VOLUME 3

TECHNICAL SPECIFICATIONS

I. TECHNICAL DESCRIPTION

1. BUILDING AND CRAFT WORKS

The facility is located in the centre of town within cadastre lot, no. 143/1. The facility is designed on the land which has relatively good geomorphologic characteristics in accordance with geomechanical tests conducted at the terrain.

Access to location is possible using two roads which are crossed at the corner of the lot.

Number of floors of the facility is P+1, which are functionally separated into two units.

Garages, workshop with storage and toilet are located on the ground floor as well as firemen wardrobe and warehouse for fire equipment. The connection with administrative unit on the first floor is made through the separate entrance, and the ground floor also contains boiler room. The height of the facility is 5m in the area of garage lights, and in the part that contains workshops and warehouse of fire equipment the height of light is 3.5m, which resulted from the functional requirements and dimensions of fire fighting vehicles and equipment.

Administrative unit is located on the floor of the facility containing two offices, toilet and tea kitchen, room for emergency service and multi-purpose room that can be used as dormitory or meeting room and training room. Due to the possibility of the existence of dormitory, the premise with two showers is planned next to toilet on the first floor.

Organisation of the facility and disposition on the lot resulted from the requirement for separated entrances for administration and part with garages, and from the requirement for the existence of area for fire fighting vehicles. The facility is located along longer side of the lot with main entrance for fire fighting vehicles in the extension of access road, while the administrative entrance is at the corner from the ancillary road which continues to neighbouring lot. Parking lots are constructed in front of the administrative unit and the entrance in the portion of lot to workshop is enabled, which is used as needed, and one parking lot is planned in front of the entrance to the workshop.

Space for undisturbed movement of fire fighting vehicles is planned in front of the garages as well as area with hydrant for filling water into the vehicles and their cleaning. Entrance to the garages is protected with slide steel gate which is automatically opened and closed from the doorman's booth located in the corner of this part of the lot. It also contains video surveillance system of entire complex and control of entrance.

Form and composition of the facility resulted from the functional requirements and organisational technical scheme of fire station and climate characteristics of Šavnik and micro location. Simple cubic form with gable roof is dominant and it fits into the surrounding existing facilities, while roof overhang is formed on the ground floor which covers three sides of the facility in the area of administrative unit.

The connection with floor is made through three sided comfortable staircase, dimensions 15x30cm, which are projected to enable facilitated and swift communication of firemen with their equipment. Central hall on the ground floor represents direct connection between wardrobe and warehouse with garages and the connection with the first floor where emergency service and dormitories are located.

External dimensions of the facility are 25.6 x 10.7.

Gross area of the facility is 389.0 m^2, and area of the lot is 880.0 m^2.

Ground floor of the facility is 275.0 m^2.

Occupancy index of the lot is 30%, and construction ratio is 0.45.

Distance of the closest point of the premise from the facility to the neighbouring lot is

minimum 150cm.

The facility is constructed in the system of classical contraction, mass structure constitution.

Foundations are band-like with foundation pillars located at appropriate places, vertical ring beams and pillars and horizontal ring beams.

Gable roof is located in the area that consists of garages and workshop made of wooden grid bearers which serve for covering entire internal area without supports, which facilitates communication within garage unit and entire space is covered.

Floor ceiling on the first floor is LMT, thickens according to statical estimate.

Façade wall is made of several layers, with hollow clay blocks as bearers. Insulation of Styrofoam is made externally (thickness 5cm) with glue and grid and external cladding is made of concrete block 10cm thick, which is plastered externally in three layers, spraying with cement paint, placing rough layer of plaster and final smooth layer of plaster. The final layer consists of bavalit in the colour selected by investor.

Wooden cladding is predicted on the ground floor below roof overhang over concrete blocks. It would be placed on battens 5x5cm, which are screwed over plastered concrete blocks. Wooden battens have dimensions 10 x 2.2cm, and are placed to overlap in horizontal layers.

Roof structure is also made of wooden grid bearers over the floor.

Roof cover is TR (Roof cover is TR (*trapezium)* sheet metal with supporting linings and flumes.

In the garages, where full floor height is on two levels, roof bearer is placed and it forms eave in length of about 120cm. Horizontal flumes are not planned in that part since this will be poorly heated area and the protection of the facility from precipitations would be achieved due to possibility of maintaining snow throughout the eave.

Insulation of roof part is made in two zones. Below TR sheet metal on battens is a layer of steam permeable and waterproof foil over OSB *(oriented strand board)* plates, which are placed over grid bearer with battens of 8x5cm. Lower part of OSB plates contains a Styrofoam of 5cm, which is screwed to OSB plates. Insulation of mineral wool is set on the ceiling, thickness 20cm in two layers of foil.

Internal processing of all walls and ceiling is planned as follows: plastering+skimng+painting in white or other colour as selected by investor, except in toilets where walls are tiled after plastering up to ceiling and in kitchens where processing of wall is anticipated above lower kitchen elements up to hanged elements, i.e. from 85cm to 120cm.

External doors and windows are made of PVC profile with final cladding in brown plasticization, glassed by thermo insulating (type as parsol) glass and opening around vertical axis and horizontal axis as needed.

The dimensions of garage doors are 350x350cm, from specific requirements and dimensions of fire fighting vehicles and are anticipated to be aluminium thermo insulated door, with filling made of polyurethane, and electrical drive unit.

Ventilation of all premises is natural through windows in external walls and sanitary unit in the floor has ventilation through the canal that exists outside the roof.

Internal carpentry consists of wooden double veneer door that has profiles made of medium-density fibreboard painted by selection of investor.

Floors in all premises are processed as described in tables that refer to specific floors and they consist of ceramic tiles selected by investor and parquet selected by investors, and in working units and garage are epoxide floors.

All areas around the facility, including space in front of the garages and workshops are asphalted with drainage of atmospheric waters based on the design of terrain development.

Parking lots are also asphalted and the plateau in front of the administrative unit entrance is paved with behaton concrete plates.

Connection of the facility to electrical grid, water supply and sewerage system should be done based on the conditions obtained from competent institutions and based on project design that make integral part of the main design.

2. HYDRO TECHNICAL INSTALLATIONS

2.1 Introduction

The design discussed technical solutions for internal installations for water, sewerage system for used waters, and external distribution to connections.

Technical solutions for installations in the facility and outside the facility are complied with architecture design and terrain condition. Based on the existing installations for water supply and sewerage system for used waters that have been already charted, and the position of facility, drains to town sewerage system are constructed as well as bringing of water to water gauge.

2.2 Water supply

The conditions for connection of the facility to town water supply system are not currently provided since water supply system in this area does not exist. According to General Urban Planning of municipality Šavnik, there is a pipeline of ø150mm in the vicinity of location. Available assumed pressure is around 3 bars. PEHD pipeline DN110mm is planned for the facility from the connection to the existing pipeline of ø150mm. Water gauges are placed in the shaft outside the facility on visible place that is available for reading. Consultations with competent utility officers should be done before assembling the water gauge and checking if the adopted water gauges correspond to their needs.

Connecting sanitary horizontal water supply system and sanitary verticals will be made of polypropylene pipes of designed profile.

Distributing network for toilets and kitchens which is placed in the floors and cuts will be made of polypropylene pipes and fittings by 10 bars that are connected by welding (delivery of material with prescribed certificates based on design). Cornered valves with rose and nickel top are planned on the offsets for individual sanitary blocks and pouring places.

Internal water supply system will be partially placed into walls in separate cuts, with required insulation covered by tiles or mortar, and partially into floor with prescribed thermal cover.

