with thermal heads (model for public facilities, additionally reinforced, the possibility of limiting and blocking the set temperature value). Each radiator is equipped with a manual valve in the plug for local venting and a nickel-plated tap for filling and emptying.

The temperature regime of the radiator heating system is 80/60 °C. The total heat energy transferred through the radiator is approx. 13 kW (the room with the MRI device is air-conditioned with an independent system).

**Partial air conditioning of the extension part**

The heat gains of the extended part amount to approx. 16 kW. Air-to-air heat pump split systems are provided for partial air-conditioning-cooling of corridors, doctor's rooms and patient preparation rooms. Split systems are also provided for the parameters in the "MRI control room" and "MRI technical room" rooms due to the large heat gains from the equipment. Heat pumps are inverter type and work with R32 refrigerant. The internal units are of the wall type and are placed on the side walls of the rooms, min. 60 cm from the outer wall and min. 10 cm below the ceiling. Outdoor units are placed on facades. A wired controller is provided for work management.

Condensate drainage is through a PVC hose into the gutter or into the PVC vertical. PVC verticals are hidden, under the "demit" facade.

**Room air conditioning with device for mri**

In order to solve the air conditioning of this room, a device is provided that provides heating/cooling and ventilation of the room. The device with heat recovery and an integrated heat pump with available heating/cooling capacity ~6 kW. The device is mounted on the ceiling of the "hallway-waiting room" room. Two filters of class ISO ePM 10 90% and ISO ePM 2.5 80% must be installed in the device. The heat pump is with refrigerant R410A. The device also includes an independent electrical control cabinet, room sensor and a frost temperature sensor. The room is equipped with a fully automatic control of the room temperature, heating/cooling and defrosting. The system works with 100% fresh air when the outside temperature is lower than -5 °C, the share of outside air decreases and the share of recirculated air increases. Air is distributed through channels made of aluminum sheet above the suspended ceiling and through grilles or diffusers installed in the suspended ceiling RF feed through wave guide.

**Forced toilet ventilation**

For forced ventilation of the toilet, the so-called bathroom fans are to be installed. The fans are with an automatic non-return valve. Waste air is discharged via a common flexible hose through the facade wall. At the place of waste air discharge through the wall, plastic blinds are installed that can only be lifted.

**Cooling of mri equipment**

Cooling of MRI equipment with a 30% aqueous solution of ethylene glycol is planned. Heat energy transferred to the water is 4.75 kW (rest state of the MRI device) up to max. 20 kW (during operation of the MRI device). The cooling device must provide an inlet water temperature of 6-16 °C (recommended 12 °C) and a cooling water flow of 3120-4080 l/h.

**D. TECHNICAL DESCRIPTION OF ELECTRICAL INSTALLATIONS**

**Facility connection and electricity measurement**

There will be object, marked​​ number 20 in the list real estate , it is powered by cable water type PP00 4x95mm2 of substations to KPK on facades of the object .

For power supply electric no​energy of the object which is being extended​ to existing​​​ resources complex of Contracting Authority, without increase​ of ​ approved strength . Measurement electric​​ energy is not subject of the project .

Power supply is provided​ by cable, which lead to the new KPK installed on facades built - in of the new object .

Because of absence of KTP whole plot no. 4973 , length​ and route of power supply cable is not certain​ and ​are determined by approx​​ method. Works Contractor should before the start of performance, to confirm​​ with Contracting Authority route of power supply cable.

In addition to the KPK, the KPK-PP is foreseen which is powered device​​ for increase​​ pressure water hydrants network .​​ The cable to the hydrocell is of type NHXH FE180/E90 4x6mm2.

**Internal installations**

For power supply consumer​​​​ inside of the object which is being extended​ it is designed to be distributed cabinet RO-2. Distribution cabinet RO- 2 consists of two parts RO-2/M and RO-2/UPS (UPS). From KPK-2 to distribution cable N2XH 4x95mm2 is installed in the RO-2 cabinet.

