

VOLUME 3

TECHNICAL SPECIFICATIONS

A. TECHNICAL SPECIFICATIONS

I. ARCHITECTURE

1. GENERAL

1.1 Location

The object is planned to be built on the cadastre plot No. 22/4/2 KO Prnjavor, Municipality of Plav. The object will be built instead of an existing, dilapidated building of Protection and Rescue Service that will be demolished. The location of the object is shown on the Layout.

The new building will use the same road connection, as well as other infrastructure existing on the plot.

1.2 Object - Purpose and Contents

Gross area of the ground floor is 280.50m², gross area of the attic 210.00m², and total gross area of the object 490.50m².

Basis of the ground floor is 20 cm above the surrounding ground level.

Area on the ground floor consists of a garage space for four fire fighting vehicles, with the space of 4.5x10 m for each vehicle, storage, restroom, entry space with the stairs for the attic and the space for the generator.

The attic is accessed by inside staircase.

The area in the attic consists of the corridor, meeting room, bedroom, kitchen with dining and sitting area, dressing room, bathroom, two offices and archive space. The attic has an exit to a terrace on the front side of the object.

The roof is wooden, two-sided, with 25% inclination, covered with trapeze shaped Al boards.

All of the façade openings are metal, with thermo pan glass.

The façade on the object is thermo stiropole d=5cm, with bitumen based finish in color as planned in the project.

1.3 Construction and Materialization

The object is 18.50x13.50m in base, and consists of the ground floor and attic. The total height of the object from foundation point to the roof is 9.60m.

The roof cover is TR Aluminum boards that are connected to the construction over a wooden sub construction made of boards. The inclination of the roof is 25%.

Roof construction is a truss roof, made of II class spruce timber, with dimensions of wooden elements: rafters 12/14 cm, eave beams, lower and upper 14/16 cm, tie beam 14/16, scissors 2x5/15cm, ceiling beams 10/14cm, braces and pillars 14/14.

Horizontal floors dividing construction is a full reinforced concrete slab supported by inside reinforced concrete beams. The slab is 14cm thick, Floor slab since it is not carrying and transferring the weight of the object to the ground is 10 cm thick, and lightly reinforced.

Basic constructive system, the vertical supporting and construction system is a concrete framework consisting of multiple and multi floor frames in two orthogonal directions. In longitudinal direction there are five frames set at the distance of 3,75m; 2,75m; 3,75m; and 3,25m, while in the

transverse direction there are six frames, set at the distances of 3,25+4x4,625m+3,25 along the whole height of the object. Reinforced concrete columns of the framework are 25/25cm, 25/50cm and 25/100cm, while the beams of the framework are 25/80cm, 25/60cm and 25/40cm. The elements of the framework are made at the spot, with breaks in pouring of the concrete at the floor level height, which enables easier supporting of slab and beams, and the continuity of the reinforced steel.

Parts of the façade filling, as well as inside wall, are not supporting elements of the construction, so they are designed with ceramic tiles with mortar and gypsum boards, and are mounted on top of supporting elements, framework beams. It is not allowed to use cement only, but reinforced lime mortar, prepared according to set ratio. Foundations are designed with a series of strips $d=50\text{cm}$ and $B=80\text{cm}$ wide, reinforced with crossing beams. Together they form a solid foundation grid. Foundation strips are made with MB30 concrete, on a thin MB10 6cm concrete layer. Calculated bearing capacity of soil $\text{doz} = 150\text{KN/m}$, soil subgrade quotient $\text{doz} = 150\text{KN/m}$.

All the construction elements are made of MB30 concrete and reinforced with rebar RA 400/500, stirrups GA 240/360 and rebar grid MA500/560.

2. CONSTRUCTION MATERIALS APPLIED

All of the designed materials must be in line with the JUS standards, and controlled and tested, and the contractor is obligated to obtain the attestations. Reinforced concrete are of following characteristics:

for foundations MB30 RA 400/500 BAB-87
GA 240/360

for framework MB30 RA 400/500 BAB-87
GA 240/360

ceiling slab MB30 RA 400/500 BAB-87
GA240/360

Rebar used is of a standard concrete quality, steel C.002/C.0300 for smooth bars of the GA 240/360 type, and ribbed rebar steel C.0550/C.055, and bars RA 400/500-1 or RA 400/500-2. Rebar grid is of MAG 500/560 or MAR 500/560 quality. All of the rebar has to be properly stored, bent and cut. It may not be greasy, dirty or excessively rusty.

3. BUILDING TECHNOLOGY

The whole object is designed for classical- monolith construction on the spot.

4. APPLIED REGULATIONS

In designing of this object, following regulations and standards were applied:

- Regulations for building load - Loads of residential and public buildings JUS U.C7.121
- Regulation on technical norms for construction of buildings in seismic areas
- Regulation on technical measures and conditions for concrete and reinforced concrete (PBAB87)
- Regulation on technical norms for the design and construction works on the architectural structures

5. OTHER

For the control of subsidence behavior of the object, it is necessary to establish min. 4 control points on the outside walls of the object on the ground floor level. Make a zero level reading and after that periodically, especially after the construction of each new level of construction. Take notes of the taken measurements and during acceptance of the object results to be given over to the investor for further care.

II. ELECTRICAL INSTALLATIONS HIGH VOLTAGE CURRENT

1. SUPPLY CABLES

The supply cable to be laid from the power station to the PMO is not the part of this project, but it will be treated by a separate project upon obtaining the permit from the electrical company.

For the backup power system, a contained type generator is designed, with noise protection postament and protection from rain. The generator is equipped with command cabinet for the protection of the generator and automatic start.

The indoor connection is made from the PMO at the property border to the GRO in the object with cables PPOO 4x35mm².

Inside connection cable to be laid inside a PVC pipe Ø110 mm, in a cable trench 0,8m deep. Before the excavation of the trench the route should be marked and compared with the underground installations cadastre, in order to establish crossing points or parallel installation of the designed cable with the existing underground installations.

The whole trench to be excavated manually, without the use of machines, with maximum care and control due to existing installations. The cable to be laid inside a sand or fine granule soil bed 10cm under and 10cm above the pipe.

At 30cm from the ground level a warning PVC tape to be laid in the trench, with “EE kabl, opasno po život” written. Power supply cables inside the object are to be laid on the walls, under the mortar.

All of the supply cables in the object(from GRO to RT-P, RT-S and ATS generator) are non halogen N2XH-J and are laid on the walls, under the mortar.

2. DISTRIBUTION CABINETS

The PMO cabinet is made of polyester, IP-55 attested for protection, and is mounted on the concrete fundament to be made according to the design of the cabinet manufacturer. In the upper (measuring) sector the three phase two tariff active energy meter with the integrated timer is placed. In the lower (connection section) the three pole limiters, copper bars and surge arresters are placed. The connection area must be separately covered with insulated lid, with the possibility to put a seal. The connection of the object and the connection/measuring cabined to be done according to regulation TP-2 EPCG.

Distribution cabinets inside the object are made of 2mm thick tin sheets IP-54 attested. Since the alternative energy supply from the diesel generator is designed, the cabinets are to be divided vertically into two separate fields with own doors.

Main distribution cabinet GRO is placed in the corridor near the attic entrance. The main switch that allows quick and simple disconnecting of the whole electrical system is designed to be placed in this cabinet.

The generator installation has a separate selector switch designed, which allows switching off of this part of installation separately. In the Position 1 the switch allows the powering from the generator, in Position 2 it creates conditions for the servicing of the generator or allows over bridging in case of malfunction of the generator.

For easier malfunction troubleshooting the design provides 3 signal lamps on the doors of distribution cabinets for the indication of network and generator power. If the light is not on that indicates the lack of that phase of power supply. That makes malfunction diagnostics much faster and less complicated.

