

Construction of Border Crossing Point (BCP) Kotroman

List of abbreviations

B.Q.	shall mean	Bill of Quantity
c	shall mean	centre
CA	shall mean	Contracting Authority
m³	shall mean	cubic meter
dd	shall mean	detailed design
EC Liaison Office	shall mean	European Commission Liaison Office to Serbia
EN	shall mean	European Standard
FFL	shall mean	Final floor level
DIN	shall mean	German Standard (i.e. Deutsches Institut für Normung)
HDPE	shall mean	High density extruded polyethylene
PE	shall mean	Polyethylene
h	shall mean	hour
ISO	shall mean	International Standards Organization
kW	shall mean	kilowatt (1000 watts)
kg	shall mean	kilogram
km	shall mean	kilometer
l	shall mean	liter
L.S.	shall mean	lump sum
m/d	shall mean	man-day
m	shall mean	meter
mm	shall mean	millimeter
MSEI	shall mean	Municipal Social and Economic Infrastructure
DN	shall mean	nominal diameter
%	shall mean	per cent
pcs	shall mean	pieces
PVC	shall mean	Polyvinyl chloride
PM	shall mean	Project Manager
QAS	shall mean	Quality Assurance System
RC	shall mean	Reinforced Concrete
m²	shall mean	square meter
mm²	shall mean	square millimetre
TA	shall mean	Technical Assistant
TS	shall mean	Technical Specifications
t	shall mean	tone (1000 kg)

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These Technical Specifications supplement the General and Special Conditions governing the Contract, which remain fully applicable.

1 PROJECT DESCRIPTION

Detailed design documents have been prepared for this project. They are fully in accordance with prevailing EU design and construction standards and fully in accordance with these Technical Specifications and the related Bill of Quantities.

1.1 SCOPE OF WORK

The Border Crossing Point (BCP) Kotroman is divided in two construction stages. Construction Stage 1 includes the objects which are highlighted in the table below. The subject Technical Specification only deals with the objects of Construction Stage 1. Construction Stage 2 (not covered by this Contract) shall be realized at a later stage. It includes all the remaining objects, as well as i.a. (inter alia) furniture, external fence, gate, guard service, unloading of containers, CCTV and the asphalt wearing course.

Book	Description	Included/ excluded	note
BOOK 1 & 2.1	Architectural and Construction works		
	00. PRELIMINARY WORKS	included	excl. fence, gate, guards etc.
	1. MIA AND CA	included	excl. furniture
	2. CANOPY	included	
	3. WEIGHTBRIDGE	excluded	
	4a. AND 4b. COMBINED CABIN NO.1 (MIA AND CA)	excluded	excl. furniture
	5. FORWARDING AGENTS	excluded	
	6. SANITARY BLOCK	excluded	
	7 INSPECTION and 8a CANOPY ABOVE 7	excluded	
	8 SECOND LINE CONTROL BUILDING	excluded	
	8a CANOPY ABOVE OBJECT 5	excluded	
	8b CANOPY ABOVE PARKING	excluded	
	9 DESINFECTION BARRIER	included	
	10. AND 11. CUSTOM'S WAREHOUSE	excluded	
	12. TRAFO (in provisional sums)	included	excl. furniture
	13. COMBINED CABIN NO.2 - AT THE EXIT (MI AND CA)	included	excl. furniture
	14. COMBINED CABIN NO.3 - AT THE ENTRANCE (MI AND CA)	included	excl. furniture
	15. CABIN NO.4 - AT THE ENTRANCE FROM THE TRUCK TERMINAL (MI)	included	excl. furniture
	16. CABIN NO.5 - AT THE EXIT FROM THE TRUCK TERMINAL (CA)	included	excl. furniture

	17. ANTENNA	excluded	
	20. MAST	excluded	
	21. GARBAGE CONTAINER	excluded	
	23. GENERATOR PLATEAU	excluded	
	24a. WATER METER SHAFT	included	
	24b. CHAMBER FOR PUMP AND 24v. WATER TANK	included	
	24g. WELL CHAMBER	included	
	25. RETAINING STRUCTURE WITH A FENCE	included	
BOOK 2.2	Traffic / Road works	included	excl. asphalt wearing course
BOOK 3.1	Water Supply and Installation	included	
BOOK 3.2	External Sewerage System	included	
BOOK 3.3	Atmospheric Sewerage System	included	
BOOK 4.1	Electric installation	included	
BOOK 5.1 & 5.2	Telecommunication and signal installation	included	Excl. CCTV
BOOK 6	HVAC Systems	included	
BOOK 8	Traffic and traffic signaling	included	
BOOK 9	Landscaping	excluded	

1.2 LOCATION OF THE PROJECT

Subject of the Conceptual design is construction of border crossing "Kotroman" on cadaster plot number 9491/2 cad. mun. Mokra Gora. The crossing presents state border with Bosnia and Herzegovina; it is located on state road IB category no. 28, between narrow-gauge railway Šargan - Vitasi - Mokra Gora - Vardište - Višegrad and Beli Rzav River.

1.3 ARCHITECTURAL DESIGN (BOOK 1) & CONSTRUCTION DESIGN (BOOK 2/1)

The existing border crossing Kotroman is characterized by inadequate capacity and flow of the existing transport areas, missing facilities and objects necessary for proper functioning of the border crossing.

The purpose of the complex is road border crossing, in the category of public construction land.

The description order for newly designed objects coincides with order of marking the objects in the layout.

Following objects are envisaged within the complex:

1. Ministry of Interior and Customs administration,
2. Canopy
4. Combined cabin no. 1 (MIA and CA)
9. Disinfection barrier
12. Transformer station

- 13. Combined cabin no. 2 at the exit (MI and CA)
- 14. Combined cabin no. 3 at the entry (MI and CA)
- 15. Combined cabin no. 4 at the truck/cargo exit (MI and CA)
- 16. Combined cabin no. 5 at the truck/cargo exit (MI and CA)
- 18. Official parking
- 19. Ramp
- 24a. Water metering shaft
- 24b. Pump shaft
- 24v. Water reservoir
- 24g. Well shaft
- 25. Support construction

1.3.1 1.Ministry of Interior and Customs Administration

The object is intended for housing the employees at the border crossing, executing the passenger and cargo control. Gross object area is about 379.96 m², G+1, and makes a functional and visual whole with the canopy and control cabins.

The object is divided into 3 functional units: MI rooms, CA rooms and common rooms.

The shape of the object grew out of functional requirements as well as comfort requirements (light, sound and thermal) necessary for work and stay of users.

Economic aspects, exploitation and maintenance aspects were taken into consideration during design and material application.

Vertical supporting structure consists of eight pillars of a square cross-section (30/30 cm), and four shear walls 20 cm thick. Shear walls are located at end of object axis and point designed for RC stairway. Horizontal supporting construction consists of slabs 20 cm thick and a beam of a square cross-section (30/40 cm). Foundation construction consists of floor slab 20 cm thick and inverted T-beam. A thin layer of concrete and crushed stone layer are envisaged below the foundation construction.

The design envisages that the part of the object is covered by thermo-insulating panels with mineral wool filling on appropriate steel sub-construction. Facade of the other part of object consists of: "C" cassette mounted on the appropriate RC structure of the object, stone wool filling 15cm thick, vapor permeable foil, air layer 4cm thick and finishing façade sinus steel sheet.

Internal, partition walls and internal lining for facade walls are designed as dry installation.

Granite tiles are designed for communication while PVC, vinyl flooring is designed for offices.

All external hardware is designed as aluminum profile with improved thermal break.

Object roof presents a part of the canopy which is supported by RC supporting pillars of the object.

1.3.2 2.Canopy

Object is intended for protection of employees and travelers against adverse atmospheric conditions, during border crossing. The canopy creates a functional and visual whole with the MI and Customs administration object (object no.1).

Canopy covers passenger-customs terminal on the north-east side and cargo-customs terminal on the south-east. The canopy has variable height from 5.50 – 8.60 m, depending on the zone it's covering, and meets requirements for passing of all vehicles except oversized vehicles.

Gross area the canopy is covering is about 1247.78 m².

The canopy consists of four slanting roof planes, i.e. two gable roofs which join in roof valley in axis 2. Roof cover for canopy is sinus steel sheet. At the request of future users, construction of suspended ceiling on the canopy is designed.

Construction solution is dictated by functional requirements and construction phases. Supporting construction will be made of steel and reinforced concrete.

Roof plane slopes are 12° (three planes) and 8° (one plane). Vertical supporting construction is made of 11 V-shaped pillars. Horizontal supporting construction is made of steel beams which connect the pillar tops in longitudinal direction and main roof rack which supports rafters. Bracing structure is designed in roof construction. A layer of thin concrete and a layer of crushed stone is designed below RC foundation footing.

Atmospheric water is drained through gutter verticals mounted towards slating pillars. Traffic signals should also be mounted on canopy.

1.3.3 4, 13, 14, 15, 16, – Combined cabins (MI and CA)

According to applicable standards and requirements from the Investor, the designs envisages combined cabins at the entries i.e. exits from the terminal, whose users are both MI and CA officials

Direct connection is made between employees, drivers and vehicle interior, during the inspection and control of passenger and trucks from the cabins.

Cabin dimensions are different depending on location within border crossing complex. Floor level varies depending if the cabin is on passenger or cargo terminal.

Cabins are designed as container type objects, steel construction, lined with thermal insulation panels with mineral wool filling. Funding of the container is on RC slab which is laid on RC beams. Aluminum fenders are on containers: entrance door and sliding counter window with safety glass (tempered or laminated).

1.3.4 9 – Disinfection barrier

The design envisages a 3x6m prefabricated disinfection barrier. Disinfection barrier is designed on state road category I A no.4, at the south-west part of the plot, by the border with Bosnia and Herzegovina and the entry in the cargo-customs terminal.

1.3.5 24a - Water meter shaft

Supporting structure is made of reinforced concrete.

The object has rectangular base, maximum dimensions 3.20x2.20m and 180cm high. The object is buried. RC construction consists of floor slab, walls and upper slab. Walls exiting the upper slab and finishing above the terrain are designed in the upper slab at points of openings. A layer of screed and a layer of crushed stone are envisaged below the foundation construction.

1.3.6 24b - Pump shaft

Supporting structure is made of reinforced concrete.

The object has rectangular base, maximum dimensions 5.63x3.85m and 310cm high. The object is buried. RC construction consists of floor slab, walls and upper slab. Walls exiting the upper slab and finishing above the terrain are designed in the upper slab at points of openings. A layer of screed and a layer of crushed stone are envisaged below the foundation construction.

1.3.7 24v - Water reservoir

Supporting structure is made of watertight reinforced concrete.

The object has rectangular base, maximum dimensions 5.90x5.60m and 480cm high. The object is buried. RC construction consists of floor slab, walls and upper slab. Walls exiting the upper slab and finishing above the terrain are designed in the upper slab at points of openings. A layer of screed and a layer of crushed stone are envisaged below the foundation construction.

1.3.8 24g - Well shaft

Supporting structure is made of reinforced concrete.