Number and arrangement of sanitary units is planned according to the disposition given in architecture design. All sanitary elements will be made of 1st class material provided from local or foreign manufacturers depending on the investor.

Testing of external and internal water supply system will be made based on rulebooks for such type of work. It will be set under pressure of at least 12 bars and deviation and fall of pressure after 24 hours will be monitored. Each deviation higher than 10% means that the system has not properly developed. Testing is performed before the assembling of sanitary equipment. Testing and disinfection of the system will be made after assembling sanitary equipment and rewashing. Competent institution should submit to the investor certificate on water quality which will be used in the facility after all procedures described above. Competent authority is obliged to submit minutes on all tests performed for the pressure, disinfection and washing.

Dimension of pipes in toilets and in vertical are enclosed, where estimate is made based on the same methodology and for the same allowed fall of piezometric line (J_{doz}).

Besides the internal hydrants (3 in total), placing of surface hydrant DN110 is planned for

filling vehicles with water according to the position in the enclosed graph.

2.3 Used waters

All used waters from the facility are sent to inspection chambers which is located next to the facility, RO1 to RO4. Used waters from the first floor are collected in horizontal distributors, connected to verticals and descended through verticals below foundation structure, connected to horizontal dissolution and sent outside the premise. Waters are further collected in control inspection chambers RO1, RO2, RO3 and RO4 and further transferred to the existing town sewerage system DN200.
Technical solutions of distributing installations through the facility and collection canal are harmonised with the architecture design. This design projects internal installations and intercepting sewer that conducts water to town sewerage system DN200.
When resolving horizontal sewerage system, the attention was paid to provide optimum solution with as shorter distributors as possible and to provide efficient transport of waste waters to the connection to septic tank.
Good ventilation of sewerage installation is provided through projected two verticals. Verticals of Ø100 mm are projected. Inspections are planned in the bottom of each vertical. They are placed in the specially projected canals. Hanging of sewerage system to floor structure is planned with steel clips, while sewerage drains from verticals, which are placed next to the wall, will lean on steel bearers on rubber stands.
Horizontal and vertical sewerage system in the facility will be made of polypropylene pipes for house sewerage. External canals will be made of PVC pipes for external sewerage.
Intercepting sewer in the facility will be Ø150mm with fall of I=1.5%.
External intercepting sewer will be Ø200mm with fall of I=1.5%.
Selected profiles and falls of sewers completely meet requirements of the facility and all conditions and regulations valid for this type of installations.

2.4 Sanitary equipment

Selection of sanitary equipment and accessories will be made based on the proposal of the architect and investor.

3. HIGH VOLTAGE ELECTRIC INSTALLATION

3.1 Introduction

Fire station consists of ground floor and 1st floor. Units for fire equipment, diesel of electric generator, boiler room and garage are located on the ground floor. Offices are located on the 1st floor. The high voltage design resolved the following:

- supply of the facility with electricity and distribution of electricity around the facility
- installation of lighting and devices
- installation of main and additional equalisation of potential
- installation of lighting conductor and grounding

3.1.1 Supply of the facility and distribution of electricity around the facility

Supply of the facility is planned through connecting measurement board (CMB). It contains counter for measuring electricity used. This board is made of polyester materials in the protection of IP 55. It is mounted on the façade and has equipment that is projected by single pole scheme and bill of quantities.
Supply cable of this board is not resolved in this design and it will be determined after issuing conditions by competent electric company.

Cable PP00-Y 5x16 mm2 is placed from CMB to main distribution board (MDB) This board is mounted to the wall and it is made of twice pickled sheet. It consists of the following fields:

- grid– main distribution
- generator– main distribution
- distribution board RT-PR – grid
- distribution board RT-PR – generator

All fields have separate doors with lock.
Board RT-SP on the 1st floor and board RT-PO in the doorman's booth are supplied from MDB. Board RT-SP is made of twice pickled sheet and has doors and lock and it has two fields: grid and generator. This board serves for supplying with electricity the consumers on the 1st floor.
Equipment projected for supplying consumers on the ground floor of the facility is built into MDB. The equipment is part of distribution board RT-PR, which also consists of two fields: RT-PR(m) – grid, and RT-PR(a) – generator.
Besides the supply from the electric grid, supply through diesel electric generator (DEG) is also projected in the facility, which serves for supplying the majority of consumers in the facility in case of power outage. Change of voltage is made through automated transfer panel (ATI63) marked on the drawing as ATS, which rated current is set based on the power of consumers supplied through it. Its function is to detect power outages and make transfer to grid/generator voltage and vice versa. ATS panel is mounted next to MDB, so that its door is levelled with the wall. Cable from DEG to MDB is PP00-Y 5x10 mm2. Cable is placed in the floor in plastic PVC pipe.
Diesel electric generator has 30 kVA (24kW), 400/230V, 50Hz, $\cos\varphi=0.8$ and it is located within the facility.
Full distribution of supply and the cut of all supply cables are visible on drawings, scheme of main distribution board and single pole schemes.

3.1.2 Installation of lighting and devices

According to modern requirements, required number of lights was planned and levels of lighting are determined based on the recommendations of Yugoslav committee for lighting. Lights with fluorescent bulbs are mostly projected as well as lights with compact fluorescent bulbs. In the premises where dust and humidity is expected and in sanitary units, waterproof light structures are planned to be mounted to the wall and/or ceiling.
Lights for urgent (panic) lighting are planned which are turned on automatically in case of generator/grid outage.
Lights are distributed on grid and generator supply and their distribution based on power circles are visible from the drawings.
Turning on/off of lights in the premises is performed within the premises by switches that are placed 1.2m above the floor.
Turning on/off the lights intended to light the space around the garage can be done manually (through drum-type switches and normal switches) or automatically (using timers).
All sockets (high and low power) must be from the same manufacturer's programme (LEGRAND, VIMAR, AVE or similar).
The largest portion of these sockets is for technological purposes and smaller number for general purpose. They are placed 0.4m above the floor. It is worth mentioning that sockets for generator supply must have special colour to differ from other sockets.
Conductor for lighting in the facility is PP-Y -2.3 and 4 x 1.5 mm2. For all power circuits, one of lodes serves for grounding of the lights.
The conductor PP-Y -3x2.5 mm2 is used for single-phase connectors, and PP-Y -5x2.5 mm2 is used for three-phase conductors, where one of lodes also serves for grounding of the

connected consumers.
A certain number of direct distributors are planned in the facility which will serve for supply of specific consumers. Distributor is left at the height marked on drawings in the length of:
- 0.5 m for boiler supply,
- 0.4 m for heaters' supply,
- 2 m for supply of projectors in multi purpose room,
- 2 m for supply of consumers of low power in RACK case,
- 2 m for supply of compressors,
- 1.5 m for supply of motors of garage doors,
- 2 m for supply of motors of slide doors at the entrance to the manoeuvring plateau

3.1.3 Potential equalising

Main and additional potential equalising is applied in the facility. Main potential equalising is done by interconnected electroplate connection of external parts of cable (plumbing pipes, hydrants, cabinets of low voltage and the like), closer to the place where these parts are introduced in the facility.
Main potential equalising is done through bus bar, i.e. rail for main potential equalising which is located in CMB. Additional potential equalising in the facility includes potential equalising in toilets. It is done in the way that all metal masses in the bathroom which are not, during normal work, under voltage, are bonded and/or brought to the same potential. Distribution is done so that boards for potential equalising are placed in bathrooms (PS-49), and metal masses are connected to the board, which is tied to the protective bus bar "Z" in distribution board. The position of the potential equalising board should be determined after consultations with interior designer.
The following metal parts do not have to be interconnected: frames of showers, windows and doors, handrails, lid of floor drain, flushing of toilet and the like.
Conductor for potential equalising is needed when there is no electric equipment in the room with bathtub or shower.