The distribution cabinets RT-P, RT-S are made of 1,5mm tin sheets IP54 attested. Since the alternative energy supply from the diesel generator is designed, the cabinets are to be divided vertically into two separate fields with own doors.

3. LIGHTING SYSTEM INSTALLATION

The whole installation is of non halogen N2XH-J type 3x1,5mm², N2XH-J 4x1,5 mm² i N2XH-J 5x1,5 mm² cables. The installation is to be performed in the construction phase of the floor slab, by setting of PVC pipes of designed diameter in the slab, which will allow later placement of the cables in the pipes. Out of the slab the cables are laid on walls, under the mortar. The cables in the attic that are placed on the ceiling leading to the lights are to be placed inside non halogen corrugated hose.

The electrical installation material of the garage and the generator room is designed in OG installation, in other rooms to be placed under the mortar. All the switches are placed on 1,2m above the floor, sockets in the garage on 0,6m and sockets on the first floor on 0,4m of the floor level.

The lights on the ground floor are of type BFN-2x36W/T or equivalent, certified to IP-65 Protection.

For the office space and the meeting room in the attic the designed lights are of type BFU/G or equivalent, to be mounted on the gypsum board ceiling. In other rooms of the attic the designed lights are of AURA-38 type or equivalent. The lights on the terrace are of the CHIP TONDO 30 GRILL type or equivalent. In sanitary units the lights are waterproof, fluo, type PA-15.

The two lights and one socket are put into one channel and connected to the low 24V voltage through a safety transformer that is placed inside the RT-P. The lights in the channel are insulation type II attested.

For the lighting around the object the street lights type BSOMT or equivalent with NaVT, 150W bulb and pre connection device. These lights are mounted on a metal console 60mm n diameter, that is fixed to the façade wall of the object on the height indicated in the ground floor situation. Outside lighting is automatically turned off and on, through a lighting controller in the RT-P.

The object has panic lighting system designed. The panic lights are mounted in the corridors and above the entrance. These lights have own ACCU battery that allows 3 hours of independent operation in case of power shortage from the network or generator.

4. ELECTRIC INSTALLATIONS FOR GENERAL CONSUMER

This installation will be made on non halogen cables type N2XH-J 3x2,5 mm² for single phase and N2XH-J 5x2,5 mm² for three phase sockets. Cables to be laid on the walls under the mortar. Cables in the attic that are laid in the gypsum board walls to be placed inside the corrugated hose.

The electrical installation material of the garage and the generator room is designed in OG installation, in other rooms to be placed under the mortar. Sockets in the garage placed on 0,6m and sockets on the first floor on 0,4m of the floor level.

5. INDIRECT CONTACT PROTECTION

Indirect contact protection is designed according to "Rules on technical standards for low voltage electrical installations" (Official Gazette SFRY, br.53/88) and JUS N.B2.741 with the disconnection of the devices in designed time(TNC/S system). As an additional safety measure, the installation of a differential current protection device is designed.

As an additional protection measure, the equalization of potential is performed inside the object. Equalization of potential in sanitary units is done with P/F 4mm² conductors and 20x1mm galvanized steel clouts. In the sanitary rooms the potential equalization box PS-49 is installed, from which the conductor P-6mm² leads to the protection bar in the respective distribution cabinet.

Equalization of potentials covers all the metal masses in the object. For general potential equalization the potential equalization rail is installed with the GRO, connected to the earthing of the object. Conductors P-16mm² are laid from the rail for earthing of the main water supply pipe, sewage pipe and heating system main pipes. Equalization of potentials covers all the metal doors and windows of the ground floor.

Metal door frames are interconnected with P-6mm² conductors, and connected from the nearest spot to the rail in the distribution cabinet. Metal door frames are interconnected with 6mm² copper braid wires.

6. EARTHING SYSTEM

Galvanized steel strip Fe-Zn 25x4mm is used for earthing, laid in the objects foundation with the power supply cable. All of the connections in the soil, as well as the places where the strip is leaving the trench is protected with hot, bitumen based coating.

7. LIGHTING ROD INSTALLATION

Lightning rod installation is designed according to "Rules on technical norms for the protection of structures against lightning "(Official Gazette br.11/96) that is JUS IEC 1024-1 and JUS IEC 1024-1-1 standards.

The object will be protected through installation of the lightning rod. The whole installation is made of standard elements selected by using JUS N.B4.901 to JUS N.B4.950 standards.

To create protection from atmospheric discharges both inside and outside lightning installation is designed.

Outside installation consists of receiving part, vertical conductors and earthing system. The inside installation consists of all the additional measures applied to the outside lightning installation to decrease electromagnetic discharges in the area that is being protected. To decrease the difference in potentials caused by the atmospheric discharge current the equalization of potentials of all the metal masses that can accidentally become live is performed.

The receiving system on the object is the metal roofing of the object, The connection of the vertical conductor and the receiving system is done by overlapping a galvanized strip in the length of 10cm, fastened with two M-12 screws.

Vertical conductors represent the direct connection of the receiving system with the earthing. Galvanized steel strip Fe-Zn 20x3 mm will be used for the vertical connectors to the measuring connections, and from the measuring connections to the earthing Fe-Zn 25x4 mm.

Down the façade wall the strip is laid inside concrete columns as those are poured. At the joining point of vertical conductor and earthing the testing connection is installed. The testing connection is placed inside a metal box, 1.7m above the level of the sidewalk.

For efficient protection from atmospheric discharge the joint earthing is designed, used as integrated and providing complete protection (from atmospheric discharge, protection of electrical installations, and telecommunications' installation). The earthing in the foundation of the object is designed for earthing.

III. ELECTRICAL LOW VOLTAGE INSTALLATIONS

1. STRUCTURED CABLE SYSTEM

Remark: The project does not define the connection to the telecommunication infrastructure. It is designed that reserve PE pipes are placed from ITO cabinet to the outside of the object. These pipes are to be used for later putting the telephone cable through, when the connection is defined.

Construction of a structured cable system (SKS) is designed. It represents a base for the development of the information system of the object.

The installation of the SKS is to be realized in hierarchy levels- horizontal and vertical distribution. The quality of the equipment as well as of the work (all of the cable connections, mounting...) needs to be on such a level to provide reliable, uninterrupted flow of various signal types with speeds up to 200mbps (category 6).

Horizontal distribution represents the connection of the users of the system through the telecommunications socket and the connecting panel within the RACK to the appropriate equipment within the same RACK.

For the realization of the horizontal distribution the designed conductor is copper, four pair FTP Wall cat 6. These cables are to be properly finished at RJ45 cat. 6 connectors on both ends (telecommunications socket/patch panel).

Computer FTP network is a universal installation according to ELA/TLA T-568A standard. This installation is able to support any kind of telephone and computer networks. Project design for the realization of the horizontal cabling defines copper 4line cat. 6 conductors. They should be 0.57mm diameter (23AWG). Project design defines FTP (Folded Twisted Pair) category 6. Standard ISO/IEC 11801 defines maximum length of horizontal cabling of 90m. The designed routes in the object comply with these conditions. When placing the cable with folded pairs one has to make sure that the minimum bending radius of 20mm (four times the diameter of the cable) is respected, as well as the distance from the high voltage electrical installation is at least 30mm.

RJ45 sockets will be modular and built in the modular sets of the suitable capacity. Each socket should have a female 8-pin IEC603.7 modular cat.6 connector for 100-Ω. Sockets are mounted on 0.4m from the floor or in line with other installations. Appropriate FTP cat. 6 cables will be connected to connectors. During installation the unfolding of the folded pairs of the cable on the back of the connector must not exceed 13mm. Sockets represent the spot where the fixed installation of the cabling system begins. On the front side of the connector for the computer socket the connecting is performed by the flexible cable that connects the USER (phone or modem) equipment to the phone/modem system.