The object has rectangular base, maximum dimensions 3.40x2.40m and 198cm high. The object is buried. RC construction consists of floor slab, walls and upper slab. Walls exiting the upper slab and finishing above the terrain are designed in the upper slab at points of openings. A layer of screed and a layer of crushed stone are envisaged below the foundation construction.

1.3.9 25 - Supporting construction

Supporting structure is made of reinforced concrete.

Supporting wall consists of RC footing 45cm thick, and RC wall 40-50cm thick. Wall has a total height of 290 to 510cm (from the top to the lower edge of the foundation footing) while the founding depth is 200cm in relation to existing floor level. Supporting wall is founded on the existing rock. Foundation footing width is B1=320cm and B2=350cm.

1.4 TRAFFIC DESIGN (BOOK 2/2)

The main objective of the construction and reconstruction of the existing international border crossing "Kotroman" between Republic of Serbia and Bosnia and Herzegovina, which is on IB state road No. 28 Kremna (Tara) - Border SRB / BiH (BC "Kotroman"), regarding traffic is to create the optimal conditions for a functional and technological traffic with the fulfillment of optimum conditions of functioning of the border services - border police and customs.

The preliminary design for traffic areas, several additional traffic lanes were designed, which will increase the throughput capacity of border crossing.

In the direction of exit from Serbia, a traffic lane for truck traffic (4.50m wide) and two lanes for passenger and bus traffic (2x3.50m) were designed.

Two traffic lanes (width 2x3.50m) for passenger and bus traffic and a special niche for bus inspection are designed at the entrance from Bosnia and Herzegovina for both passenger and bus traffic, with minimum length of the flat part of 16m.

Trucks are forwarded to a special truck terminal on the right side in the direction of movement which is a separate fenced area with a special entry regime, vehicle movement and control of trucks and the loads. Truck terminal has 14 parking spots for trucks and large trucks.

Within the terminal, and below the canopy of the border crossing, a weighbridge is designed for controlling load and truck axle pressure.

After inspection and registration of documents, vehicle shall be, depending on the type of goods that are transported and regularity of documentation, directed to a specific parking place where the driver expects the invitation to access the canopy for load control, where he will, after authentication of documents, as well as vehicles in transit, continue on the exit road to Kremna and Užice. A ramp for unloading the goods during control inspection of the truck is designed within the truck terminal. A warehouse for storing temporarily seized goods is designed at the exit from the truck terminal.

Two positions for business parking for cars with total of 13 spots are designed within the border crossing.

Expected average annual daily traffic which would be carried out through complex

for about 1100 vehicles.

PC – 955

BUS - 17

JIT - 10

ST - 10

TT - 18

AB - 90

The entrance into the customs complex will be through state road category IB no. 28 (code according to the new categorization of state roads), Kremna (Tara) - border SRB/BiH (BC "Kotroman"). The approximate chainage of the entrance in direction towards Serbia is km 156+479.000.

A connection of the complex to the mentioned state road, which is exit road by its function, is designed for exit of cargo traffic from the complex.

The connection is located at approximate chainage km 156 + 483,346 of state road IB no. 28 towards Serbia (Užice).

Designed width of the connection is about 24.00 m with a radius of right edge of the connection from 20m and left edge of 6.5m which passes into radius of 15m at the entrance into the complex. This connection is one-way and it serves for exit of cargo vehicles from the complex so the designed radius and width enable safe and clear exit of cargo vehicles from the complex and further movement. The connection area is about 116 m².

1.5 HYDROTECHNICAL INSTALLATION DESIGN - WATER SUPPLY DESIGN (BOOK 3/1)

There are no technical conditions for connection to the public water supply network at the location.

Potable water supply and firefighting needs for the complex, as well as water for washing and maintenance of maneuvering areas, will be provided from groundwater from wells which will be located at the site of the border crossing Kotroman. The well itself is a subject of a separate design. Water from the well will be carried to the buried reservoir after which it will be distributed to consumers by a booster station. A water metering shaft is envisaged after the booster station for measuring the water consumption, for sanitary and hydrant water separately.

Pipe material for distribution network of the external sanitary and hydrant water will be PEHD water pipes.

Internal network would be designed of polypropylene (PP-R) water pipes.

Internal hydrant network would be designed of galvanized steel water pipes.

1.6 HYDROTECHNICAL INSTALLATION DESIGN – DESIGN (BOOK 3/2)

1.6.1 Sewer

There are no technical conditions for connection to the public sewer network at the location, which are not yet constructed at the locality.

A separate sewage system for sanitary-fecal water, conditionally clean and potentially contaminated storm water is designed in the complex.

Sanitary-fecal waste water from the complex objects at the border crossing will be captured by a separate sewage system and will be carried to the waste water treatment device and evacuated into the recipient - Beli Rzav River.

Atmospheric (rain) water from the roofs of buildings and landscaped area of the border crossing complex (not contaminated) will be resolved by the drainage into the surrounding green area (channels and gullies system), without prior treatment.

Polluted-oiled atmospheric water from maneuvering areas and water from washing and maintenance of these areas, will be separately channeled, and after treatment at the oil separator, grease and light liquids will be carried to the recipient.

Complete sewer distribution is designed of PVC sewer pipes.

1.7 HYDROTECHNICAL INSTALLATION DESIGN – DESIGN (BOOK 3/3)

1.7.1 Atmospheric sewer

Atmospheric sewer design for border crossing Kotroman was made based on: Architectural-construction design, traffic design, geodetic survey, location requirements, water management conditions, geodetic survey and data on precipitation for the subject area.

The adopted solution enables conditions for catching atmospheric waters from flat and inclined roofs, roads, pavements and green areas. Caught atmospheric water will be drained to existing recipient, i.e. riverbed of Beli Rzav River, through piped sewer system.

Line grates, monoblock type made of polymer concrete and prefabricated spot culverts of standard shape, quality and designed are designed for catching surface waters from roads and pedestrian areas.

Transport of atmospheric waters from the upstream part of the basin from area north of the border crossing is achieved through three existing pipe culverts. The design envisages that the existing pipe culverts are extended and a new part of pipe culvert is constructed right below the border crossing. Pipe culvert ends in reinforced-concrete cast structure.

All atmospheric waters from the border crossing complex are, after catching, taken to the lowest part of the complex where installation of standard separator is designed. The design envisages a coalescing separator for light oil derivatives with external by-pass, OLEOPATOR-K or similar.

After passing through the separator, treated atmospheric waters are discharged into the pipe culvert and later into the recipient - Beli Rzav River.

Reinforced concrete shafts are designed at each horizontal and vertical route break, change in diameter of sewer pipe or height denivelation of the pipe bottom level.

Prefabricated covers with round or rectangular frameworks for heavy traffic load are designed on sewer shafts.

1.8 ELECTRIC INSTALLATION DESIGN (BOOK 4)

Based on obtained location requirements no. 350-02-02274/2016-14 from 30/01/2017, the connection to the power supply network is designed in line with Requirements for connection to power distribution system issued by Distribucija doo Beograd, Užice branch, D.09.15-311465/2-16 (broad consumption - broad consumption) and D.09.15-311465/1-16 (low voltage consumption).

Both decisions state that it is necessary to define the position of the future MBTS "Carinarnica" 10/0,4kV, construction 1000, electric 1x630kVA, in the first phase with power transformer, installed power 250kVA.

The conditions define that the connection of the border crossing Kotroman is done through two measurement/distribution cabinets MRO located next to transformer station "Carinarnica".

In one MRO, installation of two semi-indirect metering groups with power meter transformers, transmission ratio 125/5 A / A and 75/5 A / A class of accuracy of 0.5 is designed. These two semi-indirect group are provided for supply of main power distribution cabinets, respectively, GRO-UP and GRO-MUP, PP00 cables of the required cross-section and number of wires.

Installation of 7 three-phase meters 10-40A (inspection, bank, post office, AMSS, tourist organization, forwarding agency and backup) is envisaged in the second MPO. Both meters are designed for supplying single units, cable type PP00, of required cross section and number of wires.

MPO, transformer station and connection line are not a subject of this design.

No.	Name	Installed power $P_{inst}(kW)/I(A)$	Cable(mm ²)
1.	Customs administration	83/125	PP00-A 4x120
2.	MI	53/80	PP00-A 4x95
3.	Inspection	13,8/20	PP00 5x6
4.	Bank	11,04/16	PP00 5x6
5.	Post office	11,04/16	PP00 5x6
6.	AMSS	11,04/16	PP00 5x6
7.	Tourist	11,04/16	PP00 5x6
8.	Forwarding agency	11,04/16	PP00 5x6
9.	Backup	11,04/16	PP00 5x6

Cable lines are laid in ground, distribution type D.

Supply routes are given in the design drawings.

Requirements to be met by the object for construction of the connection:

Object purpose: Border crossing

Voltage at which it is being connected: 0.4 kV

Power factor: above 0.95

Requirements for protection against indirect contact voltage, overload and over-voltage: Protection against indirect contact voltage in electric installations of the object within the complex shall be done by applying TN-C-S protection system.

Requirements for placing the installation in the object behind the connection: Protection devices on the distribution panel of the installations shall be done in line with applicable technical requirements.

Selection of supply cables was made based on permissible current in permanent service, voltage drop, short circuit and conditions for allowed loop resistance i.e. meeting requirements from SRPS HD 60364-4-41.

Within the border crossing complex Kotroman, an alternative supply through diesel generator is designed, which is placed next to the transformer station. Features of the designed generator are QAS-125 "ATLAS COPCO" or equivalent. Backup supply envisages that in case of power failure in transformer station, entire load is taken over by the generator.

1.8.1 Lightning protection installation and equipotential bonding

For object of the border crossing Kotroman complex, installation of standard lightning protection "FARADAY CAGE" or equivalent is envisaged. This system is based on installation of foundation grounding to which all objects and all larger metal masses of the complex are connected.

The object is lower than 30m so no additional ring for lightning protection installation is needed.

During evaluation of the protection level of lightning protection installation, a calculation for determining the protection level in line with Standards and Regulations shall be applied.

Such technical solution is designed that enables safe and sound work, where basic criteria for installation quality are met. Analysis of the object size, current situation and surrounding infrastructure, a conclusion was made that the application of "FARADAY CAGE" is the most optimal solution or equivalent.

1.9 TELECOMMUNICATION AND SIGNAL INSTALLATION DESIGN (BOOK 5)

Based on obtained location requirements no. 350-02-02274/2016-14 from 30/1/2017, the connection to telecommunication network is designed in line with Technical requirements for connecting the object to TC network issued by Telekom Srbija, 171-451435/2-2016.

Optical cable Mokra Gora-Kotroman and subscriber cable TC 10 through which the existing telephones are in function in border crossing Kotroman, are located at the subject plot.