3.1.4 Installation of grounding and lightning conductor

3.1.4.1 Reception system

Metal roof cover is used as reception system. This system belongs to natural reception systems and metal cover must be built of materials resistant to corrosion such as copper, aluminium or galvanised steel.
Conduction bypass must be provided on joints between sections of plates covering parapet wall except on places where there is good continuity of joints between the plates. Tapes that are tightened with screws or overlapping of sheet metals with overlap of at least 100cm2 on each side of overlap is bypass that is in accordance with the standard JUS IEC 1024-1.
Reception system and lowering conductors must be tightly connected to disable any disruption or keeping of conductors due to electro dynamic forces or sudden mechanic forces and vibrations (causing, e.g. earthquakes, avalanches and the like)
The connection is made by welding in the length of 10cm. After connecting, joint must be covered by anti corrosive layer.

3.1.4.2 Lowering conductors

Tapes Fe/Zn 20x3mm are used as lowering system. They are connected on the roof to reception system and are placed through reinforced concede walls. Lowering conductors are connected in the foundation of the facility using connecting piece JUS N.B4.936 to the tape that is wriggled through the foundation.

3.1.4.3 Grounding system

Tape Fe/Zn 25 x 4mm is used for grounding, which is set in the foundation board of the facility and welded to the reinforcement at each 1,5m. Tape leads from foundation grounding to each connecting measurement board and/or to rails for potential equalising which is located into connecting measurement system.

Protection from dangerous voltage is achieved through the system TN - C/S. Only protective and zero rails are connected into CMB for this purpose.

4. LOW VOLTAGE ELECTRIC INSTALLATION

4.1 Structural cable system

This design anticipates the preparation of structural cable system (SCS). This system represents the basis for construction of information system of the facility which should be formed based on modern approach in telecommunication technologies. It implies full efficiency, elasticity and flexibility which the designed system should provide by adhering to modern, generally accepted standards defining this area.

In that respect, information system should be realised on the principles of structural cable systems defined by standards and recommendations of the leading companies from this sector. Implementation of these standards provides compiling of distributive media for different types of traffic: transfer of data within various computer networks, transfer of sound and video signal (video conference, multimedia presentations, etc.). This will enable integration of telephone and computer system through uniform cable network into uniform telecommunication system.

Installations of SCS equipment should be realised in hierarchical level – horizontal and vertical distribution. The quality of equipment and the quality of built-in works (all cable connections, the manner of placement, etc.) should enable reliable and undisturbed transfer of various types of signals at 200 mbps (category 6).

Physical topology of horizontal distribution line of SCS has star structure, where distances between connecting panel in RACK and telecommunication socket must not be over 90m long. Selected paths for cables in the facility provide meeting of this condition. The concentration of cables ends in free standing RACK cabinet which is located on the ground floor of the facility as shown in the enclosed graph.

Horizontal distribution line represents connection of end users of the system made through telecommunication socket with the connecting panel within adequate RACK up to appropriate equipment in it.

Computer FTP network is universal installation based on standard *EIA/TIA T-568A.*This installation can support all type of telephone and computer networks. Design for realisation of horizontal calibration defines cables made of copper with 4 twisted pairs, performance level of 6^{th} category. Conductors (full wire) should be in diameter *0.57mm (23 AWG).* Design solution determines use of cables in foiled twisted pairs (FTP). These cables should be finished on RJ45 category 6 by connectors on both sides (telecommunication socket - patch panel).

When placing installation cable with comparable pairs, it should be taken into account that minimum radius of bending of *20 mm* (4-fold cable diameter) is not disrupted, as well as distance from high voltage electric installation should be at least 30mm.

RACK cabinet is equipped by: cable lead-in, front glass door with lock, appropriate ventilation and lighting, supply rail of 220 V, equipment for grounding and other required equipment. RACK cabinet should be placed so that cable lead-in is set on the back side and it is easy access for surveillance and maintenance. The premise where it is placed should meet optimum climate conditions. RACK cabined is grounded by connecting to rail of mutual grounded conductor PPOO-1x16mm.

The placing of three module sockets RJ45 cat.6 is planned by design. This provides the possibility of connecting to several devices: computer, direct telephone, local telephone, extra TV, etc. All sockets should be distant 3m from working place, at maximum.

The connection between ITO cabinet and RACK cabinet is achieved by cable type IY(St)Y 10x2x0,6mm.
After completed installation of full system to its full functionality, each cable link should be adequately marked by uniform sign on both sides of RACK cabinet and on the side of telecommunication socket of the user. The contractor is obliged to test all links with supervisory authority and make adequate measurements. Before handing the system for use, the table of system connections and other technical documentation should be submitted to the user (as-built documentation) for administrative purposes and system maintenance.

4.2 Radio and TV (RTV) installation

RTV installation is designed to enable the reception of all earth TV programmes and satellite digital programmes from the satellites ASTRA (19^0 E) and HOT BIRD (13E).
Antenna system consists of antenna pillar and reception antennas. Antenna pillar must be properly grounded in accordance with the Rulebook on technical regulations for construction, placement and maintenance of antenna devices. Material for grounding cables is:
- FeZn 2.5 x 20mm tape as external cable and P10 mm^2 (copper) interior cable.

Cable for lightning rod can be used for grounding.
Antennas for signal with the lowest electromagnetic field are mounted to the highest place of antenna pillar, and then followed by antennas based on the increase of intensity of the field. The height of the antenna pillar must be sufficient that the lowest reception antenna is mounted at the height higher than 2.5m from the bottom of antenna pillar. The closest point of antenna system must be at least 4m distant from axis of the chimney.
The antenna pillar structure must enable the access to each antenna. Pillar is mounted to provide full mechanical stability which is reached with the set for anchoring.
Signals from SAT antenna are brought into multi switcher-amplifier of satellite signals (SMS 9609), while signals from earth antennas are brought to the device MBV 435, and from this device to the signal amplifier. All these devices – mutual antenna system - are mounted into TV cabinet to the wall as illustrated in the enclosed graph. From SMS 9609 amplifier, which combines signals of earth and satellite television, cables are distributed to RTV/SAT sockets in the facility.
Distribution grid must be at the same time transport type. The projected grid must enable transfer of signal directly in frequencies ranging from 40 to 600MHz.
Type of cable is RG 6A/U and it is placed through installation pipes (∅20 mm), which are placed below the mortar or through reinforced concrete plates.
RTV sockets are mounted 0.4m above the height of the completed floor in the installation box (∅ 60mm).
When preparing technical documentation, articles of Rulebook on technical norms for CATV and ZAS should be fully honoured.
Principle scheme of distribution is given in the picture.