Cable concentration ends in a self standing RACK cabinet that is placed at the base of the attic, as defined in the graph annex. RACK cabinet has: cables entering point, front glass door with lock and key, proper ventilation and lighting, power supply width 220V, equipment for earthing and all other necessary equipment. RACK cabinet should be placed in such a manner that the cables are introduced to the back side, and it should be easy to access and service. The space where it is placed should have optimal climate conditions. RACK cabinet is earthed through connecting with the joint earthing rail with a PPOO-1x16mm conductor.

The connection between the ITO and RACK cabinets is done by IY(St)Y 10x2x0.6mm. After complete installation of the system and before its full operation each link should be properly marked with a unique mark, both on the side of the RACK and the telecommunications socket. The constructor has the obligation to test and properly measure all links, together with the supervision. Before commissioning of the system the user should be given the chart of the system links and other technical documentation (the built design) for the management and maintenance of the system.

2. RTV INSTALLATION

RTV installation is designed to enable the reception of all earth and satellite digital programs from the satellites ASTRA (19⁰E) i HOT BIRD (13E).

The antenna system contains of an antenna pole and reception antennas. The pole has to be properly earthed, according to Rules on technical standards for construction, installation and maintenance of antenna devices. Material for the earthing conductors is Fe-Zn2.5x20mm strip as the outside conductor and P-10mm²(copper)as the inside conductor. The conductor for the lightning rod earthing of the object can be used.

On the highest point of the antenna pole the antenna with the weakest electromagnetic field is placed, and other further down according to the increase of the field. The height of the pole should be such that the lowest reception antenna is at the height of 2.5m from the bottom of the pole. The nearest point of the antenna system must be at least 4m from the chimney.

The construction of the antenna pole must provide access to each antenna. The pole is set to provide its full mechanical stability, which is achieved with the anchoring set.

Signals from the SAT antenna are first brought to the Compact Multiswitch amplifier (SMS 91409NF) while the signal from the earth antenna is taken to the MBV 435 device, and from there to the signal amplifier. All these devices, the joined antenna system(ZAU) are mounted in the low current cabinet, placed on the attic. From the amplifier SMS 914409, where the satellite and earth signals are joined, the cables are distributed to the RTV/SAT sockets of the object. distribution network has to be of an open type. Designed network must enable the transfer of a signal in direct flow within the frequency range 40 to 600 MHz.

Cable type is RG6A/U, and it is laid through installation hoses 20mm in diameter, under the mortar, or through slab.

RTV sockets to be mounted on 0.4m above the finished floor level, in an installation box 60mm diameter.

Technical documentation has to fully comply with articles of the rulebook on standards of CATV and ZAS.

3. VIDEO SURVEILLANCE SYSTEM

For the purpose of video surveillance in and around the object the installation of surveillance system color(CCTV) is designed.

The installation consists of central device(video desk VP), outside and inside cameras, cabling and the device for continuous power supply(UPS).

The project plans nine cameras(three inside and six outside). Video desk(VP)is designed in the office in the attic, and consists of one digital video recorder and one professional 22 inch monitor.

Digital video recorder/multiplexer is a computer device specially designed for security industry, and it enables multiplexing and continuous recording from all cameras simultaneously. The recording is saved on a 160gb hard disc, of extreme reliability and quality, with the possibility of memory extension and recording time change.

Special advantage of this system is the integrated motion detector that can be programmed for each scene separately(or for part of a scene, for ex. to cover only the entrance to an object) as well as the choice of the level of sensitivity.

Alarm inputs and alarm relay outputs allow the integration with the anti burglar signalization system or the entrance control and thus increase the achieved level of security.

The managing of the video recorder/multiplexer, i.e. the whole system is done through keyboard on the device, or through a PC connected to the local computer network with the installed software. The connection to the local computer network enables all users(with authorization) to watch "live" or already recorded video footage.

All the devices and cameras are powered by a UPS device, powered from the 220V source with a separate fuse.

Inside TV camera is designed to be mounted on the wall with appropriate mounts, and the inside cameras inside boxes.

The box for the outside camera provides optimal work of camera in all weather conditions. It is mounted on the appropriate holder that is mounted on the wall.

For the transfer of video signal a coaxial cable RG-59B/U 75 is designed, and for the powering of the cameras the cable PPY 2x0,75mm². The cables are placed inside PVC hoses laid on or inside walls.

4. FIRE ALARM SYSTEM

For the purpose of early fire warning system the stable installation for automatic detection and warning is designed. It consists of: central device(PP central) printer, automatic telephone, automatic smoke and heat detectors, manual fire warning buttons, alarm horns and cabling.

Central device(PPC) represents modern adresibl probamable microprocessor station of type similar to AM1000, capacity one responding loop, which provides connections for up to 99 automatic and up to 99 manual signaling devices, control modules, horns etc. PPC is designed to be placed on the attic wall, 1,5m from the floor to the axis of the device.

Powering is from 220V power source with a separate fuse and backup batteries. On the front there is a keyboard and LCD display. It is programmed from the keyboard or with the PC. Device memorises all changes of the system and it is possible to monitor the changes regardless of the functioning of the printer.

For the system protocol the printer is designed, placed on the desk or shelf next to the device. It is powered from the 200V source and connected to the standard printer socket of the device.

Automatic phone is placed on the desk or shelf next to the central device and printer. It is designed to transfer the pre recorded voice message when a fire detector connected to PPC is activated to

one or more telephone numbers(police station, fire brigade...). The same applies when the anti burglar detector connected to the main anti burglar device is activated, with the different message being transferred. The message sending is initiated by programmable relay outputs on the central devices. It is powered from the PPC.

Automatic signaling devices are optical smoke detectors of type similar to NFX-OPT, and addressable thermo differential detectors of type similar to NFX-TDIFF. They are mounted in boxes of type similar to , on the ceiling or dropped gypsum board ceilings. They are connected directly into the addressable loop. To increase the reliability of operation, on every 15-20 detectors the carrier "insulation" detectors(NFXI-OPT)are installed, also in boxes of type similar to B501AP.

Addressable manual signaling devices, of type similar to M700K are designed for installation on the walls, on 1,5m from the floor to the lower edge, on the evacuation exits. Connected directly into addressable loop.

Addressable alarm horns of type similar to AWS32/R are planned for on wall installation, under the ceiling on 2,3m from the floor. They are activated by any signaling device impulse in the entire, or part of the object. It is connected directly into the addressable loop.

Output module of type similar to CMX10RM or equivalent with 10 relay outputs is designed to be installed next to the central fire warning device. This module transfers the executive functions from the central fire warning device to:

- thermo technical, device and automatics cabinets- ventilation, airconditioning and smoke removal
- unlocking the doors with access control and automatic sliding doors
- elevators
- PP flaps

For connecting all the components the designed cable is halogen free SAS0215 HAFEE 2x1,5mm, laid into channels or inside PVC hoses laid on the walls.

For control over the executive functions non combustible cables SSRHFEEU-F3 2x1mm FE180/E30 or equivalent are used.

4.1 Alarm plan organization of the object is as follows:

When a on duty person is present in the room where the PPC is placed, the system works in "DAY" mode. In that case with the triggering of the signal device the internal alarm on the device starts (sound and light). The authorized person disconnects the alarm by pressing "SOUND ALARM OFF" within 20 sec from the start of the alarm ("PRESENCE TIME") Pressing the "CHECK" button the "VERIFICATION TIME" starts to run, which in this case will be 5 min. In that time the authorized person on duty goes to the place where the fire alarm was signaled, puts it out if it is of smaller scale, goes back to the central device and resets it, so that the main alarm and executive functions are not started. If the fire is of a larger scale the person presses the nearest manual signaling button, which stops the "VERIFICATION TIME" and starts the general alarm(the system on fire warning and executive functions are started). If by the elapse of the "VERIFICATION TIME" the central device is not reset the "GENERAL ALARM" starts. By activating the alarm signal from the manual signaling button the "GENERAL ALARM" is immediately started.