For connection of border crossing Kotroman to the telecommunications network, construction of two diffusers TK chambers, dimensions 1x1x1m with a light cover is designed. The first chamber is envisaged in front of CA and MI object (object no.1) and the second near the inspection object (object no. 7). A trench 0.8m deep is envisaged between the chambers with two PVC fi110mm pipes laid. From the border of regulation plan (towards Užice) to TC chamber no.2 a trench 0.8m deep is envisaged with two PVC pipes fi 110mm. From newly constructed TC chamber no.1 to MI and CA object a trench with two PE pipes fi 40mm ending in outlet cabinet are envisaged. Through pipes from TC chamber to ITO cabinet, a cable type TC DSL (30)59GM of the proper length and capacity (20x2x0.4) is envisaged. Terminal strips type KRONE where guiding cables end are envisaged in outlet cabinet. The other pipe is envisaged for later optical cable installation. ITO cabinet is installed at the ground level of the object. ITO cabinet will be grounded. Internal installation is designed with cables type UTP cat6. Installation inside the object will be placed in installation pipes. KRONE terminal strips are envisaged in ITO cabinet where installation cables end.

Computer network is made of UTP cat6 cables. Concentration of these cables is in REK cabinet.

1.9.1 Automatic fire alarm

All parts of the border crossing Kotroman complex that can be in danger of fire will be covered by fire alarm system. The system consists of detector, installation, sirens and switchboard. The switchboard is installed at a place where the duty staff will be present 24h.

1.9.2 Other low voltage systems

Access control and video monitoring systems will be designed within the border crossing Kotroman complex. These systems will be especially elaborated by the safety services of CA and MI.

1.10 MECHANICAL INSTALLATION DESIGN (BOOK 6)

1.10.1 General Remark

The MECHANICAL PROJECT has been designed in accordance with the Rulebook on the content, method and procedure of preparation and the manner of controlling technical documentation according to the class and purpose of the facilities (Official Gazette RS, No.23 / 2015, 77/2015, 58/2016 and 96/2016).

1.10.2 Building No.1 of MIA and UC (P + 1)

The building has floors P + 1, the dimensions of the base are 24.7x8m. It is envisaged that the facility has two users of the MUP and the Customs Administration (UC). Due to the request of the Investor for the possibility of dividing the energy consumption (user of the premises), a system for heating and cooling is described below. The system 1 as well as the system 2 for the premises of the Rek (1) is envisaged for the user of the facility No.1 MUP. For the user of facility No.1 Customs Administration, system 2 as well as system 4 for the premises of Rek is envisaged (No. 17). According to the calculations, the heat losses of the heat for the object are 11,19kW for the ground floor, ie, 12,16 kW for the floor and a total of 23,35 kW for the facility, and the heat heat generated for the ground floor is 26,13 kW and 27,76 kW for the floor.

The basic energy for heating and / or cooling of the building is electricity. For the heating of the object there are two systems, which are not used in parallel operation, but either one or the other system is used depending on the outside temperature. Electric parapet radiators (due to extreme low temperatures) are provided as the primary heating system. For heating (secondary system) and cooling of the facility, a heat pump is provided for air air (air conditioning Variable System - VRV) consisting of one outdoor unit and several indoor units (cassette and parapet models). Since these VRV systems can also be used for heating the facility (the system works at -15 ° C outside temperature), the system is cooling the object. The VRV system in the heating mode is to use as much as possible because of the economy.

There is no provision for air exchange in offices (offices). In room no. 6 on the ground floor, the heating body is a parapet unit mounted according to the conditions of the MUP for detention rooms (prison). All other indoor units are cassette (ceiling), mounted in the lowered ceiling (Compact 4-way Cassette) with remote and wired controls, a condensate drain pump and an accompanying coarse filter. The indoor air conditioning units have microprocessor control and air temperature control in the room, they have this work and the possibility of network addressing and the system of self diagnosis. The outdoor units are located on the facade of the building. The outdoor units are air-cooled condensers and compressors and have the possibility of heating when the outdoor temperatures are up to -15 ° C. The outdoor units are equipped with safety devices (pressure switches) for too high and low pressure, dryers (filters), relays, coolant collectors, active systems for automatic oil and lubrication control and microprocessor control systems with display of fault code in operation. Features of external units: system 1 - MDV Plus Outdoor Unit type MDV-280 (10W) / DRN1 (B), Qhl = 28kW, Qgr = 31,5kW, Pel = 4,39kW, 260kg, 960x1615x765mm, 57dB (A) System 5 - MDV Plus Outdoor Unit, Type MDV-280 (10W) / DRN1 (B), Qhl = 28kW, Qgr = 31,5kW, Pel = 4,39kW, 260kg, 960x1615x765mm, 57dB (A) -type MOU-18HDN1-Q, Qh = 5,6kW, Qg = 6,14kW, Pel = 2,5kW. Other characteristics of the equipment are given in the graphic documentation.

The tube working fluid network of the freon is a copper (with the necessary insulation). All pipes should be insulated with steam-jet insulation with AC type thickness of 9 and 13 mm, and external distribution of copper pipes of HTS insulation thickness min. 20 mm and additionally protected with facade paint. The drainage of condensate from the indoor units is made of PVC sewer pipes of the dimensions indicated in the graphic documentation. Take the lines according to the graphic documentation to the nearest wet nodes (or sewers) and connect through the siphon to a suitable drainage point. Freon installations are carried in suspended ceilings (as well as conduit lines).

On the first floor and on the ground floor of the facility where the sanitary facilities are located, the heating will be done through heating bodies - electric radiators. The ventilation will be done by the natural air flow (window) from the sanitary nozzle. Room no. 13 on the ground floor of the building it is foreseen to have forced ventilation (exhaust fan with channel divorce) as well as a grid on the door to the corridor.

1.10.3 Object combined cab 3 (MUP and UC)

The object of the combined cabin is on floors F. The dimensions of the base of the building are 3x2,4m. Based on the calculations, the heat losses of this object are 1017W and the heat gain is 1583W.

The basic energy for heating and / or cooling of the building is electricity. For heating, a heating body electric radiator is provided with a 1000 W power take-off type (with thermostat and associated equipment), dimensions and characteristics given in the drawings. The cooling of the object will be done by the heat pump air injection split inverter consisting of one outdoor unit (MS12FU-12HRFN1-QRD0GW (F8), $Q_h=1.29-4.45\text{kW}$, $Q_{gr}=1.2-4.87\text{kW}$, $P_e = 1.17\text{kW}$, 55dB (A), 29.1kg, 800x554x333mm), and one indoor unit (wall model). This system can also be used for heating the facility (the system works at -15°C outside temperature), but the system's accuracy is cooling the object. Split system in heating mode is used as much as possible due to economy. The indoor unit is wall mounted (with remote control). The drainage of the condensate is from the outside. Freon installations work from copper pipes dimension indicated in the graphic documentation. All pipes should be insulated with steam-jet insulation with AC type thickness of 9 and 13 mm, and external distribution of copper pipes of HTS insulation thickness min. 20 mm and additionally protected with facade paint.

The outdoor unit is on the roof of the building. The outdoor unit is air-cooled with condensers and compressors and has the possibility of heating when the outdoor temperature is up to -15°C . The outdoor unit is equipped with safety devices (pressure switches) for too high and low pressure, dryers (filters), relays ie. coolant collectors, active systems for automatic oil and lubrication control and microprocessor control systems with display of fault code in operation.

At this facility there is also a ventilation system that serves to maintain overpressure in the cabin and prevent the entry of carbon monoxide from the outside, ie, prevents the entry of exhaust gases of motor vehicles into the cabin. The system maintains an overpressure in the cabin of 50Pa, and is located on the roof of the facility and consists of a duct diverter, fan, duct electric heater (with necessary protection), non-return valves, air filters, pressure difference sensors and an exterior element - aero valve.

1.10.4 Object cabin No 6

Object of the cabin no. 6: The dimensions of the base of the building are 3x2,4m. According to the calculations, the thermal losses of this object are 1017W, and the heat gain is 1583W.

The basic energy for heating and / or cooling of the building is electricity. For heating, a heating body electric radiator is provided with a 1000 W power take-off type (with thermostat and associated equipment), dimensions and characteristics given in the drawings. The cooling of the object will be done by the heat pump air injection split inverter consisting of one outdoor unit (MS12FU-12HRFN1-QRD0GW (F8), $Q_h=1.29-4.45\text{kW}$, $Q_{gr}=1.2-4.87\text{kW}$, $P_e = 1.17\text{kW}$, 55dB (A), 29.1kg, 800x554x333mm), and one indoor unit (wall model). This system can also be used for heating the facility (the system works at -15°C outside temperature), but the system's accuracy is cooling the object. Split system in heating mode is used as much as possible due to economy. The indoor unit is wall mounted (with remote control). The drainage of the condensate is from the outside. Freon installations work from copper pipes dimension indicated in the graphic documentation. All pipes should be insulated with steam-jet insulation with AC type thickness of 9 and 13 mm, and external distribution of copper pipes of HTS insulation thickness min. 20 mm and additionally protected with facade paint.

The outdoor unit is on the roof of the building. The outdoor unit is air-cooled with condensers and compressors and has the possibility of heating when the outdoor temperature is up to -15°C . The outdoor unit is equipped with safety devices (pressure switches) for too high and low pressure, dryers (filters), relays ie. coolant collectors, active systems for automatic oil and lubrication control and microprocessor control systems with display of fault code in operation.

At this facility there is also a ventilation system that serves to maintain overpressure in the cabin and prevent the entry of carbon monoxide from the outside, ie, prevents the entry of exhaust gases of motor vehicles into the cabin. The system maintains an overpressure in the cabin of 50Pa, and is located on the roof of the facility and consists of a duct diverter, fan, duct electric heater (with necessary protection), non-return valves, air filters, pressure difference sensors and an exterior element - aero valve.

1.10.5 Object cabin No.4 Combined cabin no. 1 MUP and UC

Object of the cabin no. 4: Combined cabin MUP and UC are floors P. The dimensions of the base of the building are 6x2,1m. According to the calculations, the thermal losses of this object are 2566W, and the heat gain is 4140W.

The basic energy for heating and / or cooling of the building is electricity. For heating, radiators are provided with electric radiators, type 1500 W and 1250 W Beams (with thermostat and accessories), dimensions and characteristics given in the drawings. The cooling of the object will be done by the heat pump air injection split inverter consisting of one outdoor unit (MS12FU-12HRFN1-QRD0GW (F8), $Q_h = 1.29-4.45\text{kW}$, $Q_{gr} = 1.2-4.87\text{kW}$, $P_e = 1.17\text{kW}$, 55dB (A), 29.1kg, 800x554x333mm), and one indoor unit (wall model). This system can also be used for heating the facility (the system works at -15°C outside temperature), but the system's accuracy is cooling the object. Split system in heating mode is used as much as possible due to economy. The indoor unit is wall mounted (with remote control). The drainage of the condensate is from the outside. Freon installations work from copper pipes dimension indicated in the graphic documentation. All pipes should be insulated with

steam-jet insulation with AC type thickness of 9 and 13 mm, and external distribution of copper pipes of HTS insulation thickness min. 20 mm and additionally protected with facade paint.

The outdoor unit is on the roof of the building. The outdoor unit is air-cooled with condensers and compressors and has the possibility of heating when the outdoor temperature is up to -15 ° C. The outdoor unit is equipped with safety devices (pressure switches) for too high and low pressure, dryers (filters), relays ie. coolant collectors, active systems for automatic oil and lubrication control and microprocessor control systems with display of fault code in operation.