4.3 Video surveillance system

For the purposes of visual surveillance within and around the facility, the installation of colour video surveillance system (CCTV) is planned.
This installation consists of central device (video board), external and internal cameras, supporting cable installation and devices for undisturbed power supply (UPS).
The design planned placing of nine cameras (four interior and five external). Video board should be mounted on the 1^{st} floor of the facility in the premises of emergency service, and it consists of 1 digital video recorder/multiplex device with nine channels and one professional monitor of 22 inches.
Digital video recorders/multiplex device is a computer device developed especially for security industry which enables multiplex functions and simultaneous undisturbed recording of all cameras.
Everything is recorded on hard disk (160Gb), which is extremely reliable and has good quality

(manufacturer – Maxtor or similar), with the possibility to expand the memory and time of recording. Recording of data on hard disk avoids use of analogue video recorders (VCR), which require relatively frequent and expensive maintenance, as well as VHS tapes that should be changed on daily basis, where the problem of wearing out and squeezing appears after ten recording (typically), which leads to deterioration of the quality of recorded tape, and it is not the case with digital systems.
In addition, long-term search of recorded material is not needed anymore since the direct and current access to hard disk is possible by entering desired date and time.
Special advantage of this device is integrated motion detector that can be programmed for each scene separately (or for portion of scene, e.g. to cover only entrance of a facility) and for selecting sensitivity level.
Alarm entrances and alarm relay exits enable integration with the anti-theft signs or access control, so that they increase already achieved security level.
Managing video recorder/multiplexer i.e. full system is done using keyboard on the same or through PC connected to local computer network and with the installed software. Connection to local computer network enables that all users (which have authorisation) monitor "live" and/or recorded video sequences. In this respect, high savings are accomplished since additional placing of cables is avoided. Without use of any specialised software (Internet Explorer is sufficient) this system can be accessed from any point in the world using Internet.
All abovementioned devices and cameras are supplied from UPS device which is supplied from the source 220V from special fuse.
Interior TV camera is planned to be mounted to the wall by appropriate holders and external cameras will be placed in boxes.
Box for external assembling serves for placing TV cameras and enables undisturbed work of camera in all time conditions. It is assembled at appropriate holder mounted to the wall.
Coaxial cable RG-59B/U 75Ω is planned for transmitting video signal, and cable PPY 2x0.75mm2 for supplying cameras. These cables are retracted into PVC pipes placed in or to the wall.

4.4 Fire alarm system

For the purpose of early fire detection, stable installation of automated fire detection and alarm annunciation is planned. This installation consists of: central device (PP exchange), printers, answering machine, smoke and heat detectors, manual fire alarms, alarm sirens and supporting cable installation.
Central device (PPC) represents modern addressable programmable microprocessor PP central station similar to type AM1000, "NOTIFIER" with the capacity of one alarm line (loops) where it is possible to connect up to 99 automated fire alarms and 99 manual fire alarms, modules for management of sirens and the like. PP central station will be placed on the first floor of the facility in the premises of emergency service, as illustrated in graph which is mounted to the wall 1.5m from the floor up to axis of the central station.
It is supplied from the source 220V through special fuse and spare batteries. Keyboard and LCD display are on the front of the central station. It is programmed from the keyboard at the central station or ancillary computer. The central station memorises all changes in the system it covers and it is possible to read those changes regardless of the functioning of the printer.
For current archiving of the condition in the system that is covered by the central station, printer is envisaged which is set on the table of shelf next to the central station. It is supplied from the source 220V and connected to standard serial exit of the central station.
Answering machine is placed on the table of shelf next to the central station and/or printer. Its purpose is to transfer recorded voice message in advance to one or several phone numbers given in advance (town fire station, police and the like) through phone pairs once fire detector which is connected to PPC is activated. Sending of the mentioned message is initiated from programmable relay exits on central stations. It is supplied from PP central station.
Automated detectors are: addressable optical smoke detectors similar to type NFX-OPT, "NOTIFIER",

and addressable thermo differential detectors similar to type NFX-TDIFF, “NOTIFIER”. They are assembled in the bottom similar to type B501AP, “NOTIFIER” on the ceiling or suspended ceiling. They are connected directly to addressable loop. In order to increase work security, detectors, bearers of “insulation” (NFXI-OPT and NFXI-TDIFF) are placed in the bottom similar to type B501AP on each 20-25 detectors and/or in transits from one area to another.
Addressable manual detectors similar to type M700K, “NOTIFIER” are planned for wall mounting 1.5m from the floor to the lower edge of the detector on the emergency exits. They are connected directly into addressable loop.
Addressable alarm sirens similar to type AWS 32/R, “NOTIFIER” are planned for wall mounting below the ceiling 2.3m from the floor. They are activated on impulse of any detector in the alarm in entire or part of the premise. They are connected directly to addressable loop.
For mutual connection of all components of the system, halogen free cable SASO215 HAFEE 2x1.5mm2 is planned, which is inserted into PVC pipes mounted to the wall.

4.4.1 Organisation of alarm plan of the facility is as follows:
When emergency officer is present in the premise where PP central station is located, the system works in the regime “DAY”. In that case, an internal alarm in the central station appears (sound and light). Emergency officer turns off the alarm pressing the button “ALARM BUZZER OFF” in period of 20sec from the beginning of the alarm (TIME OF PRESENCE). By pressing the button “CHECK”, “TIME OF PATROL" starts, which will in this case amount to 5 minutes. During this period, emergency officer goes to the location of fire, puts it off if it is smaller, returns in the central station and resets it, so that general alarm is not switched on and no commands are executed. If it is large fire, emergency offices shall press the firms manual fire detector which interrupts “TIME OF PATROL” and sends general alarm (system for fire information is turned on, planned executive functions are activated). If upon the expiry of “TIME OF PATROL" the central station does not reset, the “WORKING ALARM” is turned on. Activating signal "ALARM" from manual fire detector “WORKING ALARM” is automatically activated.
When emergency officer is not in the premise, the system works in the regime “NIGHT”. In case of activation of automated detector, working alarm is immediately activated (system for fire information is turned on, planned executive functions are activated).

II. GENERAL CONDITIONS

1. BUILDING WORKS

The price offered by the contractor (and accepted by the investor) must be calculated exactly based on the terms and conditions from this study, norms, standards and technical rules.

The manner of calculation, work descriptions, supporting works are obligatory: preparation, ancillary, supporting, service and finishing works– should be determined according to the following norms:

- AVERAGE NORMS IN CONSTRUCTION, published by "Građevinska knjiga"
- EXPERIENCE NORMS IN CONSTRUCTION
- TECHNICAL CONDITIONS FOR FINISHING BUILDING WORKS IN CONSTRUCTION

The contractor is obliged to adhere to general conditions for building works and general conditions for individual works from this study, norms and technical rules while performing works of all positions of the related group of works regardless if this was particularly emphasised in the description.

The following is calculated into price without special notes:

- All works materials and activities mentioned in BoQ;
- Purchase and delivery of all material needed to the construction site;
- Scaling, recording and transferring of measures needed for works;
- All required horizontal and vertical transport to the working place;
- All preparation, ancillary, supporting, service and finishing works are envisaged by norms and general conditions including also material;
- Cleaning of work place upon completed or interrupted work and transport of waste from the construction site, if it is not planned for the given position (waste from normal work, if these are demolition and dismantling works);
- Full protection of damage of all found or previously completed works, installation and interior elements and processing;
- All normative extensions of working time arising form difficult work conditions;
- Survey, recording and calculation that investor may require at any stage of works;
- Curing of built-in and stored material in extreme time conditions.

All material used must have quality described in the design and must be certified. Certifications are provided by contractor and represent an integral part of construction documentation which remains with investor.
Work must be performed exactly according to the design and according to the items of supporting norms. If the contractor performs works with material which does not have good quality and which is unsatisfactory, it should make repairs upon investor's request at its own expense in the prescribed deadline. If the works are performed by better quality, the investor is not obliged to compensate for the price, if it is not regulated in advance.
The investor (supervisor) has the right to demand all types of checks of works and materials if it has doubts into quality at any stage of works. In this case, the committee must be formed which will have representatives of both parties, strengthened by neutral professionals or specialised organisation, if needed. Expenses will be checked by the contractor if the suspicion is proven, if not, the investor shall bear costs.