When there is no person in charge in the room where the system is located, the system operates in "NIGHT" mode. In that case, if a signal is triggered the "GENERAL ALARM" is immediately activated.

IV. WATER SUPPLY AND SEWAGE

1. GENERAL

The construction that is the object of this design is performed in an area where the infrastructure is existing, therefore the designed network will be connected to the town water supply system, and the sewage network into the town sewage system.

2. WATER SUPPLY

Sanitary and fire hydrant network is connected to the town water supply system with pipes Ø65, while the inside distribution is made with Fluidterm type 3 pipes PPR-random Ø15, Ø20 i Ø25 mm. Hydrant network is made with galvanized Ø65 steel pipes. All of the outside water supply network is laid in trenches inside a sand layer, with the use of all necessary fittings, and fixed with concrete blocks at intersections and turns.

The pipes leading to wall fire hydrants are of galvanized steel, laid horizontally under the ground floor slab. The attic hydrant is supplied by a vertical pipe, set according to fire protection regulations. Fire hydrants to be installed at the defined spots, inside metal casing, with all the necessary equipment.

Water supply network to be tested prior to operation, chlorinated and pressure tested according to regulations for the pipe type.

Fire hydrant network not to be separated from the sanitary network, since it is rarely used and water can become unusable due to stagnancy.

For the measuring of water consumption one meter is designed, measuring small and large consumption, with remote reading, placed in the manhole 2,7x1,2x1,6 with drainage, climbing ladder and cover.

3. SEWAGE

Horizontal and vertical sewage network in the object is made of PVC pipes of diameters Ø50mm i Ø110mm laid in walls and floors of the object. Inclination of the inside network is 2%, and the main outside pipe 1%.

Atmospheric water from the roof of the object is distributed to green surfaces around the object.

The sewage installation must be tested on water tightness before commissioning into operation. All installations must comply with valid regulations and have to be tested before mounting. Revision holes are defined at each necessary location, turns, crossings and connection points to the vertical sewage pipes, so that a possibly necessary intervention is enabled.

Gutters in the garage and mechanical canal are separated from the rest of the sewage system. Waste water from the garage and the canal are taken to the gravitational oil separator, and from there to the town sewage system.

V. FURNISHING OF SURROUNDING AREA

1. LOCATION

The position of the object on the plot is given in the Layout.

2. FURNISHING OF SURROUNDING AREA

Since the object is planned on the place of an existing object the location has all the necessary infrastructure used for the existing object with the same purpose.

Connection to the local road and the plateau in front of the object are asphalted. Asphalt is in good condition so there is no need for additional work there. The existing object, which will be removed,

and the new are of different in dimensions therefore the area of the existing object not covered by the new object is planned to be covered by concrete, together with the sidewalks from the back side of the object. Before concrete work it is necessary to remove earth layer to the depth of 20cm under the level of the existing plateau, cover it with 10cm of tampon layer with compressing.

The proper indents are to be made in the concrete from the gutters, in order to have the water from the roof flow unobstructed to the green surfaces around the object.

At the location, around the existing object, there are 8 fir trees. All of the trees are fit into the project and preserved at present locations. All of the excavation works that are done need to be completed with returning the green areas into previous condition, flattened and cultivated.

On the asphalt plateau 6 parking spaces are to be marked, according to the project design.

B. TECHNICAL REQUIREMENTS

I. ARCHITECTURE

1. CONSTRUCTION WORKS

The price offered by the contractor (and accepted by the contracting authority) has to be calculated precisely according to the conditions and descriptions from this technical requirements, norms, standards, and technical standards.

The calculations, descriptions of work, necessary additional works are to be performed according to the following standards:

- AVERAGE NORMS IN CONSTRUCTION INDUSTRY
- TRADITIONAL NORMS(EXPERIENCE) IN CONSTRUCTION INDUSTRY
- TECHNICAL REQUIREMENTS FOR FINISHING WORKS IN CONSTRUCTION INDUSTRY

General provisions for construction works and general requirements for specific works, norms and technical regulations are mandatory for the constructor, regardless if they are specifically mentioned in the description.

Without specific remarks, always calculate in the price

- All of the BoQ works, materials and procedures
- Procurement and transport to the site of all the necessary material
- Taking measurements, recording and applying the measurements necessary for the works
- All necessary vertical and horizontal transport on the site
- All preparatory, auxiliary, following, service and finishing works according to the norms and general provisions including the material
- Cleaning of place of work after completion or interrupted work and taking out the left over material out of the site, unless specific conditions are envisaged for the position (meaning the leftover spare material created by normal work, in case of demolition or dismantling the material is to be driven away)
- Full damage protection of all existing or earlier completed works, installations and elements of the interior. All of the increases of the working time caused by the difficult working conditions
- Taking measurements and calculations made upon the investor at any stage of the works
- Nourishing of the built in and stored material in extreme weather conditions.

All used material has to be of required quality, attested. Attests are provided by the contractor, and they are a part of the construction site documentation that remains with the investor.

Works have to be performed exactly according to the design, and regulations and norms. If the contractor performs certain works with the quality or material that is not satisfactory, he is obliged to repair those, at his own cost within the given deadline. If the works are done in the higher quality the investor is not obliged to pay the extra price, if this is not agreed upon.

Investor (supervision) has the right to request all kinds of tests of the works and materials if the quality is doubtful, at any stage of works. In this case a committee is formed with representatives of both parties, strengthened if necessary with neutral experts or a specialized company. The costs of quality control are covered by the constructor if the doubt proves to be right, or investor if wrong.

Possible additional or unpredicted works or changes in works must be reported in advance. In this case the constructor is obliged for additional offers and contract and upon request by the investor has to calculate prices in accordance with the above mentioned regulations. All the changes have to be approved by the designer or investor (supervision).

Works performed by the contractor without the technical documentation will not be calculated or paid if not approved in writing by the investor and supervision.

The constructor has to remove the construction waste upon the request of the investor (supervision). Such a request may come at any time, due to the piling up of waste that prevents circulation on the construction site or for protection of already performed works.

All the removed material belongs to the investor, and the cases in which the transport of that material from the site is paid are specifically listed.

All material, works and the whole construction site needs to be protected by the constructor at his expense, until final takeover. The constructor has to apply all the general, specific and internal HTZ and PPZ rules.

The calculation is made based on performed and accepted works.

1.1 PREPARATORY WORKS

Before starting the construction works on the object or the location certain demolition and dismantling works need to be performed. The constructor may not begin any other works until all those demolition and dismantling works are completed, except if directly requested by the designer or investor. The elements that are to be removed are calculated with moving to the spot where no works are planned. Therefore the unit price should contain works on all bigger demolition works that have the function to connect the old and new elements or are necessary in order to perform some of the planned work.

Special waste disposal spots will be arranged for each constructor and those will have to be emptied according to the dynamic plan made by the designer. All of the constructors will have to sign the acceptance of this obligation. Discrepancies with the dynamic plan is allowed only with the permission or upon the request of the designer or investor.

The contractor has to secure (by supporting) the cutting through walls wider than 90cm and digging trenches deeper than 2,0.

The constructor has to build a fence around the construction site and to obtain necessary documentation for the start of the works.

1.2 EXCAVATION WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, GN. 200 norms and technical regulations exactly according to design.

The price of positions includes also the following works, with material, without mentioning in the text

- Taking care of the surveying marks (permanent and for the object)
- Marking of necessary profiles and levels for work purposes
- Draining of surface water regularly, with no damage to the excavation
- Supporting the excavated sides of more than 1,5m with work and material according to GN. 601.
- Additional constructions for the removal of the material
- Compulsory geomechanical control of the excavation before foundation.

Possible over excavations the constructor has to fill in with gravel or concrete, upon request by the investor.

Investor(supervision) or geomechanic may request the final layer of earth(cca20cm) to be excavated immediately prior to founding, without compensation, if it is established that this is necessary.