Data for RO-2:

RO-2/M

Pi=10.40kW

RO-2/UPS

Pi=79.60kW

Total RO-2: Pi=90.0kW, Pj =81.0kW, Ijm =129.9A

The project envisages​​ alternative the source power supply electric no​ power supply (UPS) for will follow​ consumer :​​​​

UPS 1 – 60kVA

- Magnetic resonance 50kVA

UPS 2 – 30kVA

- Chiller 23kW​

- Recuperation thermal pump 6.6kW

The others consumers​​​​ are powered by network.​​

It works easy​​ and fast orientation in the building especially in case​​​​ hazards in the facility are foreseen​placement of panic lamps lights. These lamps next to the grid power supply equipped are and local source power supplies (Ni- Cd batteries ) with own battery which provides​​ them autonomy of work for 3h

In accordance with current principles energetic efficiency for lighting of object selected lamps the latest generations with LED sources of light.

In the offices sockets are placed in the wall on height 0.4 m from done floor. Connectors​​ are modular mounted in doses of 2, 4 or 6 modules in the wall.

Power supply connector​​ it is made with cables N2XH -J 3 and 5x2 , 5mm2 or another section defined electric no​ with strength consumer , and everything in accordance​​​ with SRPS IEC 60364-5-52 or equivalent and SRPS IEC 60364-5-51 or equivalent. The cables are laid in above lowered​​ ceiling and in wall below plaster.

In technical spaces it is planned “on wall” installation of equipment with IP54 protection.​​ Height installation​​ of sockets is 1.1m.

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**Equalization of potential**

In accordance with standard SRPS IEC 60364-5-54 or equivalent, for whole​ object will have the main rail ​for equalization​​ potential of all electrically conductive parts in the building, connected with foundation grounding, marked​​​​ as GŠ IP. It is planned that an additional GŠ IP will be placed in the technical area. Conductors for equalization​​ of potential are placed in the carrier cables and separate on​places where should connect metal masses in the object (carrier​ cables, pipes and ventilation channels , metal parts of technologies​​ equipment ...).

Mergers between​​ conductor and metal pipes should be performed via​​ clip, and straight metal parts are connected to conductor. The room for magnetic resonance is made in » Faraday's cage «. Special wall coverings from ferromagnetic material, electrically conductive floor and lowered​​ ceiling are brought to the same potential conductors N2XH-J 4 and 16mm2. Door of these premises are connected to equalization​​ potential installation.

**Grounding**

In accordance with SRPS IEC 1024-1 or equivalent grounding is provided​​ by foundation earthing of the object. Foundation grounding is provided​​​ by galvanized strips FeZn 25x4 mm laid in the foundation of object. The tape is embedded in the layer of concrete, and below waterproofing layer. On occasion grounding tape to weld for reinforcement in the foundation on every 1-2 m in length . Installation strips are connected to two G Š IPs rails ​for equalization​ of ​ potential .

Storm lighting protection installation of the object it is not predicted​​ this project.

**System of protection against indirect touch in the object**

As a system protection dangerous voltage touches the TT system will be applied.​ Main equalization​​ potential is achieved by connecting the PE bus distribution cabinet with G Š IP with appropriate cable . As a supplement measure for protection​ FID 25/0.03A is installed in the distributor closet.

**Final remarks**

The contractor is obliged​​​​ to perform all works according to technical regulations All used material must correspond to SRPS, EN and IEC standards or equivalent and. The contractor is obliged​​​ to inspect and testing of installation and submit required attestation.​​

**D. TECHNICAL DESCRIPTION OF COMMUNICATION INSTALLATIONS**

**Technical description structural cable system**

The project envisages a structural cable system that should provide telephone traffic and other telecommunication services. The central concentration of the system will consist of: wall rack concentration cabinet, appropriate sockets, passive part of the equipment inside the concentration cabinet and cable installation.

Note: The connected to the telecommunications infrastructure is not subject of the project.

**Rack cabinet**

The expected concentration rack will be located in the head nurse's room. The wall rack cabinet should be 15HU high, 600mm wide and 800mm deep. The cabinet should have movable sides and back, have glass doors with a lock, ventilation openings. In addition to the above, the cabinet should also be equipped with: the required number of stove panels, brackets for routing cables inside the cabinet, power rails, grounding set. The concentration cabinet has a sufficient reserve of free units for the future accommodation of the active part of the equipment of the structural cabling system, which is not the subject of this project. The power supply of the rack cabinet is provided with a voltage of 220V/50Hz and was processed in the project of electric power installations.