Possible compensations and unforeseen works or changes in work and material must be announced by the contractor before the works performed. In this case the contractor is obliged to provide additional offers and contracts, and it must form and analyse prices upon investor's request according to the above mentioned norms. The contractor should submit all amendments to the designer or investor (supervisor).
Works performed by the contractor besides technical documentation will not be calculated and paid out, if written approval of the investor and supervisory body for the performance of these works is not obtained in advance.
Transport of waste and cleaning of working place should be performed immediately by the contractor upon the issued order by the investor (supervisor). This order may be issued at any time in order to prevent piling of waste in the facility, blocking of the construction site or protection of the previous works.
All dismantled material belongs to the investors, and the conditions for its transport from the construction site are specifically highlighted.
All material, works and entire construction site will be secured by the contractor at its own expense upon the take-over of the works.

1.1 Preparation works

Before the beginning of the construction works and building and craft works, certain demolitions and dismantling must be performed on the facility or location. The contractor must not start other works before finalising all demolitions and dismantling, unless designer or supervisory body requires otherwise. Elements to be removed are calculated to the location where no work is planned. Therefore, unit price should include works on possible bigger demolitions that function as establishment of connection between old and new elements or are necessary for the performance of specific works.

Separate landfills will be established for each contractor which should be emptied in accordance with dynamic plan determined by designer. All contractors are obliged to sign the acceptance of this obligation. Exceptions from dynamic plan are allowed only with the approval of or upon the request of designer and/or supervisory body.

The contractor should ensure breakthrough of walls (by strutting or bracing) in the width higher than 90cm and excavation of ditches deeper than 2.0m

Contractor should fence the construction site and obtain regular documentation needed for beginning of work.

1.2 Earthworks

The contractor should perform all works from this group as detailed in the descriptions of individual positions, general conditions norms GN 200 and technical rules exactly according to the design:

The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Keeping and maintaining of geodetic signs (permanent and for the facility);
- Recording of the required profiles and levels for work requirement;
- Pumping of atmospheric water and occasional flows, permanently and updated, without damage for excavation;
- Strutting of the sides of excavation depth over 1.5m by work and material spent according to norms GN.601.
- Ancillary scaffold for transferring of materials;
- Obligatory geomechanical control of the excavation before foundation.

Contractor is obliged to correct possible excavation at its own expense, by compacting gravel or rubble concrete according to the order of investor.

The investor (supervisor) or geomechanical engineer may issue order to excavate the last layer of land (around 20cm) directly before foundation without special compensation if it is determined that this procedure is needed.
Width of the excavation that the contractor must adhere to is calculated with minimum needed for undisturbed further works or strutting as follows:

- For the elements that are moulded without formwork, exactly in the width of the concrete;
- For elements that are moulded in the formwork, plus 0.5m on the width of the concrete;
- For wide excavation, taking over humus and the like, 0.1m on the dimension of the facility.

The contractor should include in unit price risk from unanticipated factors (subsurface installation lines, unexpected hardness in soil of underground waters and the like)
Expanded width resulted from the manner of work; technology of contractors of bevelled sides (to avoid strutting) will not be recognised in excavation or filling and transport of excavated material. Normative widths and depths, marked at individual positions are not measures of the excavation – they serve only for classification. The calculation is made according to the recorded quantity of performed works, measures before and after the excavations.
NOTE:
Prior to beginning of works, geodetic survey and marking of facility should be performed for the foundations on the excavation of soil. Adequate documentation should be obtained on possible underground installations. All earthworks are calculated for the facility and the bill of quantities does not take into account already preformed excavation.
Geomechanical oversight is obligatory for the works.

1.3 Concrete works

The Contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms GN.400 and technical regulations exactly according to the design, statical estimate and details of reinforcement.
Details of reinforcement represent at the same time repayment plans with quoted dimensions.
The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Built-in of various anchor elements required;
- Concrete curing;
- Construction site transport.

The following works are also included in adequate position of prices with special notes:

- Construction, setting, moving and dismantling of formwork with adequate bracing work and materials GN.601.

Contractor should take into account built-in (and timely purchase) of various concrete connected and anchored elements, regardless if they were calculated as supporting materials. The contractor is obliged to determine all data prior commencing the works.
Concrete works are not allowed under unfavourable conditions. Use of additions arising from the working conditions of technology of contractor shall not be paid, if not needed, if it is not on time and regulated. The calculation is performed according to the recorded quantity of completed works.
The contractor should include into unit price also works for connecting new concrete elements with the existing structure of the facility and/or with additionally needed demolitions to perform concrete work more qualitatively.

Contractor is obliged to inform the supervisory body thereof prior to built-in of concrete to perform the review of formwork and reinforcement.

1.4 Reinforced concrete works

Reinforced concrete is strengthened, cut and bended manually or mechanically. Manual construction include: strengthening by manual gantry, cutting by movable or stable scissors and other tools and bending on reinforce table by manual tools. Mechanical construction includes strengthening by gantry on electric drive unit, cutting using electric machine, bending using electrical machine. Reinforced concrete reedy for placement must be cleaned from rust and dust. If this needs to be done, it will not be paid separately. Calculation is made per 1kg of built-in reinforcement calculated by theoretical weights and lengths of reinforcement design.

1.5 Masonry works

Masonry works should be performed in full according to the design. Possible changes in material or performance during building must be made exclusively by written agreement with the designer and supervisory body.
Bricklaying should have quality and correspond to JUS rules.
Bricklaying should be performed in horizontal lines with joints 1cm thick filled with mortar. Mortar must correspond to exact proportion by quantities of materials marked in positions, and firmness and quality must correspond to JUS rules. Sand must be clean without organic substances. Lime must be good and aged, and the quality must correspond to JUS rules.
Fresh walls should be protected from the influence of high and low temperature and atmospheric disasters. Plastering of walls should be performed in suitable time when they are completely dry. Before plastering, bricks on the walls must be clean and joints deep to connect mortar better to the wall. Special attention should be paid to concrete surfaces. They must be cleaned and sprayed with cement paint. All plastered surfaces must be even and smooth without cuts and buckles, and edges should be right.
Mortar must be made in accordance with the given proportions, well mixed to be compact and without substances that do not belong to mortar.
The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms GN.301 and technical regulations exactly according to the design and general technical conditions that represent an integral part of this design.
The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Construction site transport;
- Construction, setting, moving and dismantling of scaffolds for works based on GN.601;
- Calculation is made based on recorded quantity of works performed.

1.6 Insulation works

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms TU.XV, JUS.U.M3 and technical regulations exactly according to the design.
The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works.

- Construction, setting, moving and dismantling of scaffolds for works based on GN.601.
- Construction site transport.

Calculation is made based on recorded quantity of works performed.
Note: Special attention should be paid to preparation of gully trap, WC pan and steps of toilets and balcony door.

1.7 Carpentry works

All works should be performed from good and dry sawed material (fir wood, pinewood, etc.), according to its description in bill of quantities. Used timber must correspond to JUS rules D.A O. 020. Roof structure should be performed from the adequate profiles of timber exactly according to the design with armature, joints and anchoring. All actions that are not determined in this way will not be recognised in the calculation. Placing of roof battens should be performed using adequate battens and or small beams. Roof structure is calculated per m2 of horizontal projection and placing of roof battens per m2 of the projection for slope of the roof.
The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works.
- Construction site transport.

Calculation is made based on recorded quantity of works performed.