Widths of the excavations that the constructor needs to respect are calculated as minimal needed for the unobstructed works, as:

- For the elements where the concrete is poured without scaffolding exactly the width of concrete
- For the elements where the concrete is poured with scaffolding plus 0,5m to the width of the concrete
- For the wide excavation, taking of the surface earth layer etc. plus 0.1m to the dimensions of the object.

The constructor has to include in the price the risk of the factors that could not have been predicted(underground installation lines, unexpectedly hard soil, ground water etc.)

Enlarged widths caused by the working methods, technology or inclination of excavated sides(to avoid supporting) will not be calculated either in excavation or filling in or removal of material. Regulated widths and depths, noted at certain positions are not measures for the excavation, and serve only as classification. The calculation is performed at the documented quantity of performed works, measured prior to, and after the excavation.

NOTE: before the excavation works for the foundations the surveying and marking of the object is to be performed. Obtaining of necessary documentation on possible underground installations. All the excavation works are calculated for the object, therefore the already performed work will not be taken in consideration.

Geomechanical supervision of works is obligatory.

1.3 CONCRETE WORKS

All the works in this norm group have to be performed completely, as listed in specific positions, general requirements, norms GN.400 and technical regulations. Exactly according to design, statics calculations and reinforcement details.

Reinforcement details are also the scaffolding plans with marked dimensions

The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Building in of necessary anchor elements
- Nourishment of concrete
- Construction site transport

With specific notes next to the positions the price always includes:

- Construction, setting up moving and dismantling of scaffolding with necessary support with work and material according to norm GN. 601.

The constructor has to take care of building in (and procurement) of different connection and anchor elements into the concrete, regardless where those are calculated as material. It is the obligation of the constructor to establish all the data for this purpose prior to start of the works.

Pouring the concrete in unfavourable weather conditions is not allowed. Use of additives as a consequence of working conditions or constructor's technology will not be paid if not necessary, and agreed upon in advance. The calculation is done based on the measured quantities of performed works.

The constructor should include in the price the works on establishing the connection of the new concrete elements with the existing object structure, or additional demolition works that are needed for the concrete works to be performed properly.

It is the obligation of the constructor to inform the supervision prior to pouring of the concrete, in order to check the reinforcement and scaffolding prior to pouring.

1.4 REINFORCED STEEL WORKS

Reinforced steel to be cut and bent manualu or mechanically. Manual means use of tools and mechanical means use of electrically propeled machines. The reinforced steel prepared for setting up need to be clean, with no rust and dirt and if the work is needed to obtain this it is not extra paid. Calculation is based on 1kg of built in steel calculated by theoretical lengths and weights from the reinforced steel sketches and plans.

1.5 MASONRY WORKS

Masonry works to be performed in all according to design. Possible changes in materials used or construction methods during construction have to be made only with written agreement with the designer and supervision.

Brick used have to be of quality, and according to JUS standard
Brick laying to be done in fully horizontal lines with 1cm splints filled with mortar. the mortar must be made in exact proportions marked in positions and quality has to fullfill JUS standard. Sand used has to be clean without organic substances. Lime should be good and properly stored, with quality according to JUS standard.

Newly built walls need to be protected from the influence of high or low temperatures and bad weather. Plastering of walls should be done on dry walls, with favourable weather conditions. Before plastering the bricks must be clean and splinters not filled in so that the plaster is better connected to the wall. Special attention to be given to concrete surfaces- they need to be clean before the plastering and sprayed with liquid cement mortar. All plastered surfaces have to be flat and smooth, without waves, and edges straigth.

All mortar to be made according to given proportions, mixed well and compacted without any impurity.

The constructor has to do all the works in this Svi malteri moraju biti spravljani kako to predviđaju date razmjere, dobro izmješani do kompaktnosti i bez primjesa koje ne pripadaju malterima.

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, GN. 301 norms and technical regulations exactly according to design.

The price of the positions(or separately distibuted) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transffering of measurements necessary for the works
- Construction site transport
- Construction, setting up moving and dismantling of scaffolding with work and material according to norm GN. 601.
- Calculation is based on the measured quantities of performed works

1.6 INSULATION WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, TU.XV., JUS.U.M3 norms and technical regulations exactly according to design

- The price of the positions(or separately distibuted) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Construction, setting up moving and dismantling of scaffolding with work and material according to norm GN. 601.
- Construction site transport

Calculation is based on the measured quantities of performed works

Note: Special attention to be given to insulation of gutters, toilet seats and doorsteps on the bathroom, toilet and balcony doors.

1.7 CARPENTRY WORKS

All works to be done with dry wood(fir, pine etc.) and according to the position's description. Used timber has to be according to JUS-a D.A O. 020 standard. Roofing to be done with proper profiles according to the design, with all the fittings and anchors. All additional works not designed will not be calculated. Lathing of the roof to be done with proper material. Roof construction is calculated per m2 of the horizontal projection, and lathing per m2 of the projection with roof inclination.

The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Construction site transport

Calculation is based on the measured quantities of performed works.

1.8 ROOFING WORKS

All the works to be done according to given details in the design and with high quality materials. Works include construction of the finishing layers of passable and impassable roofs.

Price includes procurement and installation of all necessary materials, additional elements and tools for these works. All the works preceding the roofing works have to be done in sequence and according to the design.

Before the roofing works the control of the quality of performed works that can affect stability, quality and durability of material that is built in needs to be done, and the findings recorded in the construction diary.

All materials used for the roof surfaces have to be functional, suitable by their characteristics shape and color to the designed conditions.

All the material used has to have atests provided by the manufacturer.

It is necessary that the works on the roof are done by a company specialized for these works.

Calculation for these works is done by m2 of the performed roofing works.

1.9 STEEL SHEETING WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, normama TU.XVII. JUS.C.B4.081 JUS.C.E4.02 norms and technical regulations exactly according to design. The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Formation of all necessary steel sheet connection elements and additional materials.
- Construction, setting up moving and dismantling of scaffolding with work and material according to norm GN. 601.

- Construction site transport

Calculation is based on the measured quantities of performed works

All the preceeding works have to be completed in order to have the steel sheeting works to be performed under normal conditions. Metal parts that are in direct contact with the galvanized steel sheets have to be galvanized, or coated with led sheets. Nails have to be of the same material as the steel sheets. All surfaces where the sheets are laid have to be flat and ready for work, in case of concrete and mortar wooben bar are to be laid, as well as roofing paper, which is separately calculated. Riveting and soldering is performed at areas where full waterproofness is required. All sheeting wider than 50cm have to be equiped with trapeze shaped wooden boards at the distance of 50cm. Areas covered up to 50cm tto be riveted and soldered. All battens to be 3cmwide, with the distance from the wall 4cm, edges to be tightened to the wall with galvanized wire and nails at the distance of 25cm. With widths over 50cm fastening to be made at the middle of the wall. At windowsills tin sheets to be bent over for at least 4cm and fastened with nails at each 5cm.

Note: All coating to be done on a bed of wooden boards 4cm thick. Tin sheet fittings to be made of the same material and fastened to the concrete wall surface, with screws. Take special attention to watertightness of the connections of tin sheets, both longitudinal and at the fitted pieces.

1.10 CARPENTRY WORKS (DOORS AND WINDOWS)

Procurement and installation of inside doors. Door frames made of solid wood. Door wings, that is fixed to the wall with steel anchors and the connection points are filled with poliurethane foam and covered with a batten. Painting with industrial polyutethane paint. Rubber ptotection from impact to be placed on the floor. Fitting sand locks(with three keys) to be suitable for the intended purpose. Calculated per piece of completely installed doors in the object. Colour as choosen by the designer.

Calculated per piece, the price including:

- procurement
- construction,
- transport
- installation

Measurements to be taken on the spot.