At this facility there is also a ventilation system that serves to maintain overpressure in the cabin and prevent the entry of carbon monoxide from the outside, ie, prevents the entry of exhaust gases of motor vehicles into the cabin. The system maintains an overpressure in the cabin of 50Pa, and is located on the roof of the facility and consists of a duct diverter, fan, duct electric heater (with necessary protection), non-return valves, air filters, pressure difference sensors and an exterior element - aero valve.

1.10.6 Object cabin No.13 Combined cabin no. 2 MUP and UC

Object of the cabin no. 4: Combined cabin no. 2 MUP and UC are floors P. Dimensions of the base of the building are 3,5x1,5m. According to the calculations, the heat losses of this object are 1409W, and the thermal gain is 3945W.

The basic energy for heating and / or cooling of the building is electricity. For heating, heating bodies are provided electric radiators type Beha power 2x800 W (with thermostat and associated equipment), dimensions and characteristics given in the drawings. The cooling of the object will be done by the heat pump air injection split inverter consisting of one outdoor unit (MS12FU-12HRFN1-QRD0GW (F8), $Q_h = 1.29-4.45\text{kW}$, $Q_{gr} = 1.2-4.87\text{kW}$, $P_e = 1.17\text{kW}$, 55dB (A), 29.1kg, 800x554x333mm), and one indoor unit (wall model). This system can also be used for heating the facility (the system works at -15 ° C outside temperature), but the system's accuracy is cooling the object. Split system in heating mode is used as much as possible due to economy. The indoor unit is wall mounted (with remote control). The drainage of the condensate is from the outside. Freon installations work from copper pipes dimension indicated in the graphic documentation. All pipes should be insulated with steam-jet insulation with AC type thickness of 9 and 13 mm, and external distribution of copper pipes of HTS insulation thickness min. 20 mm and additionally protected with facade paint.

The outdoor unit is on the roof of the building. The outdoor unit is air-cooled with condensers and compressors and has the possibility of heating when the outdoor temperature is up to -15 ° C. The outdoor unit is equipped with safety devices (pressure switches) for too high and low pressure, dryers (filters), relays ie. coolant collectors, active systems for automatic oil and lubrication control and microprocessor control systems with display of fault code in operation.

At this facility there is also a ventilation system that serves to maintain overpressure in the cabin and prevent the entry of carbon monoxide from the outside, ie, prevents the entry of exhaust gases of motor vehicles into the cabin. The system maintains an overpressure in the cabin of 50Pa, and is located on the roof of the facility and consists of a duct diverter, fan, duct electric heater (with necessary protection), non-return valves, air filters, pressure difference sensors and an exterior element - aero valve.

1.10.7 Building 6 - Sanitary node

Thermal losses of this object are 2102W. The building is a storey P and the dimensions of the base of the building are 8,06x4,76m. The main energy source for heating the building is electricity. For heating, heating bodies are provided in the form of electric radiators (with thermostat and associated equipment), dimensions and characteristics given in the drawings. The cooling of the object has not been considered. Ventilation in the sanitary node will be done naturally (windows).

The warehouse facility was not taken into consideration since according to the Investor's order there was no need for heating and / or cooling the facility.

The projected temperature is: in all offices in the winter period 20 ° C, in the corridors 18 ° C, and the toilet rooms in the MUP and UC are 22 ° C. For the object 6, the project temperature is 12 ° C, due to the low frequency of use. Designed temperature in the summer period in all rooms being treated, 26 ° C. All other conditions for the performance of the works concerned are described in the numerical and graphic part of the project and must be strictly observed. Before beginning the execution of the works concerned, it is obligatory to consult the designer. Any changes during the performance of the works concerned must not be performed by the contractor without the prior written consent of both the professional supervision and the designer.

1.11 DEMOLITION DESIGN (BOOK 10)

The existing border crossing consists of several ground level object which are located along the state road, i.e. between the road and narrow-gauge railway. Following objects are present: tourist object, CA and MI object which is partially covered with steel canopy. The canopy covers two traffic lanes for entry and exit from the state, as well as combined cabin with divisional island. There is a plateau with generator at the exit from the country as well as container type object which is owned by border police.

A line of ground level objects, forwarding agency, inspection and other are in the north-east part of the existing border crossing complex. The mentioned objects are not a part of plan regulation and are not included in this design.

The layout of the existing state, existing objects at the site are given in the design. During the construction works, the border crossing will not be closed, working hours are 24h. In this regard the Preliminary demolition design displays phase construction of the border crossing in technological sense, addendum 2. Depending on phase technology of the construction, a display of demolition of the existing objects per phases is given in the design.

The existing canopy will be disassembled in the first phase of construction of border crossing. A protection platform under the canopy will be built first. Its function is to provide safe functioning of the crossing during construction. Sheet lining and existing installation will be disassembled from the protection platform. The main canopy structure will be disassembled in segments. Disassembly starts from the end fields. The last field to be disassembled is the field where the bracing structure is located in the roof plane.

After the disassembly of the roof layers and installations, rafters and grid roof support are disassembled. Pillars are disassembled at the end.

Support RC slab will be demolished in phase 2. The support structure will be demolished up to about 80cm from the level of the newly designed road.

The existing object of MI and AC, foundation pads of the existing canopy, as well as cabin and its foundation will be demolished in phase III. Non-supporting and partition walls inside the object will be disassembled first. After that, the roof cover and roof structure are disassembled. Remaining walls and foundations will be disassembled at the end. All remaining existing objects within the future border crossing complex will be disassembled/demolished in the third phase.

Machinery and equipment that will be used during demolition must be approved by the supervisor.

Newly designed border complex includes several objects which are a part of unique border crossing entirety. The designed objects within the complex will be constructed in phases in technological sense, all in order to keep the crossing in function. In that regard, the demolition design is connected to construction phase.

2 GENERAL SPECIFICATIONS I

2.1 INTRODUCTION

Under this Contract, the Contractor shall take responsibility for supply and construction/ installation of the works, all as described hereunder.

2.2 PHASING OF CONSTRUCTION

The border crossing will remain in operation throughout the construction of the works. The contractor must make every effort to ensure that the border crossing remains in operation. Traffic management systems and pedestrian control are to be designed and proposed by the contractor.

Access to all parts of the border crossing must be maintained and the contractor is to work in close cooperation with the operator and the Supervisor.

The works will be constructed in phases, for details of the construction phasing and traffic management restrictions, refer to drawing E-1619-8/1 Project traffic signaling during the execution of works.

2.3 SCOPE OF WORK

The Contractor's scope of works shall include all required activities to ensure the correct and proper realisation of the schemes as defined in the contractual documents. The works shall include, but not necessarily be limited to, the following works:

- drafting a Control Plan and Programme showing the critical path for all the Works, receiving approval from the Supervisor and keeping it updated;
- receiving sites from the Beneficiaries;
- setting up sites and making these safe and secure to avoid accidents and damage to neighbouring assets throughout the construction process till final completion;
- complying with Serbia's Law on Construction;
- co-ordinating activities with relevant authorities and ensure ongoing operation of BCP;
- obtaining all necessary permits in accordance with the relevant Serbia regulations and providing electricity, water, telephone, all weather access; etc to the sites;
- obtaining and keeping updated any required permit;
- providing security for the entire construction period and displaying warning signs informing that building sites are hard hat areas and that parents are responsible for the safety of their children, in 2 languages (English, Serbian);
- supplying and delivering of all materials, building and installing as to the provided detailed drawings;
- providing additional geotechnical survey where required
- providing shop drawings for the approval of the Supervisor;
- providing samples prior to placing orders;
- testing, commissioning of completed areas;
- preparing as-built drawings, maintenance manuals and any other documentation necessary for the beneficiary to be able to operate and maintain the facilities;
- complying with all instructions received during the provisional and final acceptance of the schemes (e.g. remedying of defects, etc.).
- to make whatever drawing, calculation or specification is needed for the completion of the

border crossing that is missing in the Contract Documents

2.3.1 Regulations, Standards, Testing

During the progress of the works, all required tests shall be carried out on materials and workmanship in order to ensure compliance with these Technical Specifications. All testing procedures shall be done in accordance with the General and Special Conditions of Contract and these Technical Specifications.

Certain sampling and testing procedures, not covered in the other sections of the specification or by reference to standard methods are given in this section. Copies of all the test results must be supplied by the Contractor to the Supervisor at the latter's request.

List of applied regulations:

General:

- Law on Planning and Construction, Official Gazette of the Republic of Serbia 72/2009, 81/2009 – correction, 64/2010 – decision of the Constitutional Court, 24/2011, 121/2012, 42/2013 – decision of the Constitutional Court, 50/2013 – decision of the Constitutional Court, 98/2013 - decision of the Constitutional Court, 132/2014 and 145/2014)
- Law on environmental protection, Official Gazette of the Republic of Serbia, 135/2004, 36/2009
- Law on work health and safety, Official Gazette of the Republic of Serbia no. 101/2005
- Law on standardization, Official Gazette of the Republic of Serbia no. 36/2009 and 46/2015

Fire protection

- Law on Fire Protection (Official Gazette of the Republic of Serbia no. 37/88 and Official Gazette of the Republic of Serbia no. 111/09);
- Regulations on technical norms for protection of passenger cars parking garages against fires and explosion (Official Gazette of SCG no. 31/05);
- Regulation on technical norms for access roads, turns, and organization of plateau for fire trucks near the objects with increased risk of fire (Official Gazette of SRJ no 8/94);
- Regulation on technical norms for external and internal hydrant network for fire fighting (Official Gazette of SFRJ no. 30/91);
- SRPS ISO 8421-1:1998 Fire protection -- Vocabulary -- Part 1: General terms and phenomena of fire - (Identical to ISO 8421-1:1987)
- SRPS ISO 8421-2:1998 Fire protection -- Vocabulary -- Part 2: Structural fire protection (Identical to ISO 8421-2:1987)
- SRPS ISO 8421-3 1995 Fire protection -- Vocabulary -- Part 3: Fire detection and alarm (Equivalent to ISO 8421-3:1989)
- SRPS ISO 8421-4:1998 Fire protection -- Vocabulary -- Part 4: Fire extinction equipment (Identical to ISO 8421-4:1990)
- SRPS ISO 8421-5:1998 Fire protection -- Vocabulary -- Part 5: Smoke control (Identical to ISO 8421-5:1988)
- SRPS ISO 8421-6:1998 Fire protection -- Vocabulary -- Part 6: Evacuation and means of escape (Identical to ISO 8421-6:1987)
- SRPS ISO 8421-7:1998 Fire protection -- Vocabulary -- Part 7: Explosion detection and suppression means (Identical to ISO 8421-7:1987)
- SRPS ISO 3941 Classification of fires (Identical to ISO 3941).
- SRPS Z.C1.673:1989 Hose coupling for fire fighting - Solid coupling C