**Sockets**

Cable installation and sufficient number of RJ45 cat 6 sockets should be provided for the local computer network in accordance with the requirements of the Contracting Authority. The communication cables are terminated on the RJ-45 connectors of the rack panel, located in the communication cabinet. The connectors of the stove panel must correspond to the type of installation cable F/FTP Cat. 6. The positions, number of connectors and necessary auxiliary details, as well as cable routes in the building, are shown in the graphic part of the project.

**Cable installation**

Horizontal cable distribution in the building will be realized with telecommunication, halogen-free, installation cables type F/FTP 4x2x0.5mm, Cat 6. A reserve is provided for the cables in the desk for later disposition. For sockets in the field, the cables are placed partly on the ceiling in the PNK 100 rack, and partly through the HF pipes in the wall. All installation is carried out with sheathed cables without halogen elements.

**Intercom system**

The project envisages an intercom system for communication between operators and patients in the magnet area. The project envisages the speech system, which is designed to facilitate conversations between staff and users separated by a glass safety window that prevents the transmission of sound. Conversation should takes place naturally, without the need to press keys or use telephone units.

**E TECHNICAL DESCRIPTION OF FIRE ALARM SYSTEM**

**Note:** As the Honeywell Morley IAS type automatic fire alarm system is installed in the hospital complex, the installed equipment must be compatible with the mentioned equipment for later integration of the system. The project envisages a fire control panel with multiple loops due to the later expansion of the system.

**Fire control center**

The fire control panel is a modern modular microprocessor-controlled addressable fire alarm control panel with 2 loops and 125 elements per loop, expandable to 4 loops.

Power to the control unit must be provided from the nearest switchboard from a special circuit, with a red fuse, as well as through accumulator batteries that take over the power supply of the stable installation without interruption, in the event of a power failure from the electrical network, and the loss of the power supply is signaled by sound and light on to the central office itself. Accumulator batteries are provided with the control panel, which provide backup power for the system for a minimum of 72 hours in quiet mode and 30 minutes in alarm mode in case of power failure.

The assembly of the fire control center is planned in the existing neighboring building. Addressable loops for fire detection, as well as lines for managing fire systems and lines for fire signaling, are connected to the control center. The control panel is controlled via a keyboard with an LCD display, through which monitoring and control of fire loops is carried out. Information is displayed automatically and with priority.

The control unit has functions and outputs that enable the control of signal lines for interruption and short circuit, control of the correctness of the power supply, control of the contamination of automatic detectors. When a fire breaks out, there is the appearance of smoke, an increase in temperature and the appearance of characteristic infrared and ultraviolet radiation. Depending on which of these accompanying effects is expressed in which space, the type of fire detector is selected. In this project, the following types of detectors are foreseen:

- Optical smoke detector, which reacts to visible light and dark smoke. It is intended as a basic type of fire detector and is mounted on the ceiling of the room. In the case of a suspended ceiling, the optical detector is also used to cover the space between the suspended ceiling and the ceiling.

The detectors are connected directly to the addressable loop. The detector has electrical compensation and pre-alarm assessment as standard. It is able to automatically recognize soiling. Each detector also contains a short-circuit isolator, can be switched off separately and is not sensitive to electromagnetic interference. When mounting the detector, it is necessary that the location of the detector is coordinated with the position of other elements that are installed in the ceiling (lights, elements of mechanical installations) and building elements (beams, walls, etc.), whereby: the distance of the detector from the wall should be at least 50 cm, • the distance of the detector from the beam (rib) should be at least 50 cm, • the distance of the detector from the place of air injection should be min. • 50 cm. When laying the cables, in the places where the installation of the detector is planned, the cables should be left in a slightly longer length in order to be able to carry out the aforementioned adjustment. By connecting the detector in the detector loop, greater reliability of the system operation is ensured in the event of a line break. All elements on the detector loop are also equipped with a loop isolator.

**Manual fire detectors**

The addressable manual fire detector is used for manual activation of the alarm in the event of a fire, without checking time, and thus plays a role in fire protection for direct alarming.

**Elements for alarming**

For alarming in the facility, alarm sirens are provided in general communications. Installation of alarm sirens is provided on the wall at a height of 2.2m from the floor or on the ceiling. Power is supplied from the fire control panel.

**Cable installation**

For mutual connection of fire detectors, a standard cable type JH(St)H 2x2x0.8mm is provided, which is placed in a ribbed hose with a sheath without halogen elements.

For alarm sirens and executive functions, an installation cable JH(St)H 2x2x0.8mm FE180/E90 is provided, which is laid under the plaster directly in the wall or on nail clamps at a distance of 30 cm.