1.11 LOCKSMITH WORKS

1.11.1 Facade PVC windows

Facade windows are made of five chamber box profiles, brown colour. Installed on a blind frame, anti corosion protected. Double low emitting glass(6+12+6mm). Woterproofing with neoprene seal. Quality fittings to be used, uder the window aluminum or PVC sill on the inside and outside.

Calculated per piece, the price including all of the described: procurement, transport and installation with fittings and frame inside and outside window sill. Measurements to be taken on the spot.

1.11.2 Fences and other

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, normama TU.XVI, TU.XX, TU.XVIII, TU.XI norms and technical regulations exactly according to design.

The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Installation of frame elements according to GN.301 i GN.601 norms
- Installation of covers according to TU.18.
- Preparation, technological production and development of details for the window sistem given in the guideliness of description.
- Construction sie transport.

Calculation based on the measured quantities of performed works. More detail under the position.

1.12 CERAMICS WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, GN.501 TU.IX JUS.U.011. norms and technical regulations exactly according to design.

The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Making samples
- Preparation of the surface.
- Construction, setting up moving and dismantling of scaffolding norm GN.601.
- Construction site transport.

Calculation based on the measured quantities of performed works

Tiles to be laid without gaps. The price includes the installation of a gutter bar on the floor in the midle of the tile and installation of switches and sockets in the midlle of a wall tile. Also calculate the PVC finishing battens.

1.13 FLOOR LAYING WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, GN.691 TU.XIII, TU.XIV JUS.U.F2.016, JUS.U.F2.017 norms and technical regulations exactly according to design.

The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Making samples
- Preparation of the surface.
- Construction site transport.

Calculation based on the measured quantities of performed works

1.14 PAINTING WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements, TU.X., TU.XI., JUS.U.F2.013 and technical regulations exactly according to design. The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Making samples
- Preparation of the surface.
- Construction, setting up moving and dismantling of scaffolding norm GN.601.
- Construction site transport.

Calculation based on the measured quantities of performed works

1.15 FACADE WORKS

The constructor has to do all the works from this norm group, as specified in the description of positions, general requirements and technical regulations exactly according to design. The price of the positions(or separately distributed) has to include also these works, with material, without it being mentioned directly in the text:

- Marking surveying and transferring of measurements necessary for the works
- Making samples
- Preparation of the surface.
- Construction, setting up moving and dismantling of scaffolding norm GN.601.
- Construction site transport.

Calculation based on the measured quantities of performed works

The performer of facade works has to strictly follow the dynamic plan made by the designer/supervisor and allow other performers of works to use the facade scaffolding for 3 working days upon completion of facade works.

1.16 VARIOUS WORKS

Various works contain all those works on the object not listed in any of the categories and have to be completed prior to technical acceptance and takeover of the object.

II. HIGH VOLTAGE CURRENT INSTALLATION

2.1. TECHNICAL REQUIREMENTS FOR LIGHTING AND SOCKET INSTALLATION

1. Drilling and cutting of steel reinforcement and columns can not be done without approval from the supervision.
2. When laying cables into pipes all conductors belonging to the same circuit have to be placed in the same pipe.
3. Connecting of conductors may only be done inside cabinets, batteries and installation boxes.

4. Metal protection of cables and metal installation pipes can not be used as a return or protective conductor.

5. Tubes, cables and cable lines are to be laid only in straight lines, horizontally or vertically. Inclined or bent laying can only be exceptionally allowed. At horizontal installation the cables should have a mild inclination toward the sockets or boxes. Not connected ends of metal tubes have to be covered with insulation material.

6. Tubes laid in the floor or on wall can not be covered with material that can cause corrosion.

7. Placement of cables into tubes has to be done in such a manner to provide easy pulling out, except in cases that are directly described in the project design.

8. In each circuit the neutral conductor has to be different in colour from phase conductors. Protection conductor has to be yellow green. The yellow green conductor can not be used for other purposes.

9. Installation of distribution boxes of shafts is done with the space of 6cm between two, or according to specific conditions.

10. One distribution box or shaft can contain conductors from various circuits.

11. Switches and fuses are set only with phase conductors. It is forbidden to interrupt the neutral and protective line.

12. In dump spaces use only waterproof equipment.

13. Mounting of cables on the walls can be done only with spacing colars on the distance of 15cm for the conductors diameter to 1,5mm, 40cm for diameters from 2,5-4mm and 50cm for diameters larger than 6mm².

14. Traversing of cables through inside walls separating dry from dump rooms has to be done so that the water can not enter the tube, or to collect in it. The tubes should be of waterproof material, and set with inclination towards damp room. When laying the tubes through outside walls the inside space is considered dry in comparison with the outside area.

15. When passing through the wall between dry and wet room the conductors have to be protected and finished in the dry room with the insulation material for wet rooms.

16. Connections of conductors not to be done by twisting together, but with the use of clamps.

17. Conductors belonging to the same low voltage circuit have to be laid inside separate installation tubes. When parallel laid the lines to be distributed as:

- closest to the ceiling telecommunication lines
- 10 cm under signal lines
- 10cm under energy lines

18. Distribution boxes on these lines are placed under inclination, 45°, one under the other. At the intersections of lines with conductors belonging to the other types of installations the crossing should be under straight angle, and between the conductors there should be 10cm distance. If this is not possible, than an 3mm thick insulation material implant is set between the conductors.

19. Parallel laying of cables with smoke pipes or heating pipes should be avoided. When this is not possible, lines should be set at a distance of 5cm. At the intersecting points between conductors and smoke channel there should be at least 3cm. Installation lines should be protected from heat with proper thermal insulation.

20. Switches and sockets are placed inside installation boxes. Parts of switches not live have to be made of insulation material.

2.3. SPECIAL TECHNICAL REQUIREMENTS FOR THE INSTALLATION OF THE EATHING GALVANIZED STEEL STRIP

1. For any type of earthing the material used is hot galvanized steel, with specified dimensions. Use of other materials if not allowed, due to short durability(aluminum) or shortage in supply and price(copper)
2. When expanding the existing earthing systems use the same material of which the existing system is made, in order to prevent electrical corrosion when connecting different materials.
3. Standard material for the construction of earthing is galvanized steel strip. strip used for earthing system has to be at least 100mm² diameter aand 3,5mm thick due to resistibility to corrosion.
4. The use of striped(ground) earthing is determined by specific resistance of the soil and the distribution of conductivity of the soil. Strip earthings are used at the terrain where the groudng level is of the highest conductivity.
5. Earthing should be installed as follows:
 - marking of the path
 - excavation of the trench at least 0,8 m deep
 - laying of galvanized steel strip and creating exit points from all the places where the connections to the earthing are.
 - making of underground connections with standard elements and screws
 - protection of all connections(especially welded) against corrosion with bitumen based coating
 - covering of the trench in layers with compressing, flattening of the surface and returning to previous state(grass surfaces, concrete surfaces, asphalt)
 - measuring of the transitional resistance and attesting
6. At places where the earthing strip is set in the same line with the cable, by rule the strip is laid under the cable, in an indent on one side of the trench, than that side is covered with soil, and laying of cables is done.
7. All the connections at intersections of the strip to be done with standard connection elements, or with at least two galvanized screws. In case of welding, the connection should be protected against corrosion with a bitumen based coating.
8. All outlets from the earthing are made of the same material as the earthing.
9. Conection of the outlets to the objects that are earthed are done with removable connections, so that the measurement of transitional resistance or test of connection of the object with the earthing system can be done at any time,
10. At places where the outlets are in a position where mechanical damage is possible, they should be protected by placing into insulation tubes to the level of at least 50cm above ground.
11. Upon completion of works measurement of transitional resistance from each outlet should be done, in order to establish possible disconnection of an outlet or poor connection to the earthing system.
12. Results of the measurements are to be entered into a record, signed by the contractor and the supervisor.