1.8 Roof covering works

All works on roof areas should be performed exactly according to the design details using quality material. These works include construction of finishing part of layer of passable and non passable roofs.
The price includes purchase and built-in of all required material, supporting elements and tools for this type of works. All works preceding the roof covering works must be performed in adequate order as anticipated by the design.
Before initiating roof covering works, works that may influence of stability, quality and durability of built-in material must be controlled and checked and findings should be reported into construction log.
All materials planned for processing of roof levels must be regular and must correspond to the designed conditions by their physical and mechanical features, content, form and colour.
Adequate certificates from the manufacturers must be enclosed with all material that will be built-in on roofs.
Organisation specialised for this type of works should perform roof covering works.
Calculation for these works is made per m2 of roof covering works.

1.9 Sheet metal works

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms TU.XVII, JUS.C.B4.081, JUS.C.E4.02 and technical regulations exactly according to the design.
The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Forming of required bows and drips, connecting, joint and ancillary materials;
- Construction, setting, moving and dismantling of scaffolds for works based on GN.601.
- Construction site transport.

Calculation is made based on recorded quantity of works performed.

Before initiating sheet metal works, all previous construction works must be completed, so that sheet metal works can be performed under normal conditions. Iron parts that directly touch the surface of galvanized sheet metal must be galvanized and/or insulated by iron sheet metal. Nails and rivets must be of the same material as sheet metal. All foundations over which sheet metal is placed must be flat and set for work. Wooden plates must be placed over foundations of concrete and mortar in the specific range as well as roofing paper which is calculated separately. Soldering and riveting should be performed in roofs which require full waterproof. All linings must be wider than 50cm supplied with trapezium wooden plates at distance of 50 cm. Covers up to 50cm width must be soldered and riveted. All drips should be 3cm wide distant from the wall 4cm, edges should be tightened to the wall by galvanized wire and nail on the distance of 25cm. Tightening should be made in the middle of the wall where widths are over 50cm. Sheet metal should be bent at least 4cm on windows sills and rivet it with small nails in distance of 5cm.
Note: All linings should be placed on the wooden foundation 4.0cm thick. Sheet metal holders should be made of tape of the same material and bent for concrete foundation, nails with shims. Attention should be paid on waterproof of sheet metal joints whether they are extended or built of fittings.

1.10 Joinery works

Purchase and built-in of internal carpentry should be made. Jamb of door should be massive. Door wing, which is fixed to the wall by steel anchors and compiling is filled with foam and closed with profiled decoration laths. Painting should be made by industrial polyurethane paint. Rubber bumper should be placed on the floors. Armature and locks (with three keys) should be adjusted to purpose. The calculation is made per fully completed and installed doors on the facility. Designer should select the paint. Calculation is made per piece and the price includes all from the description:

- Purchase of material
- construction,
- transport,
- Building-in.

Measures should be taken on site.

1.11 Sheet metal work

1.11.1 Façade PVC sheet metal work

Façade sheet metal work is done of PVC 5 chamber profiles in brown. They should be built-in on blind frame of box like profiles protected by anticorrosive polish. Glazing is made by double low-emissivity (low E) glass (6+12+6mm). Sealing is made through neoprene gaskets. Sheet metal work should be made of qualitative armature, aluminium or PVC sole plate should be built-in below windows from inside and sill should be built-in from external side.
Calculation is made pre piece and the price includes everything from the description: purchase of material, construction, transport and built-in with armature and blind frame as well as building-in of sole plate and external sill. Measures should be taken on site.

1.11.2 Fences and others

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms TU.XVI, TU.XX, TU.XVIII, TU.XI and technical regulations exactly according to the design.

The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Assembling of elements and door buck according to the norms GN.301 and GN.601;
- Development and assembling of surfacing according to norm TU.18;
- Preparation, technological review and preparation of details for metalwork system given in instructions in descriptions;
- Construction site transport.

Calculation is made based on recorded quantity of works performed. See description for more details.

1.12 Tiling works

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms GN.501, TU.IX JUS.U.011, and technical regulations exactly according to the design.

The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Development of samples;
- Bringing foundation in correct condition;
- Construction, setting, moving and dismantling of scaffolds for works based on GN.601;
- Construction site transport.

Calculation is made based on recorded quantity of works performed.

Ceramics fitting will be made in the corners and all tiles will be placed without spaces (joints). The price of tiling works should include also building-in of floor gully grating in the middle of tile and building-in switches and sockets in the middle of wall tile, as well and building-in of PVC finishing laths.

1.13 Floor installation work

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms GN.691, TU.XIII, TU.XIV JUS.U.F2.016, JUS.U.F2.01, and technical regulations exactly according to the design.

The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Development of samples;
- Bringing foundation in correct condition;
- Construction site transport.

Calculation is made based on recorded quantity of works performed.

1.14 Painting work

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms TU.X. TU.XI. JUS.U.F2.013, and technical regulations exactly according to the design.

The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Development of samples;
- Bringing foundation in correct condition;

- Construction, setting, moving and dismantling of scaffolds for works based on GN.601;
- Construction site transport.

Calculation is made based on recorded quantity of works performed.

1.15 Façade works

The contractor shall perform all works from this group in full as described by descriptions of individual positions, general conditions, norms and technical regulations exactly according to the design.
The price of corresponding positions (or distributed) includes also the following works, with material and without special notes in the text:

- Denotation, recording and transferring of measures needed for works;
- Development of samples;
- Bringing foundation in correct condition;
- Construction, setting, moving and dismantling of scaffolds for works based on GN.601;
- Construction site transport.

Calculation is made based on recorded quantity of works performed.
The contractor of façade works is obliged to honour strictly dynamic plan made by designer – supervisory authority and enable contractors of other works to use façade scaffold 3 business days upon the completion of façade works.

1.16 Miscellaneous work

Miscellaneous work includes works on the facility that are not included in none of the aforesaid groups of works, and they must be preformed before the building report and taking-over.

2. EXECUTION OF WATER SUPPLY AND SEWAGE WORKS

2.1 Earthworks

2.1.1 Mechanical digging of the trench for the pipeline, width d = 50cm. Excavations are carried out in the material of the found category, due to which it is required to visit the routes of the projected pipeline sections prior to making the offer for the execution of works, because the contractor is not allowed to change categorization during the execution of works. Unit price includes all necessary work and materials including the necessary care about keeping the existing installations that are found along the route of the pipeline and potential supporting of the trench. Correctly and well done excavation implies rejection of excavation material to a sufficient distance from the trench, so that it would not interfere with the communication along the trench needed for all phases of mounting and testing of pipeline.

2.1.2 Bedding for drain PVC pipes is made from the natural mixture of sand, 10 cm under, above and around the pipe along the entire width of the trench. Bedding can be made from the screened material from the excavation so that the fractions in contact with piping fractions do not exceed 4 mm. If sand from a special landfill is used for bedding, the unit price must also include transportation.

2.1.3 Backfilling of trenches with mounted and tested pipeline is done in 30-40 cm thick layers with proper compaction until the required compressibility module of MS> 300 kp/cm2

is achieved. Backfilling of the first trench layer is conducted by hand with selected material from excavation. Further backfilling can be conducted with the remaining surplus from excavation and it may be conducted mechanically provided that when backfilling the trench machines do not go over the trench with mounted and tested pipeline and that the layers are not thicker than 50 cm with proper compaction.