- SRPS Z.C0.005 - Protection against fires and explosions. Classification of materials and goods depending on their behaviour in a fire.
- SRPS Z.C0.012 - Protection against fires and explosions. Categories and grades identification of the fire hazards of materials.
- SRPS Z.C1.002 - Fire fighting equipment. Code of symbolization.
- SRPS N.C8.xxx - Series of standards regarding anti-explosion protection.
- SRPS ISO 7240-1:1998 Fire detection and alarm systems -- Part 1: General terms and definitions (Identical to ISO 7240-1:1988)
- SRPS U.J1.030 - Fire fighting Fire load.
- SRPS U.J1.050 1997 Fire protection in civil engineering - Behaviour of building materials in fire - Synopsis and classification of building materials
- SRPS U.J1.054:1997 Fire protection in civil engineering - Determination of combustion factor m of combustible building materials
- SRPS U.J1.055:1992 Fire protection in civil engineering - Testing of combustible building materials
- SRPS U.J1.060:1973 Fire protection - Testing of surface spread of flame
- SRPS U.J1. 220 - Fire protection. Standard symbols for designs.
- SRPS U.J1.240 - Fire protection in civil engineering. Stage of the fire resistance of a building
- SRPS TP 21/03 - Technical recommendation for structural fire protection for residential, business and public buildings
- SRPS EN 1074-6:2009 Valves for water supply - Fitness for purpose requirements
- and appropriate verification tests - Part 6: Hydrants
- SRPS EN 14339 (EN) 2009 Underground fire hydrants
- SRPS EN 14384 (EN) 2009 Pillar fire hydrants
- SRPS EN 671-1:2015 Fixed fire fighting systems - Hose systems. Part 1: Hose reels with semi-rigid hose
- SRPS EN 671-2; Fixed fire fighting systems - Hose systems. Part 2: Hose systems with lay-flat hose
- SRPS Z.C2.020:1980 Portable and mobile fire extinguishers - General requirements
- SRPS Z.C2.022:1980 Portable and mobile fire extinguishers - Testing specifications
- SRPS Z.C2.030:1980 Portable and mobile fire extinguishers - Portable chemical foam fire extinguishers
- SRPS Z.C2.035:1980 Portable and mobile fire extinguishers - Dry powder portable fire extinguishers
- SRPS Z.C2.040:1980 Portable and mobile fire extinguishers - Portable carbon dioxide fire extinguishers
- SRPS Z.C2.050:1980 Portable and mobile fire extinguishers - Portable water/foam extinguishers
- SRPS Z.C2.055:1980 Portable and mobile fire extinguishers - Portable fire extinguishers of the foam type (gas pressure)
- SRPS Z.C2.060:1980 Portable and mobile fire extinguishers - Portable fire extinguishers of the water type
- SRPS Z.C2.130:1980 Portable and mobile fire extinguishers - Mobile chemical foam fire extinguishers
- SRPS Z.C2.135:1980 Portable and mobile fire extinguishers - Mobile dry powder extinguishers
- SRPS Z.C2.140:1980 Portable and mobile fire extinguishers - Mobile carbon dioxide fire extinguishers
- Sprinkler systems - planning and installation, CEA 4001, Feb 2009 (EN)
- SRPS EN 12259-1:2008 Fixed fire fighting systems - Components for sprinkler and water spray systems - Part 1: Sprinklers

- SRPS EN 12259-2:2008 Fixed fire fighting systems - Components for sprinkler and water spray systems - Part 2: Wet alarm valve assemblies
- SRPS EN 12259-3:2008 Fixed fire fighting systems - Components for sprinkler and water spray systems - Part 3: Dry alarm valve assemblies
- SRPS EN 12259-4:2008 Fixed fire fighting systems - Components for sprinkler and water spray systems - Part 4: Water motor alarms
- SRPS EN 12259-5:2008 Fixed fire fighting systems - Components for sprinkler and water spray systems - Part 5: Water flow detectors
- SRPS EN 12845 (EN) 2009 Fixed fire fighting systems - Automatic sprinkler systems - Design, installation and maintenance
- SRPS ISO 5923:1994 Fire protection -- Fire extinguishing media -- Carbon dioxide (Identical to ISO 5923:1989)
- SRPS ISO 7202:1994 Fire protection -- Fire extinguishing media -- Powder (Identical to ISO 7202:1987)
- SRPS EN 10255:2008 Non-Alloy steel tubes suitable for welding and threading - Technical delivery conditions
- SRPS EN 287-1:1995 Welding - Approval testing of welders - Fusion welding - Part 1: Steels (Identical to EN287-1:1992)
- SRPS C.T3.035:1987 - Welded joints - Quality control methods
- SRPS ISO 5579:1997 - Non-destructive testing -- Radiographic examination of metallic materials by X- and gamma rays -- Basic rules (Identical to ISO 5579:1985)
- SRPS ISO 2504:1995 - Radiography of welds and viewing conditions for films -- Utilization of recommended patterns of image quality indicators (I.Q.I.) (Identical to ISO 2504:1973).
- Collection of regulations in the field of protection against fire and explosions with explanations for practical application

Water system:

- SRPS C.A5.011:1990 - Pipe components -- Definition of nominal pressure
- SRPS EN ISO 6708: 2007 - Pipework components - Definition and selection of DN (nominal size)
- SRPS EN 10255:2008 Non-Alloy steel tubes suitable for welding and threading - Technical delivery conditions
- SRPS ISO 228:2007 Pipe threads where pressure-tight joints are not made on the threads
- SRPS M.A6.505:1990 malleable cast iron fittings threaded - technical requirements.
- SRPS EN 10255:2008 Non-Alloy steel tubes suitable for welding and threading - Technical delivery conditions
- SRPS ISO 228:2007 Pipe threads where pressure-tight joints are not made on the threads
- SRPS M.A6.505:1990 malleable cast iron fittings threaded - technical requirements.
- SRPS EN ISO 15874-1 (EN) Plastics piping systems for hot and cold water installations -- Polypropylene (PP) -- Part 1: General
- SRPS EN ISO 15874-2 (EN) Plastics piping systems for hot and cold water installations -- Polypropylene (PP) -- Part 2: Pipes
- SRPS EN ISO 15874-3 (EN) Plastics piping systems for hot and cold water installations -- Polypropylene (PP) -- Part 3: Fittings
- SRPS EN ISO 15874-5 (EN) Plastics piping systems for hot and cold water installations -- Polypropylene (PP) -- Part 5: Fitness for purpose of the system
- SRPS EN 12201-1 (EN) Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 1: General
- SRPS EN 12201-2 (EN) Plastics piping systems for water supply, and for drainage and

sewerage under pressure - Polyethylene (PE) - Part 2: Pipes

- SRPS EN 12201-3 (EN) Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 3: Fittings
- SRPS EN 12201-4 (EN) Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 4: Armatures
- SRPS EN 12201-5 (EN) Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 5: Fitness for purpose of the system
- SRPS EN 1074-1:2009 Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Part 1: General requirements
- SRPS EN 1074-2:2009 Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Part 2: Isolating valves
- SRPS EN 1074-3:2009 Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Part 3: Check valves
- SRPS EN 1074-4:2009 Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Part 4: Air valves
- SRPS EN 1074-5:2009 Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Part 5: Regulation valves
- SRPS M.C5.702:1987 Water fittings for sanitary appliances - General requirements and tests
- SRPS M.C5.008 1988 Face-to-face dimensions of valves with screwed sockets
- SRPS M.C5.009 1988 Face-to-face dimensions of valves with connection by compression fittings
- SRPS EN 558-1 2003 Industrial valves - Face-to-face and centre-to-face dimensions of metal valves for use in flanges pipe systems - Part 1: PN-designated valves
- SRPS EN 736-1 2004 Valves - Terminology - Part 1: Definition of basic types of valves
- SRPS M.C5.260:1998 Water pressure reducers - Technical requirements
- SRPS EN 14154-1 (EN) Water meters - Part 1: General requirements
- SRPS EN 14154-2 (EN) Water meters - Part 2: Installation and conditions of use
- SRPS EN 14154-3 (EN) Water meters - Part 3: Test methods and equipment

Sewage:

- SRPS EN 1451-1 (EN):2008 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP) - Part 1: Specifications for pipes, fittings and the system
- SRPS CEN/TS 1852-2 (EN):2009 Plastics piping systems for non-pressure underground drainage and sewerage -- Polypropylene (PP) -- Part 2: Guidance for the assessment of conformity
- SRPS CEN/TS 1852-3 (EN):2009 Plastics piping systems for non-pressure underground drainage and sewerage -- Polypropylene (PP) -- Part 3: Installation guide
- SRPS CEN/TS 1852-3:2009/A1:2009 Plastics piping systems for non-pressure underground drainage and sewerage - Polypropylene (PP) - Part 3: Installation guide - Change 1
- SRPS EN 1852-1 (EN):2009 Plastics piping systems for non-pressure underground drainage and sewerage - Polypropylene (PP) - Part 1: Specifications for pipes, fittings and the system
- SRPS ENV 1451-2 (EN):2008 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP) - Part 2: Guidance for the assessment of conformity
- SRPS EN 1401-1 (EN):2009 Plastics piping systems for non-pressure underground drainage and sewerage – Non-plasticized polyvinyl chloride (PVC-U) - Part 1: Specifications for pipes, fittings and the system
- SRPS ENV 1401-2 (EN):2008 Plastics piping systems for non-pressure underground drainage and sewerage – Non-plasticized polyvinyl chloride (PVC-U) - Part 2: Guidance for the assessment of

conformity

- SRPS ENV 1401-3 (EN) 2008 Plastics piping systems for non-pressure underground drainage and sewerage – Non-plasticized polyvinyl chloride (PVC-U) - Part 3: Installation guide
- SRPS ENV 1329-2 (EN):2008 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – Non-plasticized polyvinyl chloride (PVC-U) - Part 2: Guidance for the assessment of conformity
- SRPS C.J1.485:1987 Cast iron drainage pipes and fittings without socket - Technical requirements
- SRPS C.J1.486:1987 Cast iron drainage pipes and fittings without socket - Pipes - Shapes and dimensions
- SRPS C.J1.487:1987 Cast iron drainage pipes and fittings without socket - Inspections pipes with circular access door - Shapes and dimensions
- SRPS U.J1.488: 1987 Cast iron drainage pipes and fittings without socket - Inspections pipes with rectangular access door - Shapes and dimensions
- SRPS U.J1.489: 1987 Cast iron drainage pipes and fittings without socket - Bends - Shapes and dimensions
- SRPS U.J1.490: 1987 Cast iron drainage pipes and fittings without socket - Branches - Shapes and dimensions
- SRPS C.J1.491:1987 Cast iron drainage pipes and fittings without socket - Taper pipes - Shapes and dimensions
- SRPS U.J1.492: 1987 Cast iron drainage pipes and fittings without socket - Pipe and plugs, socket plugs, supports of drain pipes and connectors - Shapes and dimensions
- SRPS U.J1.493: 1989 Cast iron waste and soil pipes and fittings with socket - Traps for preventing odour spread, for vertical flow, with top and bottom opening for cleaning - Shapes and dimensions
- SRPS C.J1.600:1992 Gully tops and manhole tops for vehicular and pedestrian areas - Design requirements, type testing, marking
- SRPS C.J1.610:1992 Equipment for sewage water drainage - Parts made of cast iron, concrete and cast iron in combination with concrete - Technical requirements

Sanitary equipment:

- SRPS EN 200:1993 Sanitary tap ware - Single taps and combination taps (PN 10) - General technical specification
- SRPS M.C5.750:1991 Storage water heaters - Safety units - General technical specifications
- SRPS M.C5.820:1967 Water pipe fittings - Valve with swimmer - Main outside sizes, connection sizes
- SRPS M.C5.821:1971 Sanitary fittings - Water closet flush valves - Main outside sizes, connection sizes
- SRPS M.C5.810:1967 Sanitary fittings - Water seal for lavabo - Main outside sizes, connection sizes
- SRPS M.C5.812:1967 Water pipe fittings - Discharge knee with stopper - Main outside sizes, connection sizes
- SRPS M.C5.813:1967 Water pipe fittings - Over flow knee - Main outside sizes, connection sizes
- SRPS M.C5.811:1966 Water pipe fittings - Water seal for urinal - Main outside sizes, connection sizes
- SRPS U.N5.100:2000 Vitreous china sanitary ware - Quality requirements
- SRPS EN 31:2004 Pedestal wash basins - Connecting dimensions (U.N5) (Identical to EN 31:1998)
- SRPS EN 32:2004 Wall hung wash basins - Connecting dimensions (U.N5) (Identical to EN 32:1998)
- SRPS U.N5.112:1972 Vitreous china sanitary ware - Washers and of grey iron casting, enamelled
- SRPS EN 37:2003 Sanitary appliances - Pedestal WC pan with independent water supply -

Connecting dimensions

- SRPS EN 38:2001 Wall hung W.C. pan with independent water supply - Connecting dimensions (Identical to EN 38:1992)
- SRPS EN 33:2008 Pedestal W.C. pans with close-coupled flushing cistern - Connecting dimensions
- SRPS EN 34:2001 Wall hung W.C. pan with close coupled cistern - Connecting dimensions (Identical to EN 34:1992)
- SRPS EN 198:1993 Sanitary appliances - Baths made from cross-linked cast acrylic sheets - Technical requirements (Identical to EN 198:1987)
- SRPS EN 232:1993 Sanitary appliances - Baths - Connecting dimensions (Identical to EN 232:1990)
- SRPS EN 251:1993 Sanitary appliances - Bath tubs - Connecting dimensions (Identical to EN 251:1990)
- SRPS EN 263:1993 Sanitary appliances - Cross-linked cast acrylic sheets for baths and shower trays for domestic purposes - Technical requirements (Identical to EN 263:1987)
- SRPS EN 35:2004 Pedestal bidets with over-rim supply - Connecting dimensions
- SRPS EN 36:2004 Wall-hung bidets with over-rim supply - Connecting dimensions
- SRPS EN 80:2004 Wall hung urinals - Connecting dimensions
- SRPS UN5.150:1979 Sanitary appliances - Pedestal urinal - Shape and sizes
- SRPS UN5.160:1979 Sanitary appliances - Trocadero - Shape and sizes
- SRPS U.N5.170:1982 Sanitary appliances - Flushing cistern - Technical requirements
- SRPS UN5.300:1982 Kitchen equipment - Kitchen sinks, built on table top units - Shape and dimensions
- SRPS U.N5.305:1972 Kitchen equipment for dwellings - Enamelled sink basins of grey iron casting
- SRPS U.N5.305:1972 Kitchen equipment for dwellings - Enamelled sink basins of grey iron casting
- SRPS U.N5.306:1972 Kitchen equipment for dwellings - Enamelled double sink basins of grey iron casting
- SRPS U.N5.306:1972 Kitchen equipment for dwellings - Enamelled double sink basins of grey iron casting
- SRPS UN5.310:1982 Kitchen equipment - Kitchen sinks, built into table top units - Shape and dimensions
- SRPS U.N5.320:1972 Kitchen equipment for dwellings - Washing-up cupboard
- SRPS IEC 60335-2-73:1998 Safety of household and similar electrical appliances - Part 2: Particular requirements for fixed immersion heaters (Identical to IEC 60335-2-73:1994)

2.3.2 Methods of Testing

All tests shall be made in accordance with the standard methods prescribed by the following, in order of preference as ordered by the Supervisor.

- Serbian National Standards
- EN: European Standards
- BS: British Standards Institute Specifications (Abbreviation: BS).
- DIN: Deutsches Institut für Normung (Abbreviation: DIN).
- NF: Norme Française (Abbreviation: NF)
- UNI: Ente Nazionale Italiano di Unificazione (Abbreviation: UNI)

- ASTM: American Society for Testing and Materials (Abbreviation: ASTM).
- AASHTO: American Association of State Highway and Transportation Officials (Abbreviation: AASHTO).

In addition to the above, standard specifications or test methods of other bodies may be referred to this specification, or test methods may be described where no acceptable standard methods exist.

2.3.3 Cost of Testing

The cost of all provision of samples and testing of materials and workmanship undertaken by the Contractor to ensure compliance with the Specifications, including the submission of certificates that materials supplied by him comply with the relevant Standards or other specifications shall be deemed to be covered by the contractor.

2.3.4 Additional Testing

The Supervisor shall have the right to take any samples and to order any additional tests on materials or workmanship supplied by the Contractor if he has reasonable doubt as to their quality. No additional payment shall be made for such tests

2.3.5 Sampling

Where it is required in the Specifications that the Contractor shall submit samples of materials or mixtures to the Supervisor for approval prior to their use in the Works the use of these materials or mixtures without the Supervisor's written approval shall constitute default on the part of the Contractor for the consequences of which default he shall be liable. All samples shall be submitted in sufficient time for proper testing.

Same applies to testing of finishing materials for internal as well as external use.

2.4 PERFORMANCE SPECIFICATIONS

All design, materials, workmanship and tests shall, as a minimum, comply with Standards and Codes of best Practice, and with the Specifications of the Local Authorities, Contracting Authority and the Supervisor.

It shall be the responsibility of the Contractor to include all works necessary to ensure the intended performance of the works in all respects. No additional costs shall be awarded for subsequent design changes resulting from the Contractor's failure to fully understand and assess the complete works before Tendering. The sole responsibility rests with the Contractor to produce work which conforms in quality and accuracy of detail, to the Contracting Authority Specifications.

The Contractor must, at his own expense, establish a quality control system and provide experienced execution and quality control personnel, together with all transports, instruments and equipment, to ensure adequate supervision and positive control of the Works at all times.

The Contractor shall produce certificates of origin of the equipment and materials to be built into the works to the Supervisor at any time which have to be in accordance with these Technical Specifications.

2.5 AS-BUILT DOCUMENTATION AND OPERATION AND MAINTENANCE MANUALS

The As- built Documentation/Drawings and Operation and Maintenance Manuals shall be prepared in English and Serbian language, in 3 copies, and be approved by the Supervisor on behalf of the Contracting Authority.

The Contractor shall also provide a list of all spare parts and items of wear (filters, seals, light bulbs, etc) required to operate the building for 1 year and prepare a schedule of items the Beneficiary will require to purchase after the 1 year in order to maintain the building correctly and professionally.

The Contractor shall submit to the Supervisor, all such documentation as well as all warranties and /or guarantees and operation manuals for the installed plant and equipment, all in three copies and in electronic format.

2.6 TRAINING

The Contractor shall be responsible for training the selected technical staff employed by the Beneficiary per scheme by means of on-site training for each type of equipment and technical appliance and make him/her aware of regular maintenance Specifications, all in accordance with the particular technical specifications.

The training shall cover as a minimum the following:

- The correct operation and understanding of the system, control system and the technology applied;
- Operation of systems and equipment;
- Maintenance procedures;
- Procurement of spare parts and other items that require replacement.

The training shall be based on the actual systems and equipment installed and on the implementation of operation and maintenance schedules outlined in the Operation and Maintenance Manuals prepared and provided by the Contractor all to be approved by the Supervisor.

2.7 QUALITY ASSURANCE

A comprehensive Quality Assurance System (QAS), covering all aspects of the Contract and the Works must be implemented, documented and maintained by the Contractor during the entire implementation period of the Contract.

The QAS shall as a minimum consist of:

- A Quality Assurance plan (QAP)
- A Control Plan (CP)

The Contractor shall make sure that the quality control complies with International standards.

Guidance from the following international standards shall be taken from:

- ISO 9000 Standards for the quality control and assurance – Guideline for selection and utilization.
- ISO 9001 Quality system - Model for the quality assurance in conception development, production, installation, and after-sales support.
- ISO 9002 Quality system - Model for the quality assurance in production and installation.
- ISO 9003 Quality system - Model for the quality assurance in controlling and final tests.
- ISO 9004 Quality control and element of the quality system – Guidelines.
- ISO 8402 Quality management and quality assurance - Vocabulary.

2.7.1 Quality Assurance Plan (QAP)

- The QAP shall, as a minimum, cover the following issues:
- The Contractor's staff and management organization for the project, management plan and the quality assurance organization;
- The person responsible for the Contractor's QAS shall be authorized and qualified to take decisions on quality assurance issues, and his reference and communication lines to the Company's overall quality assurance organization and its responsible management shall be clearly shown;
- Persons performing quality control and testing shall be independent of those executing or supervising the:
 - Works;
 - Management of documents;
 - Management of procurement;
 - Management of sub-Contractors and suppliers, and Specifications to their QAS's;
 - Control of materials and workmanship, defects and material reconciliation, procedures for corrective actions, etc.
 - Handling of the deviations, additions or variations to the Contract Documents.
 - The Contractor's system of management of current documentation for the execution of the Works shall include his sub-Contractors and suppliers, and shall detail:
 - How it is ensured that only valid and approved documents are used for the execution of the Works;
 - The method of recording variations and amendments to the documentation.
 - The Contractor's initial proposed Control Plan describing important and critical control activities based on the Tender Document and the Contractor's own consideration in respect of execution.

2.7.2 Control Plan (CP)

The Contractor shall present for the Contracting Authorities Representative (Supervisor) approval of his detailed CP for all quality assurance efforts or measures for the works or sections thereof. Such CP shall be presented to the Supervisor not later than 30 days after the commencement of the works.

The CP shall include controls as specified in the Contract as well as any other normal and special controls that the Contractor finds necessary in order to ensure the quality of his work. The CP shall for each control activity describe type, method, range, time / frequency, criteria for approval and documentation and state who is responsible for performing the activity.

If the Supervisor does not approve the CP as submitted by the Contractor, then the CP shall be amended for further approval. Subsequent changes in the range and contents of the quality assurance work will not be allowed as a reason to extend agreed deadlines or to increase contract sums.

2.8 THE CONTRACTOR'S CONTROL AND DOCUMENTATION

2.8.1 General

During the Contract period, the Contractor shall, to the level of Supervisor satisfaction, present and document regularly that the Works comply with the quality assurance Specifications stipulated in the Contract or approved during the Contract implementation period. Consequently, based on the approved QAS and the CPs, the Contractor shall during the execution of the works carry out and document the quality control and its compliance with the stipulated Specifications.

The Contractor's quality control does not limit his responsibility for the Works according to the Contract. If the Contracting Authority during the period of the Contract, can substantiate that the Contractor's control and/or documentation shall be extended, the Contractor shall follow the Contracting Authority written instructions to this effect at his own cost and within the agreed time for completion.