III. LOW VOLTAGE ELECTRICAL INSTALLATIONS

1. These technical requirements are an integral part of the design, and the contractor is under obligation to respect those when performing the works.
2. Installation should be done fully in line with the drawings, BoQ, technical requirements, and legal regulations for the works on low voltage electrical installation
3. All clarifications of the design are the responsibility of the supervision, or in case of misunderstanding, the designer.
4. The contractor should inspect the design prior to beginning of works and all clarify all possible remarks with the supervision and investor, and make record of that in the construction diary.
5. Before the beginning of works, the contractor has to, in coordination with the supervision and contractors that do other works make a time and dynamic plan for the works, which will be strictly followed. For any discrepancy from these plans the contractor has to have a written consent of the supervision. If that is not the case, in case of damage done to the investor, the contractor is held responsible.
6. If there is a need for a change of plans of any kind, the contractor has to obtain the written consent of the investor. Changes that affect the basic elements of the design can not be done without the approval of the designer.
7. All the material and equipment used in this type of installation has to be of I class quality, and fully comply with applicable standards for the type of material or equipment. The contractor has to change all the material or equipment that is proven not to be of the desired quality and in line with the standards, at his own expense.
8. the contractor has to make all equipment or part of the equipment which he is making himself with all the necessary documentation, and to get the approval for it by the supervisor prior to installation.
9. if that is not done, the contractor has to, upon the request of the supervision, and without extending the deadline, make all the necessary changes or replacement of the supplied and installed equipment.
10. The contractor has to do all the works professionally, cleanly in solid quality. All the shortcomings, if found by the supervision, need to be removed in the shortest possible time and at the expense of the contractor.
11. The contractor has to perform all the necessary measurements during and upon completion of the works, and give signed attests to the investor.
12. The contractor should supply the investor with the valid and stamped warranty certificates for all the installed equipment.
13. the contractor should remove all the shortcomings verified by the technical reception commission at the shortest possible time and at his expense. If the work of the contractor proves to be of low quality, or does not want to correct the shortcomings, the investor has the right to find another qualified organization to rectify the shortcomings, at the expense of the contractor.
14. The contractor guarantees the proper functioning of the installations for two years from the day of technical reception of the object. Within the warranty period the contractor has the obligation to remove all the damages that may appear due to poor quality or nonsolid work.
15. If proven that some shortcomings of the installation are caused by unconscionable operation or overload, the contractor should rectify the shortcomings at investors request, charging the realistic price.
16. For all not listed above, the contractor should apply the regulations and standards in force.

IV. WATER SUPPLY AND SEWAGE SYSTEM INSTALLATION

1.0 WATER SUPPLY

1.1 Scope of Work:

All the works described in BoQ: procurement and transport to the site of pipes, connection elements and other material, sorting, cutting and connection of water supply network. All the works and material have to comply with JUS standards, and approved by the supervision. The contractor has to look into the design carefully, check all of the measures and compare with the design measurements, check and rectify the list of material, before the procurement of material the approval of supervision has to be obtained, and the material needs to be stored at a suitable place. This is also valid for the equipment needed for the works.

After this the contractor has to make a design for the construction of water supply installation. The design should contain the complete installation and all the necessary connection elements, and the organization of internal transport of material. Only upon approval of the supervision the installation of material can start. All the materials not included in the BoQ, but necessary to guarantee safety of installation will be completed fully. Additional payments only if approved by the supervision. .

1.2 Technical description and design

All installation works have to be performed according to the attached drawing, but if some parts are not mentioned or omitted by mistake, they will be completely performed as if they are included in the mentioned parts of the design. Every change needs to be approved by the supervision. The contractor has to make the design of completed installations.

1.3 Work contents

Works described in the BoQ contain: purchase, transport installation of pipes and other material and equipment designed on the water supply network. The insulation of network with pressure testing, disinfection and chemical and biological analysis of water samples taken from the completed installation in the object.

1.4 Technical description and design

Any work for the installation of the water supply network in the design not described in the specification i.e the BoQ, and necessary for the safe operation of the system will be done as if it completely described. The layout of the pipeline, connections and equipment are shown in the drawings and need to be followed to the maximum extent possible, in line with aesthetic criteria. Accurate and precise setting up of pipeline provides easy access to it and enables it not to intersect with other installations.

1.5 Material and installation

Before ordering any material and equipment, the contractor has to present for the approval of the supervision three sets of drawings for the installation with the complete list (with a carbon copy) of all the material, fittings and equipment to be used. The contractor needs to obtain all other detailed information about the material and equipment that may be asked for. Approval for the material is based on the declarations of the manufacturers. Any material, fitting or equipment not in line with the specification and the description from the BoQ can be denied. Any material not in line with the JUS standard can not be used.

The contractor has to arrange the timely supply of the material and equipment that can not be found on the domestic market. The requests for the extension of the deadline or change of the material will not be taken into consideration if caused by the contractors poor planning.

1.6 Installation of the water supply network in the object

Connection lines need to be installed in a straight line with a small drop in inclination from the object. The depth of the connection pipeline is defined in the design of the outside water supply system.

The network is laid under the floor of the object at the depth of 30cm. The passing through constructive walls is performed by passing through a protective tube 0.4mm wider than the outside diameter of the pipe. The space to be filled with plastic sealant and ends covered with cement mortar. Vertical lines with branches on the floors are laid visible. Pipes to be fastened to the wall on each 0.5 m with fastening clips. Pipes not to be touching the walls, but at a distance of 2-3cm from the wall surface. Vertical shall be placed under the plummet, and the horizontal branches slightly inclined to the vertical.

1.7 Pipes

Pipes for the pipeline to be used are Fluidterm PPR-Random type-3 of highmolecular weight, according to JUS standard. Testing pressure 12,0 bar.

1.8 Connecting of Fluidterm pipes

Connections to be made by welding with simultaneous heating of two elements that are to be connected together. When the welding temperature(230-250°C) is reached the elements are pressed together, which creates a firm connection. Connections have to be done according to JUS i.e DIN standard.

1.9 Mounting

Outside connective lines of the pipeline at the exit from the object will be laid at 0.8m depth in the ground. The pipeline in the object will continue at 0.3m under the ground floor. All the work at laying and mounting of the pipeline to be done in a manner which will enable easy acces for repair and replacement

Vertical and horizontal branches are mounted on the walls, with pipes at 2-3cm from the wall surface. All fastening elements mounted on the wall after placing protective fittings.

All pipes passing through walls or that are visible have to be protected to prevent condensation. Pipeline to be fastened to the wall with steel clams and thermically protected

All works to be carefully planned to avoid future damage to the construction. Upon aproval from the supervision the the actual length of the installed pipeline can be measured. All necessary additions to be done in the same manner if not shown in the drawings. If any drilling of the walls is needed, it will be done with the approval of the construction designer and the drilling has to be performed with extra care. All the eventual damage done woul come at the expence of the constructor. During installation all open ends to be covered with protective covers. Apon completion of works everythign should be well cleaned. Tested for test pressure, after that disinfected and washed , and analize the samples taken from the taps after which the pipeline can be commissioned into operation.

1.10 Inclinations

All horizontal lines to be laid with the inclination towards vertical lines of minimum 2% to enable emptying of the network and prevent air cumulation in the pipes.

1.11 Fastening of the pipeline to the construction of the object

Horizontal and vertical fastening of the pipeline to the construction of the object to be done only with low PVC clams, with rubber or plastic pads. Material for the clams according to JUS standard.

1.12 testing of pipeline to test pressure

testing to hidroulic pressure to be done at 12,0 bar according to JUS standard. The set pressure to be kept for 1 hour or until inspection of all the connections. Testing the network to be done sequentially within 2-4 hours.