2.1.4 Marking and hand excavation for the shafts whose diameter is d = 1.0m are conducted in material of the found category, due to which it is required to visit the routes of the projected pipeline sections prior to making the offer for the execution of works, because the contractor is not allowed to change categorization during the execution of works. Unit price includes all necessary work and materials including the necessary care about keeping the existing installations that are found along the route of the pipeline and potential supporting of the trench. Correctly and well done excavation implies rejection of excavation material to a sufficient distance from the trench, so that it would not interfere with the communication along the trench needed for all phases of shafts mounting.

2.2 Mounting of sewage installations for waste water and water supply

The required work involves, and also where necessary to set installations, the following:
- demolition
- chase cutting and patching
- penetrations through the body and the walls
- installation of protective pipes at the places of penetration (protective pipes by 2x2 cm bigger than projected).

P.P. pipes are foreseen for all horizontal and vertical distribution of sewerage network.
Connection of pipes and fittings will be conducted with socket and rubber sealing ring (Q ring).
After laying the pipe impermeability test should be conducted. External pipes should be placed in the sand in the leveling section and in the projected decline.
All types of true sewer pipes must withstand internal pressure of 1.5 bar with no cracks and fissures. Pipes should be secured with clips under coupling to prevent it from slipping during the further installation. At the vent of penetration through the body conduct insulation from moisture and sound. Use footers for the ceiling. If constant influence of warm water over 60 degrees is taken into account, make appropriate insulation of pipes.
Polypropylene and PEVG pipes are meant for a 10 bar working pressure and galvanized steel water pipe and fittings according to JUS C.B.5.225 for a 10 bar working pressure.
The whole supply network should be made of galvanized pipes from the connection with the O 2" vertical.
Vertical grading ducts should be treated with two coats of red lead and wrap them with plastic insulation anti-sweat tape for pipes.
Connect galvanized pipe with a thread and thread joints according to JUS i.e. DIN standards.
Network should also be thermally protected with appropriate insulation such as PLAMAFLEX or another appropriate type.
Horizontal distribution in bathrooms should be made from polypropylene pipes of the projected diameter. These pipes should be connected by welding.
Verticals should be secured with steel clips. Between pipe and clips rubber or plastic pads should be placed.
After installation of water supply network, test the network to test pressure of 12.0 bars according to JUS. Contractors and supervisory bodies should make records. After testing the network should be disinfected with chlorine solution and rinse it. Water samples should be

taken from the network and send them to bacterial-chemical analysis.

3. EXECUTION OF ELECTRICAL INSTALLATION WORKS

3.1 HEAVY CURRENT

3.1.1 LIST OF USED TECHNICAL REGULATIONS AND STANDARDS

In developing the basic project the following technical norms and standards were used:
- Law on Spatial Planning and Building of Objects (Official Gazette 51/08)
- Rule on technical standards for low voltage electrical installations (Official Gazette of SFRY, 53/88, 54/88 and Official Gazette of FRY 28/95)
- Rule on technical standards for the protection of buildings from lightning (Official Gazette of FRY 11/95)
- JUS N.B2.702 - Electrical installations in buildings
- JUS N.A3.805 - Electrical graphic symbols
- JUS N.B2.730 - Electrical installations in buildings
- JUS N.B2.741 - Electrical installations in buildings
  Safety requirements
  Protection against electric shock
- JUS N.B2.742 - Electrical installations in buildings
  Safety requirements
  Protection against thermal effects
- JUS N.B2.743/1 - Electrical installations in buildings
- JUS N.B2.743/1 Safety requirements
  Protection from excessive current
- JUS N.B2.751 - Electrical installations in buildings
  Selection and mounting of electrical equipment according to external influences
- JUS N.B2.752/1 Electric distribution
  Permanently allowed current
- JUS N.B2.754 - Electrical installations in buildings
  Grounding and protective conductors
- JUS N.B2.763 - Electrical installations in buildings
  Checking conditions for protection by automatic disconnection of supply
- JUS N.B2.762 - Electrical installations in buildings
  Checking conditions for protection by automatic disconnection of supply
- JUS N.B2.764 - Electrical installations in buildings
  Checking conditions for protection by automatic disconnection of supply
- JUS N.B2.771 - Electrical installations in buildings
  Facilities with bath tub or shower
  Specifications
- JUS N.B2.774 - Low voltage electrical installations
  Voltage installations
- JUS N.B2.781 - Low voltage electrical installations
  Choice of measures for protection against electric shock depending on external influences
- JUS N.B2.920 - Low voltage electrical installations
  Place for electricity meter
- JUS U.C9.100 - Daylight and electric lighting of rooms in buildings

- JUS N.B4.800 - Lightning protection system
  General conditions
- JUS N.B4.801 - Lightning protection system
  Selection of protection level
- JUS N.B4.802 - Lightning protection system
  Procedures for design, installation, maintenance, inspections and verifications.

3.2 LOW CURRENT

1. These technical requirements are an integral part of the project, so the contractor must adhere to them when developing installations.
2. Installation should be done in all respects according to the accompanying drawings, estimated cost of works, technical description, these conditions and the applicable regulations for the installation of low current electrical installations.
3. The Investor's supervisory authority shall be responsible for all interpretations of the project or the Designer in case of misunderstanding.
4. Before commencing work the Contractor shall conduct the on-site review of the entire project and harmonize his possible objections in the same way with the supervisory body of the Investor, and to state it in the construction works diary.
5. Before commencing work the Contractor shall make together with the Investor's supervisory body and the Contractor of other works a timetable and schedule of construction, which he will strictly adhere to during the construction. For any deviation from this dynamic works, written approval of the Investor's supervisory body must be obtained in advance. Otherwise, any damage to the Investor or other performers will be paid by the Contractor.
6. If in the course of work a need for changes of any kind arises, the Contractor is obliged to obtain the written consent of the Investor. Changes that affect the fundamental solution of the project must not be made without the consent of the designer.
7. All materials and equipment used for this type of installation must be first-class quality and fully comply with the standards applicable for the specific type of material or equipment. The Contractor shall replace at his expense all materials and equipment which are found to be of poor quality or which do not meet applicable standards.
8. For all equipment and parts of the equipment the Contractor himself is bringing or making he is obliged to develop all necessary workshop documentation for which he is also obliged to obtain consent of the Investor's supervisory body prior to the beginning of its development.
9. If the Contractor fails to do so, he will be obliged, at the request of the supervisory body, at his own expense and without the extension of deadline to make all necessary changes and a replacement of the delivered and installed equipment.
10. The Contractor is obliged to conduct all the necessary works with skilled labor, cleanly, solidly and high quality. All deficiencies that the supervisory body finds during the inspection of works, the Contractor is obliged to remove as soon as possible and at his expense.
11. The Contractor is obliged during the works in progress and upon their completion to carry out all the necessary tests and measurements and to hand the verified certificates to the Investor.
12. The Contractor is obliged to give to the Investor certificates and certified warranties for all installed equipment after the completion of works.
13. The Contractor is obliged to eliminate at his own expense and as soon as possible all the deficiencies established by the Committee for technical takeover of facility. If the Contractor shows to be negligent or does not want to eliminate the established deficiencies, the Investor has the right to entrust elimination of deficiencies to another qualified organization at the expense of the Contractor.

14. The Contractor shall guarantee to the Investor validity of installations for the period of two years starting from the date of technical acceptance of works. In the warranty period the Contractor is obliged to eliminate immediately and at his own expense correct all deficiencies which may appear due to the use of poor materials or non-solid construction.
15. If it turns out that some deficiencies of installations were caused by bad or negligent use or overload, the Contractor is obliged to eliminate all deficiencies at the request of the Investor but he will charge him actual costs.
16. For anything that is not explicitly stated in these terms and conditions, the Contractor is obliged to comply with applicable regulations and standards.