- Method of documentation recording during the work execution
- All control activities specified in the Control Plan shall be documented.
- The CPs and all other issues related to the QAS shall be kept and maintained by the Contractor in the Quality Manual.
- On the basis of the QAP and CPs the Contractor shall produce the necessary form for registration, log books, and check lists, etc. before the Works are commenced.
- All original documentation shall be inserted in Control File in the Quality Manual, which shall be kept and maintained by the Contractor at the project site throughout the period of the project. In addition to the control documentation the Control File shall also include all other relevant quality documentation.

Where the contractor becomes aware that a drawing, calculation or specification needed for the completion of the Border Crossing is missing from the Contract Documents, the Works Contractor is to compile these himself and submit them for approval to the Supervisor.

2.8.2 Progress Meetings

Regular progress meetings shall take place with a frequency to be defined together with the Supervisor and the Contracting Authority.

2.8.3 Site Acceptance and Defects Liability Period

Before Provisional Acceptance, the Contractor shall in co-operation with the Supervisor finally check that all documentation which has been requested has in fact been presented.

If requested by the Contracting Authority the Contractor shall in connection with his notice for Tests on Completion present a copy of the complete documentation in the control file and the Quality Manual.

The Contractor's remedial work after Provisional Acceptance is subject to the same control conditions as the work before Provisional Acceptance.

3 GENERAL SPECIFICATIONS II

3.1 FACILITIES FOR CONTRACTOR'S AND SUPERVISOR'S PERSONNEL

3.1.1 Temporary Buildings/Office of Contractor

The Contractor shall provide, maintain and remove on completion (or at any other requested time) office space as detailed below for the exclusive use of the Supervisor and his staff. The office space shall be located adjacent to the Contractor's office. The layout, position and arrangement of the site office shall be agreed on with the Supervisor prior to erection. The site office shall be a purpose-built containerized temporary site facility or similar approved building erected, furnished, equipped and serviced ready for occupation and use within 14 days of the Date of Commencement of the Works.

Weather resistance and thermal insulation shall be according to the specification appropriate to the local conditions with heating and cooling system that will keep the ambient temperature within the office space between min. 19 and max 21 degrees. The offices shall be connected to a mains electricity supply.

The Contractor is to execute all temporary cables and wiring and to pay all charges in connection with the same and the current consumed and clear away and make good on completion. Where a mains electricity supply is not available, and subject to the approval of the Supervisor, the Contractor shall supply a "demand" type generator capable of running 24 hours per day, if required, without causing any undue noise, interference or disturbance to surrounding residents or the Supervisor and his site staff. The Supervisors and his staff shall receive a toilet for their sole use with wash basin and mechanical ventilation.

The Office and toilet shall be connected to mains or site drainage and mains water supply. If mains drainage or site is not available then all foul sewage must be collected and contained without leakage or spillage and disposed of by the Contractor as agreed by the Supervisor. If mains water is not available, the Contractor shall make suitable provision for the supply of potable water at the site offices in form of storage tanks.

A hard clean footpath shall be provided from the car park to the entrance to the offices and a standpipe, short length of hose, bootjack and brush shall also be provided adjacent to the entrance of the offices for boot washing. These facilities are to be provided at the same time as the principal office.

All premises provided for the use of the Supervisor and his staff shall be properly cleaned and maintained daily for as long as they are erected. If any item of equipment requires servicing or repair an equivalent replacement must be provided as soon as possible by the Contractor.

The Contractor shall allow in his tender price for the payment of all rates and taxes in respect of any temporary structures and offices situated on the site or elsewhere used exclusively for the purpose of the Works. The layout of all offices and car parking facilities for the Supervisor and Contractor shall be submitted to the Supervisor for approval.

All equipment shall be in good order when supplied by the Contractor, shall be subject to the Supervisor's approval and shall be maintained by the Contractor in good condition. On completion of the Works, all non-expendable equipment will be returned to the Contractor.

One full sets of surveying equipment (i.e. electro-optical theodolite and levelling instrument, incl. accessories) shall be available for the sole use of the Supervisor and his staff for the duration of the Contract and when appropriate have a Manufacturer or Agent's specified tolerance certificate at the date of issue. The Contractor is required to provide the survey instruments on the first day of the Contract until completion of the Works.

3.1.2 Offices for the Supervisor

Office accommodation of a reasonable standard and of approximately 10 square meters for each expert working on the contract is to be provided by the Works Contractor.

The Works Contractor shall provide prefab (container type) offices at site for Supervisor's team. The office for Supervisor shall have **the minimum surface of 28 m2 (two containers)**, consisting two rooms, one toilet and small kitchen, equipped with fire extinguisher, first aid kit and window type AC unit (cooling & heating) in each room. The cost of office and accommodation (maintenance and operational costs of utilities) shall be borne by the Works Contractor.

The Contractor shall provide, at a location within the site compound, parking for 1 car for the sole use of the Supervisor and his representatives. The accommodation shall be subject to the Supervisor's approval. Control of the car park shall be the responsibility of the Contractor. The offices, all fully equipped with necessary furniture, shall include, as a minimum:

- WC and bathroom
- The office accommodation shall conform to the following minimum Specifications:
- The offices shall be waterproof, of sound construction, suitably lined, insulated and decorated.
- Shall be provided with HVAC, power, light, water and drainage.

The Contractor shall provide 4 full sets of safety equipment and hard hats for the sole use of the Supervisor's staff. The equipment shall include, but not be limited to, high visibility waterproof clothing, safety helmets, and safety footwear and ear defenders.

The Contractor is to provide daily cleaning services for the Supervisor's facilities at his expense including all necessary cleaning agents and sanitary goods.

All rooms shall be covered with heavy grade linoleum and blinds to all windows. All WCs shall have internal flush toilet facilities together with a wash hand basin. There shall be a plumbed hot and cold water supply and sewerage connection.

A 220-volt electricity supply shall be connected; each room shall have one power point per 5 m², adequate strip lighting, electric heating, and air conditioning. If the site experiences power outages, a generator able to keep all equipment and AC operational must be provided.

3.1.3 Material Testing Laboratory

The Contractor shall provide a fully equipped site laboratory to carry out the specified tests on materials to be incorporated into the permanent works. Qualified and experienced staff shall be

provided to carry out the tests and record the results. Alternatively, the Contractor shall provide within 15 days from Commencement of Works the contact details of laboratories which the Contractor would intend to use for providing the required tests.

3.1.4 Mobile Laboratory

The Contractor shall provide for the daily testing as required by the Supervisor. The Contractor shall submit to the Supervisor the results of the testing every time they are requested.

The Contractor may use sub-contracting for laboratory activity, where he is not sufficiently equipped to do his own tests.

The sub-contractor's use of laboratory tests must have a valid certification in Serbia or their country of residence all in accordance with the local legislative, and all necessary information shall be submitted to Supervisor's approval prior to the beginning of the works.

Additional specialized testing, according to the relevant specifications of Contract, will be made by a Laboratory approved also by the Supervisor and which can provide the relevant testing specified in the section "Material and Testing" of these Specifications. The Contractor shall propose his means to the Supervisor within 2 weeks of the signing of the Contract.

The costs thereof shall deem to be included in the Contractor's prices.

3.1.5 Sanitary Arrangements and Waste Disposal

The Contractor shall provide adequate facilities, as required to meet the applicable statutory provision, for use of his labour force on the Site. Separate sanitary facilities shall be provided in the office for Supervisor's staff.

3.1.6 Construction Progress and Condition Photographs

The Contractor shall submit colour progress photographs as two hard copies and a digital version on a monthly basis. These photographs shall provide a record of all construction activities.

Existing condition photographs are to be taken prior to commencement of work on any structure except those to be demolished.

3.1.7 Faulty Work

Any work which fails to comply with these Specifications shall be rejected and the Contractor shall, at his own expense, make good any defects, as directed by and to the satisfaction of the Supervisor. The warranty period shall commence from the taking over of the plant and not from the time it shall be installed and put into use.

3.1.8 Site vehicle for the Supervisor

The Works Contractor shall provide one site vehicle for the sole use of the Supervisor and his staff. It shall include for all duties and allowances for registration fees, profit, depreciation, interest, indemnity and insurance. The Works Contractor shall arrange for repairs, supplies, fuel, lubricants and other consumables.

Site vehicle: new (max. 1000 km), station wagon, min. 80 kW, 4 passengers, diesel or petrol, aircondition, radio, incl. summer and winter tires. Makes: Scoda Octavia Combi, Golf Variant, Opel Astra Tourer or equivalent.

3.2 SITE PREPARATION

The Contractor shall confine his operations within the allocated Site, or such other areas of land as may be agreed between the Supervisor and Contractor.

The contractor shall be responsible for ensuring that the existing buildings on the site are made safe and are adequately protected during the construction works. The contractor must ensure that the existing buildings foundations are protected and that the existing buildings are not subject to subsidence caused by excavation works.

The Contractor shall maintain the Site in a clean, tidy and safe condition during the period of construction and commissioning. The Contractor shall remove any disused materials and other debris arising in connection with the Works from the Site as it arises. The Sites shall not be taken over until such material has been removed.

The Contractor shall prevent vehicles from entering or leaving the Site depositing mud or other debris on the surface of the adjacent roads or footpaths. Any materials so deposited shall be removed at the earliest practical opportunity.

The Contractor must establish and maintain a security fence all around the Construction Site throughout the entire work period. The Site must be guarded and signed in order to keep unauthorized persons away from the Site.

The Contractor must submit for approval a Site layout plan showing Stock yard, cabin camp, crane track and parking area for employees' cars.

The Contractor must regularly clean the site during the performance of the works and remove debris to an officially approved dump. The facility must be completely clean and suitable for moving in and for use before being handed over.

3.2.1 Marking and Measuring of a New Temporary Location of the Border Crossing Point

3.2.1.1 Description of Works

Marking of space, on the field, has to include all the measuring with the aim of transfer of data from the design to the field, as well as securing, restoring and maintaining of points established on the field during the entire construction period, i.e. until handover of works to the Investor.

3.2.1.2 Handover and Reception

The Investor will hand over the Contractor the main traverse and fixed points (benchmarks) with all the required data in the form of drawings, sketches, tables and such. Handover of data on the main traverse and fixed points should be in writing, signed by representatives of the Investor and Contractor.

3.2.1.3 Control during Execution

The Contractor will regularly control profiles, fixed points (benchmarks) and traverse points. The Contractor will restore any destroyed or damaged mark at his own expense. The Supervisor will control the accuracy of the restored marks.

3.2.1.4 Handover of the Completed Works

The Contractor will restore survey marks, traverse points and fixed points at the Investor's request, upon finishing of all the works, and submit them to the Investor before technical reception. There should be a proper note on reception/handover.

3.2.1.5 Measurement and Payment

According to the description above, the amount will be paid in a total price whose paying is envisaged in accordance with demands from chapter 1.1 (Marking) of the Terms of the Contract, including securing, maintaining and restoring of points and other marks required for quality works, as well as all the material and transport. The total price for marking includes all the necessary measuring, regulations, access roads, parallel roads, landfills and such, during work execution and technical reception, so the Contractor has no right to any separate payment for this work. The amount also includes, in the stage of marking the zero state, the help and support to the Supervisor in preparing a digital model of the terrain, transfer of data of the road-centre line into the design software and re-measuring of the requested works, paying attention to any request that could be added in the process of proper survey of works.