1.13 Insulation

Fluidterm pipes PPR-Random type-3 of high molecular weight are laid in the ground outside the object and under the ground floor need to be thermically and mechanically protected in the following manner:

Parts of the pipeline in the walls or outer floor that have straight length longer than 2m need to be coated with insulation that prevents noise and condensation. At the spots where the pipes can be subject to frost it is necessary to provide space for styrofoam or polyurethane for the possible expansion of the ice. Before covering of the trench the pipeline needs to be approved by the supervision and prove the presence of the insulation. Vertical lines and horizontal branches to be thermically protected from condensation.

1.14 Disinfection and washing out of the pipeline

Disinfectant will be chosen by the contractor in accordance with the sanitary inspection and health control office as well as the ways of control of washing out and disinfection. The dosage of chlorine for the disinfection should be from 10-20mgdl/h. Dosage of chlorine is prescribed by the authorised representative of sanitary inspection. The lower concentration(10mg/l) is recommended when the chlorine remains in contact for 12-24 hours.

Minimum time of disinfection should be 30-60 mins..

Add chlorine can be done through the left outlet. The letting out of the water to be done until the smell of chlorine is strong. Parts of the pipeline that are not disinfected have to be safely disconnected from the parts that are disinfected.

The responsible person should also inform(through public announcement etc.) the public, to avoid someone using the water used for disinfection. When the disinfection period expires the pipeline to be washed out with clear drinking water until clear drinking water is got(with tolerant level of chlorine).

2.0 SEWAGE

2.1 Scope of work

All the works listed in the BoQ: delivery of pipes, fitting elements, equipment and other material, transport to the site, sorting and storing, cutting and connecting of sewage pipes, fitting elements, installing the sanitary units and their connection to the sewage network in the object, all other equipment and works in the BoQ.

All the works to be done according to JUS standard.

The contractor has to be aware of the need to inform the client in advance of the JUS standard.

The contractor has to look into the design carefully, check all of the measures and compare with the design measurements, check and rectify the list of material, before the procurement of material the approval of supervision has to be obtained, and the material needs to be stored at a suitable place. This is also valid for the equipment needed for the works. After this the contractor has to make a design for the construction of sewage pipeline installation. The design should contain the complete installation and all the necessary connection elements, and the organization of internal transport of material. Only upon approval of the supervision the installation of material can start. All the materials not included in the BoQ, but necessary to guarantee safety of installation will be completed fully and extra paid only upon the approval of the supervision.

2.2 Technical requirements and design

All the works need to be performed according to the attached drawings, and if they are not described or are omitted by mistake, they will be completed fully, as if they are listed and described in the design. The layout of the trenches, sanitary units, equipment and connections are shown in the drawing and this will be respected. Any change needs to be approved by supervision. The contractor has the obligation to make the drawing of the completed installation.

2.3 Work contents

Works described in the specifications contain procurement, transport, installation of pipes and equipment and other units as listed in the specifications and BoQ. The contractor has to provide the machines, workers, materials and equipment needed for the installation of the PVC pipes from the same manufacturer where pipes and other fittings for the installation are ordered, according to the instructions of the supervision, regardless if this is specifically noted or not. In that case the contracted prices will contain all the material from the list, if they are not paid separately.

2.4 Technical details and drawings

Any work in installation of the sewage in the design not described in the specification i.e the BoQ, and necessary for the safe operation of the system will be done as if it completely described. The layout of the pipeline, connections and equipment are shown in the drawings and need to be followed to the maximum extent possible, in line with structural and spatial criteria. Accurate and precise setting up of pipeline provides easy access to it and enables it not to intersect with other installations, which should be avoided.

2.5 Materials and installation- general

Before ordering any material and equipment, the contractor has to present for the approval of the supervision three sets of drawings for the installation with the complete list (with a carbon copy) of all the material, fittings and equipment to be used. The contractor needs to obtain all other detailed information about the material and equipment that may be asked for. Approval for the material is based on the declarations of the manufacturers. Any material not in line with the JUS standard can not be used for the installation of sewage. With a special request by the contractor, material, fitting or equipment not listed in the specification and the description from the BoQ can be used only with the approval of the supervision and the designer. In that case the supervision issues a written declaration on the material and equipment that is different than the one chosen by the investor, or with the technology used in the design planned to be used in the execution of works in:

-laying of the pipes, material, works, testing and other.

The contractor has to arrange the timely supply of the material and equipment that can not be found on the domestic market. The requests for the extension of the deadline or change of the material will not be taken into consideration if caused by the contractors poor planning.

2.6 Pipes

Design provides that floor sewage network (vertical parts and branches on the floors) is performed with PVC KGEM home sewage systems, with appropriate connecting fittings. Those are designed for all kinds of waste water. Outer and inside surfaces of the pipes have to be leveled.

JUS standard JUS G.C6.509, JUS G.C6.501 JUS G.C6.502.

2.8 Connecting

Connecting of PVC KGEM pipes and elements is performed with connecting elements, with rubber seals providing full watertightness of the connection. Connecting to be done according to JUS regulations.

2.9 Fastening

Sewage pipes leading along the walls or wall rifles and horizontal lines under the slabs are to be fastened only with steel clamps. For vertical lines along the walls the distance of the pipe from the wall should be 1.5-2cm. Fastening of the pipes is performed under every connected piece. Horizontal pipes to be attached to the construction with hanging U clamps, on a horizontal adjustable rack. Clamp material according to JUS standard.

2.10 Installation

Before installation of the sewage the whole process needs to be carefully planned, in order to avoid any additional drilling of the walls. The contractor has to provide in advance all the openings in the walls and slabs in order to avoid drilling. After the approval of the samples by the supervision, the contractor has to make precise measurements of the dimensions. All the necessary connections have to be done, even if not shown on the design. Additional drilling of the walls to be done only with the approval of the construction designer, and with extra care. All the eventual damage done would come at the expense of the constructor. During installation all open ends to be covered with protective covers. At the end of each vertical line the revision pieces are designed. Also, revision pieces at all the horizontal collection spots that are designed need to be left accessible. All vertical line exits on the roof to be finished with ventilation caps and horizontal(side) exits to the facade to be done with respect to the aesthetics and put copper bar on the openings, complete mounting to be done according to JUS standard.

Pipeline in the ground to be done on the bed of dry sand in projected floors.

All obstacles created for the system to be adjusted to the construction standards are to be done at the expense of the constructor, and the constructor can not claim the increase in the price caused by these additional works.

Vertical lines, pipeline and sanitary units will be tested separately, and within the whole sewage system.

Possible cloggings have to be identified and removed and the whole system treated for hydrological effects, including the remaining of water on all floor openings.

2.11 Testing of the sewage installations in the object testing to be done in three phases:

- First phase contains of testing the lower sewage PVC pipeline before covering the trenches. The inclination is controlled, and the water tightness of connections. For testing of connections the whole system should be filled with water, after closing the lower end opening. Finishing openings are filled with water and kept under pressure of 5m of water column for one hour. The acceptable water tightness is achieved there is no water loss within 15 minutes.
- Second phase is done after installation of the complete vertical network with branches. Testing with water is done separately for each vertical line, after proper sealing of the branch ends except for the highest, through which the filling of the system with water is done. Testing is done with the pressure of the water column of approximately 0.3 atm. If in 15 minutes all connections are holding, that means that they are done properly.

The whole network is air tested, with the compressor and a manometer. The air compressor is connected to one opening, and all other openings are closed. The testing pressure is 0,35atm. 15 min. The smallest drop in pressure means that one of the connections is not holding, therefore that must be fixed..

- Third stage consists of the control of sanitary units with washing out and accumulation of water etc. and if there are no changes on the network(all syphons are holding) the installation is operational.

While the testing is not completed, covering of the pipes must not be done.

During testing the protocol should be written, and attached to the documentation. After completion of the installation of sanitary units the installation should be adjusted for maximum opening of all the outflowing spots and let the water into the sewage network. The washing out of the network is done at that time, control of the functioning of toilets, electric boilers and other sanitary equipment. This regulation to be used for another inspection of the functioning of the sewage system by controlling the outflow of water.