4. THERMAL INSULATION

4.1 General

1. The insulation must be in line with the project in all aspects.
2. Before the installation works, the contractor is obliged to examine the project and compare it to the facility, notify the investor on any project weaknesses or required significant changes and request further instructions from the investor.
3. The insulation elements that are not standard product but are made separately must be manufactured from a good-quality material and in the best possible way envisaged for this type of work. The surface protection layer must be set up exactly in line with the project layout, except in places where that is not specifically indicated and where such a layer shall be set up in accordance with usual standards for this type of work and in line with the quality regulations.
4. In consultation with the architect and the contractor, the project designer and the contractor shall secure a big enough resistance and insulation in the walls for the installation of horizontal and vertical distribution.

4.2 Insulation fitting

1. The contractor shall install all equipment under this project as specified under the graphic display, technical description and these technical requirements.
2. The mounting shall include the entire installation for smoke extraction and ventilation of the garage.
3. All the masonry work needed for attaching the holder, carrier, clips to carry channels and other elements of the installation shall be the obligation of the installation contractor.
4. Before each chase cutting or drilling of concrete, consent must be sought from the supervisory body and/or require that the construction work is carried out and give instructions on how to perform it. After the incorporation of the elements, the contractor shall close the holes in a way that matches the type of the embedded elements

4.3 VENTILATION

4.3.1 General technical requirements

1. The installation must be in line with the project in all aspects.

2. All elements of the installation must be such that all details match the specified characteristics and must have such dimensions that can fit in the dimensions provided by the project.
3. Installation elements which are not standard product but are made separately must be manufactured from a good-quality material and in the best possible way envisaged for this type of work. The surface protection layer must be set up exactly in line with the project layout, except in places where that is not specifically indicated and where such a layer shall be set up in accordance with usual standards for this type of work and in line with the quality regulations
5. Equipment, material and reinforcement must be of the most recent manufacturing date and in line with the applicable regulations in every aspect. The reinforcements and measurement instruments must be of solid making and fully to their purpose.
6. The contractor shall install all equipment under this project as specified under the graphic display, technical description and these technical requirements. The contractor is required to provide his own professional and auxiliary workers, their tools, machinery, instruments and everything else needed to complete the installation.
7. Works on the construction of the foundation for equipment that needs foundation are a part of installation delivery and the installation contractor is required to perform them. Also, all the masonry work needed for attaching the holders, carriers, clips and the like necessary to carry the installation elements shall be the obligation of the installation contractor.
8. Regulatory circuits, as well as other elements being parts of the automatic regulation, shall be mounted in line with the accompanying documentation. The contractor is required to fully comply with the manufacturer's instructions for measuring and regulation, these including: a detailed scheme of connection, installation manuals and guidelines for the regulation and handling.
9. Once fully completing the assembling of the entire installation, the contractor shall carry out the control and fine-tuning of equipment for measuring and automatic regulation in line with the projected parameters.
10. Electrical system is the subject of the project technical installations; however, the connecting of all electronic devices within the projected mechanical equipment shall be the obligation of the mechanical installation contractor, using his labour force, material and tools.
11. All electrical equipment intended for installation in the projected installation must be adapted to connect to the network 3x380V, 50Hz and/or 220V and 50Hz for single-phase connections.
12. Electric motors should be supplied with fuses and starters.
13. Electrical switchboard commands should contain all the elements required to manage, control and secure the devices (fuses, starters, pilot lamps, etc.). All necessary relays and other electric instruments that fall within the scope of automation or that are a piece of equipment that make the link between automation and electric motors shall be installed on the electrical switchboard.
14. The installation contractor shall provide all materials needed for the electrical connections of all electric motors and other electrical devices that form a part of the installation, their mutual connection and their connection to the electrical switchboard command.
15. Isolation and dyeing shall be performed after the completed installation and successful testing of hermetic quality of the installation. All metal parts of the installation without the manufactured surface protection layer should be thoroughly cleaned with steel brush and covered with two coats of ground paint prior to insulation and dyeing. The insulation shall be performed properly in every aspect and in the manner defined by the project. Dyeing of installations shall be with the colour of the investor's choice. The dye should have a good covering properties and resistance to the maximum predicted temperature.
16. Upon full completion of the installation, it should be subjected to a trial run and the regulation. All the preparatory work shall be made at the trial run, such as pre-regulation, setting the valves in the operating position and the like and then put the installation into operation. After the elimination of any faults that occur at the installation facility, perform fine-tuning using the designed and integrated regulation and measurement devices and equipment.

4.3.2 Special technical requirements for ventilation installing

1. To create straight and fitting channel parts, galvanized sheet metal of the following thickness must be used:

Higher channel edges (mm)	Sheet metal thickness (mm)
up to 250	0.5
251÷499	0.75
500÷999	1.0
over 1000	1.25

   For reducing and other fitting parts, the thickness of sheet sizes of the larger edge at the end of a small section is to be applied.

2. The following rolled profiled steel must be used to create a flange:
   a) for sheet metal thickness from 0.5mm up to 0.75 mm L 25x25x4 mm,
   b) for sheet metal thickness from 1.0mm up to 1.25 mm L 30x30x4 mm.
3. Connecting the flat sheet metal parts and fitting air ducts should be performed using the double-curved seam. Flanges of angle iron should be installed at the ends of straight parts and fittings. The ends of sheets of certain parts must be bent over the flange (overlapped). A gasket of asbestos braided 5-8 mm or asbestos carton thickness 3-4 mm should be placed between the flanges. Bolts ∅ 1 / 4" with hexagon head are to be used to connect the flanges.
4. Hangers and brackets for the channels must be made of rolled steel ∅ 10mm and L profiles 25x25x3 mm to 35x35x3 mm, using M10 bolts and a shim.
5. Channels should be made with as little as possible sharp bends. Every channel crank should be handled with blades for directing, and the same goes for the branching. Channels with a longer section dimension exceeding 500 mm should be 'tightened' in order to avoid drumming.
6. Shutter for air control must be solid construction with stiffeners on the bottom and top edge in order to avoid their vibration in any direction. Clappers have shaft outside the channel and/or chamber and can be manually handled or via motor engine.
7. All fans in the installation can be of a static pressure capacity and speed as indicated in the specification, and such dimensions that can be incorporated into the envisaged space. Fans should be classified as 'noiseless', i.e. to have the least possible noise at any given RPM. Fans should be connected to electric motors via V belts and joint sockets. V-belts and pulleys must be fitted with guards.
8. Electric motors to drive the fan must be designed for connection to a three-phase system of alternating current 380 V, 50Hz. The motors should be totally enclosed, with sliding wheels and must be supplied with appropriate rotor starters. The motors are mounted on sliding rails of cast iron or pressed steel.
9. Equipment that requires foundations is to be set on proper foundations whose exact measures are determined according to the dimensions of the equipment supplied.
10. Equipment in mechanical rooms shall be installed as per the project, taking into account the possibility of accessing individual elements and devices for handling and the possibility of their dismantling. Special attention should be dedicated to the installation of safety-technical and protection equipment, such as setting fire dampers and other fire protection devices, silencers and so on, abiding by the project documentation and the laws and regulations observed during the project preparation.
11. Hermetic quality of air installations that work under high-pressure shall be tested by measuring the flow at the output connector air chamber and at the current elements. At the

same time, the air balance must not differ more than 10%. For installations of low pressure, only the air installation tightness is examined.

12. Technical examination of the installation verifies whether the installed equipment, tools and automation fit the project. The quality of installation work is examined and designed parameters for installation in air-conditioned rooms are checked.