The arrangement of elements and cable routes are shown on the drawings in the graphic documentation.

**System executive functions**

* Switching on alarm sirens
* Signal for turning off ventilation on RO-2/M/UPS
* Sliding door opening signal

**Alarm plan**

We use automatic fire detectors to detect fire already at an early stage of development, but it is necessary to include the human factor in the fire detection process, i.e. manual fire detectors.

In order to ensure the full efficiency of the fire alarm system, it is necessary to ensure the constant presence of a person, that is, in case of his absence, to provide a notification to the monitoring center. The man's task is to check the information received from the caller and make the necessary decisions.

There is always the possibility of human confusion, improper actions or the panic factor. Such possibilities must be bridged by technical means, which is why two ways of alarming are foreseen:

* Alarm from automatic tellers i
* Alarm from manual call points.

By using these two independent alarms at the same time, we achieve the highest possible security. In order to eliminate human errors, a third control was developed, which is applied as:

* Reconnaissance supervision.

This third type of monitoring, which takes place at the same time as the first two, is divided into two channels, whereby we have two time delays for each automatic or manual detector alarm. We set these delays to different times. When the person on duty in the switchboard turns off the acoustic alarm, the delay time begins to run - reconnaissance monitoring. We set this delay for a longer time, depending on the distance of the threatened area from the room where the fire alarm central is located, in this case the monitoring time is 3 minutes. For this time, the person on duty must inspect the fire, if possible, put it out and return the control unit to its initial position (reset). If the control panel does not return to its initial position within the specified time, the alarm is automatically transmitted as a general alarm. The 3-minute delay time can be shortened by the person on duty, in case he finds that the fire is of greater intensity, by pressing the manual fire alarm. Activating the manual call point automatically activates the general alarm. The person on duty further acts according to the prescribed procedures in the event of a fire: calls the fire brigade, assists in extinguishing, evacuation, etc. This third principle of supervision excludes the possibility of the alarm falling out as a result of an accident by the person on duty or his illegal actions in the alarming procedure.

**E TECHNICAL DESCRIPTION WATER AND SEWAGE SYSTEM**

The new sewage installation should be made of PVC pipes. Pipes are laid in a trench on a layer of sand, below, around and above the pipe /30 cm above the top of the pipe/, pipe installation control is done with a leveler. It is mandatory to build a trench deeper than 1.50 m. Excavation of the trench is done manually, earth of poor quality is taken to a landfill up to 3.00 km away from the construction site. After the installation of the pipeline and the construction of watertight inspection shafts, test the pipeline for watertightness, with a pressure of 0.5 bar, above the top of the pipe. For the internal installation of sewage, PVC pipes for home installation are provided, on all verticals mount inspection pipes for easier control of the sewer drain. The connection of the new part is made on the already existing route of the sewage network. Equipment connections in the building are quoted in the project and refer to the axial distances from the wall to the pipes.

The new water supply installation is made of PEHD PN10 PE100 pipes for a working pressure of 10.00 bar from the connection to the place where the facility is connected to the water meter shaft and the new connection to the water supply network.**The existing water network does not have sufficient capacity to enable the connection of the hydrant network of this building.**

Water consumption is measured by a new combined water meter type 161 DN 80/20 placed in the water shaft with all the necessary valves and fittings. Pipes are placed in a trench on a layer of sand, below, around and above the pipe/min. 10 cm above the top of the pipe/, the trench is filled with earth from the excavation, and the excess is taken to a landfill located up to 3.00 km away from the construction site. PPR pipes and steel-galvanized pipes for an operating pressure of 10.00 bar are intended for the internal installation of the water supply system, they are installed in the slot and in the wall, under the ceiling with an attachment to the reinforced concrete construction. The pipes must be protected with an anti-corrosion coating and covered with flamaflex, as and hot water installation. Hot water is provided by electric boilers.

The new hydrant network is made of PEHD PN10 PE100 pipes for a working pressure of 10.00 bar for distribution in the ground, while the "upper" distribution is made of galvanized steel pipes. The network consists of two internal wall hydrants and one external overhead hydrant. There is also a room for housing the device for increasing the pressure in the hydrant network, because the assumed pressure is 2.8 bar, which does not meet the minimum requirements.

Testing of the water supply installation at a pressure twice the working pressure should be carried out according to the instructions given in the project, the testing is carried out at the expense of the contractor, the supervisory authority signs the minutes, as well as the test pressure tester.

For all materials used in the construction of water supply and sewage installations, it is necessary to obtain certificates from the manufacturer, manipulation of pipes and connecting fashion pieces according to the instructions of the material manufacturer. All works on the construction of the installation of water supply and sewerage must be carried out according to the project, for a change from the solution given by the project, the approval of the designer is required, which is requested by the Supervisory Authority and the Investor.

**E TECHNICAL DESCRIPTION TRAFFIC ROADS AND OBJECTS**

**Concept of planned department**

The new MR unit is planned as a unit directly connected to the X-ray department through a common communication - the entrance hall. The existing building is located at one end of the entrance hall, and the extension is at the other, with a common access road and a canopy. The access plateau and road are used only for medical and possibly personal vehicles that transport patients only to this department.

**Exterior arrangement**

The following is planned for the planned extension:

* + Sidewalk
  + Access platform for entering equipment
  + Plateau chiller (for MR device) with quench enclosure
  + Access road
  + Plateau with canopy

The pavement and the first two plateaus are made of concrete "behaton" cubes on a layer of sand or concrete. The space for the excess discharge of cooled helium (the so-called quench) must be surrounded by a protective fence with a warning and no-access sign. The access road and the canopy plateau are made of asphalt or concrete. The "traffic road" is a one-way road and is used exclusively for the access of vehicles that bring patients to this department (X-ray, CAT scan or MR). The vehicle stops so that the rear part of the ambulance - the part for taking out the patient - is under the canopy. One parking space for a vehicle waiting for a patient is also planned. Two roads are planned in the project. The first road connects the existing internal road within the complex of the Psychiatric Hospital in Vršac, while the third one provides access for bringing in equipment.

**Road 01** The length of the roadway is 41.45m with one traffic lane 3.5m wide. Road 1 is bordered by a gray road curb measuring 18x24cm. Curbs are intended to be installed vertically with an overhang of 12 cm in relation to the level of the asphalt. Drainage of storm water is foreseen by the project along the left edge of the roadway as the parking lot grows to the access internal road. Pavement construction of road 01 from pr.01 to pr.06:

- AB11 ……………………d=4cm

- BNS22 …………………… d=7cm

- Crushed stone 0/31.5mm ………......d= 10 - 20cm

- Crushed stone 0/63mm ……….........d= 25 - 40cm

Pavement construction of road 01 from pr. 07 to pr. 10:

- AB11 ……………………d=4cm

- BNS22 …………………… d=7cm

- Crushed stone 0/31.5mm ………......d= 10 - 20cm

- Existing concrete col. construction ……….d= 15 - 20cm

**Road 02**

The length of the roadway is 13.10m with one traffic lane 3.5m wide. On this road, a one-way traffic mode is provided, that is, the entry of vehicles into reverse for the purpose of unloading equipment and goods. The beginning and end of the route is at the junction with the newly designed road 01. The longitudinal drop of road 02 is determined by the existing configuration of the terrain and the floor elevation of the existing/newly designed building and amounts to 5.79% next to the newly designed building. The lateral fall is also conditioned by the existing configuration of the terrain and the floor elevation of the existing/newly designed building and amounts to 2.90% next to the newly designed building, and up to 2.70% at the level of road 01. Road 02 is bordered by a gray road curb measuring 18x24cm. Curbs are intended to be installed vertically with an overhang of 12 cm in relation to the level of the asphalt. On the right side, according to the growth of the station, it is planned to make a sidewalk made of concrete slabs d=6cm placed on a layer of sand d=3cm. Drainage of stormwater is foreseen by the project along the left edge of the roadway as the parking lot grows up to road 01.

Pavement construction of road 02 from pr.01 to pr.03:

- AB11 ……………………d=4cm

- BNS22 …………………… d=7cm

- Crushed stone 0/31.5mm ………......d= 10 - 20cm

- Crushed stone 0/63mm ……….........d= 25 - 40cm

Pavement construction from pr.01 to pr.03:

- Concrete slabs ……………...d=4cm

- Sand..... …………………… d=7cm

- Crushed stone 0/31.5mm ………......d= 10 - 20cm

- Crushed stone 0/63mm ……….........d= 25 - 40cm