3.2.2 Marking and Staking out of Installation Route

Marking of space, on the field, has to include all the measurings with the aim of transfer of data from the design to the field, as well as securing, restoring and maintaining of points established on the field during the entire construction period, i.e. until handover of works to the Investor.

3.2.3 Making Benchmarks for Determining Height Elevations

Fixed points (benchmarks) on the construction site are given by the surveyor, i.e. representative of the authorized institution for geodetic surveying and measurement, hired by the Investor. The surveyor has to set the height elevation, marked on a fixed facility, which will serve during construction to check the amount of excavation or for monitoring the height elevations on the facility/ies, according to Design and Technical Documents. The Contractor takes over the set point and has to secure in a way envisaged in the rulebook, and maintain it until the works are finished, i.e. until the construction site has been handed over.

3.2.4 Cleaning and Washing of Facilities And Construction Sites

Upon the finishing of all the works on construction and assembly of facilities and integral parts, i.e. ancillary construction and craft works, the facilities and the whole construction site should be cleaned of debris. The facilities are cleaned of debris, dust; walls, floors, windows and doors in all the rooms are washed. Cleaning is to be done carefully, surfaces are to be washed with water and suitable chemicals. The debris collected during the cleaning is to be loaded into a vehicle and transported to city landfill.

3.3 EXISTING AND SITE USE SERVICES

3.3.1 Existing services

No warranty is given as to the accuracy or completeness of the information on existing services included in the Contract. The Contractor shall consult all relevant authorities and owners of services before commencing any excavations and shall satisfy himself as to the exact position of existing services which affect or may be affected by the Works. If any service is found to exist, but is not as indicated in the Contract, then the Contractor shall at once give written notification to the Supervisor.

The Contractor shall record the position of all located existing services on the general arrangement drawings, a copy of which shall be made available by the Contractor to the Supervisor.

The Contractor shall execute the Works in such a manner that he does not damage or interfere with existing services on or near the Site. If damage or interference is so caused, the Contractor shall make his own arrangements, to the approval of the Supervisor and the relevant authority, to execute the repairs at his own cost.

It shall be the Contractor's responsibility to ensure proper back-filling, appropriate to the section of the site, of any excavation made in the work area by any utility company, necessitated by the Contractor's operations.

The Contractor shall make his own arrangements for any diversion or removal of services, which he may require for his own convenience or method of working, and shall obtain the prior approval of the Supervisor to such arrangements. Every working power employed by the Contractor shall possess a serviceable detector for locating buried pipes and cables and at least one gang member shall be competent in its use. Each detector shall be operated in accordance with the manufacturer's instructions prior to and during each and every excavation, to assist in the identification of all cable and pipe positions.

Where work is being carried out in the vicinity of overhead power lines, the Contractor is responsible for ensuring that all persons working in such areas are aware of the relative distance that high voltage electricity can short to earth when cranes, or other large masses of steel, are in the vicinity of power lines.

The Contractor will establish for himself safe clearances to cables of various different voltages from the appropriate local electricity authorities. All damage to, or interference with, existing services, caused during the progress of the works, shall be deemed to be the responsibility of the Contractor, who shall undertake to make good, at his own expense, any damage so caused to the existing underground services or other features, and shall be liable in respect of all claims (including claims for consequential costs) arising from such damage or interference. .

In all cases where such works are exposed, they shall be properly shored or otherwise supported. Special care must be exercised in refilling to compact the ground under mains, cables, etc. and not to cover up exposed water meters and stop cock boxes, etc. Poles supporting cables, adjacent to the works, shall be kept securely in place until the work is completed, and shall be made as safe and as permanent as before.

Notwithstanding the foregoing Specifications, and without lessening the Contractor's responsibility, the Contractor shall inform the Supervisor immediately if any existing works are exposed.

The Contractor shall make his own arrangements for any diversion or removal of services, which he may require for his own convenience or method of working, and shall obtain the prior approval of the Supervisor to such arrangements.

It shall be the Contractor's responsibility to ensure proper back-filling, appropriate to the section of the site, of any excavation made in the work area by any utility company, necessitated by the Contractor's operations.

The Contractor shall ensure that damage to any public or private roads, footpaths and tracks used by any vehicles or equipment proceeding to or from the Site is kept to a minimum and he shall be responsible for the cost of all repairs necessary to restore such roads, tracks or footpaths to the satisfaction of the Supervisor and the owner and/or controlling authorities.

3.3.2 Site use and services

The Contractor shall restrict his activities to within the Sites and shall avoid entry on to any other lands except where the Contractor has made his own arrangements for such entry or the owner has arranged for this entry. Any trespass, damage or claims arising from such entry shall be the sole responsibility of the Contractor, who shall hold the Contracting Authority indemnified against all claims arising from such trespass or damage.

The Contractor shall arrange at his own cost the supply of electricity, fresh water, telephone, compressed air and other services as are necessary to his Site establishment and shall provide, maintain and remove on completion all pipes, cables and fittings which carry such services to his operations. The Contractor shall provide an adequate supply of safe drinking water on the Site. All electrical installations forming part of the Temporary Works shall comply with the current National Regulations.

3.3.3 Site access by officials

Authorized government and municipal officials shall at all times have access to the work whether it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection.

3.3.4 Site working considerations

The following general Specifications shall apply:

- The Contractor shall provide adequate lighting where work is being executed at night and shall provide and install any additional lighting which the Supervisor may require in order to watch and supervise the Works and carry any testing and examination of materials;
- Materials available on the Site or materials made available or supplied by the Employer - shall be used solely for the execution of the Works;
- The Contractor shall minimize the pollution of and disturbance to roads and other places on and around the Site.
- No trees or other vegetation shall be removed except with the express permission of the Supervisor;

- The Contractor shall ensure that access is provided to all buildings and properties adjacent to the Site for the duration of the Contract;
- All temporary buildings erected by the Contractor upon the Sites and the layout of the buildings and the site, shall comply with Laws and all local bylaws in so far as they are applicable.
- The Contractor shall be absolutely and solely responsible for the safety and security of Temporary Works and for the equipment in connection therewith which may be erected or provided for the carrying out of the Contract and for the execution of the Works.
- This provision shall be applicable to all temporary works and equipment whenever provided and erected by the Contractors for the purpose of or in connection with the Works.
- Examination and acceptance by the Supervisor of the Contractor's Temporary Works or of the drawings connected therewith shall not absolve the Contractor from his responsibility for those works and his liability for the consequences of any failure.
- The Contractor shall clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation.
- Cleaning shall include washing with water, power brushing, and use of manual labor as necessary to achieve the necessary standard comparable with adjacent streets unaffected by the works

3.4 WORKING HOURS FOR CONSTRUCTION

Site working hours shall be restricted according to the existing legislation, unless mentioned otherwise in the contract.

The Contractor's programme and methods of working must be made on the assumption that the working hours will not be varied.

Any proposal by the Contractor to work outside these hours shall be submitted to the Supervisor for approval giving at least 7-day notice. A clear definition of the work to be carried out and the reasons for the request shall also be provided.

Unplanned deviation from the normal working hours will normally be limited to emergencies only and the Supervisor shall be informed of any such working, or the Contractor's intention of such working, at the earliest opportunity.

For the purposes of this clause, working shall be deemed to include for any activity whatsoever undertaken by the Contractor or any of his subcontractors in connection with the execution of the Works undertaken within the Site.

3.5 VISIBILITY

The Contractor shall provide, install and maintain in good condition at least one Visibility Panel in an adequate, well visible location near to the access to each site. The Visibility Panel shall be prepared in accordance with the "Communication and Visibility Manual for EU External Actions" (http://ec.europa.eu/europeaid/work/visibility/index_en.htm) and must be approved by the Contracting Authority.

The Contractor shall provide publicity measures in accordance with EU requirements. The measures should ensure that the project, funded by the European Union (EU), visibly acknowledges the support of the EU. They cover the written and visual identification of the financing parties and are to be used in briefings, newsletters, press conferences, presentations, invitations, signs, commemorative plaques and all other items used to highlight all involved parties' participation on English, Albanian and Serbian Languages.

The general requirements for these publicity measures are given in the EU visibility guidelines for external actions, which can be downloaded from the following web page:

http://europa.eu.int/comm/europeaid/visibility/index_en.htm

The Contractor shall propose an adequate publicity measures strategy.

Before initiating any information, communication or visibility action, the Contractor and/or implementing partners must contact the Press and Information Officer at the EU Office in Serbia. He/she is responsible for co-coordinating the overall EU visibility strategy in Serbia to which his/her EU Office is accredited and as such can provide authorized guidance on the formats and types of flags, stickers and other promotional materials such as videos that may be useful to the Contractor and/or Beneficiary Municipality.

3.6 SECURITY AND FIRE FIGHTING

The contractor shall respect all relevant local legislation and best available practice which is covering the field of Security and Fire Fighting.

The Contractor shall perform all work in a fire-safe manner. He shall supply and maintain on the site adequate fire-fighting equipment.

The Contractor shall provide and maintain adequate fire extinguishers on the Site and areas of high fire risk shall be fenced and signs posted and supplied with specialized fire extinguishers, if necessary.

Generators and their batteries and water pumps shall be adequately protected against vandalism and theft.

Unless otherwise provided by the Supervisor, the Contractor shall not by his operations obstruct any road or access to other buildings nor break down any fence nor obstruct any drains or water courses, but if such blockages occur he shall at once remove the blockages and repair them too.

3.7 WORK REGISTER AND SURVEY DIARY

A Work Register shall be kept on the Site by the Contractor, who shall enter in it at least the following information:

- a) the weather conditions, interruptions of work owing to inclement weather, hours of work, number and type of workmen employed on the Site, materials supplied, equipment in use, equipment not in working order, tests carried out in situ, samples dispatched, unforeseen circumstances, as well as orders given by the Supervisor;
- b) detailed statements of all the quantitative and qualitative elements of the work done and the supplies delivered and used, capable of being checked on the Site and relevant in calculating payments to be made to the Contractor;

The Work Register shall be arranged according to the format established by the law of the beneficiary country or as instructed by the Supervisor and be open for consultation at any time by the Supervisor or his Representative or by the members of the Beneficiary's team.

Unless otherwise specified in the contract, the value of the work executed in accordance with the Contract shall be established and calculated by measurement. The dimensions, notes, calculations and drawings required for establishing the quantities in the course of the survey of the Works shall be entered into the Survey Diary. The Survey Diary shall be kept by the Contractor continuously on the basis of the survey performed in accordance with the various stages of completion.

For the survey performed jointly with the Supervisor, or when a repeated survey is required by the Supervisor, the Contractor shall ensure the participation of his authorized and qualified representative who shall assist the Supervisor or his Representative and shall supply all the Information required by either of them.

If the Contractor's representative is not present at such jointly survey, the result of the measurement performed by the Supervisor or approved by him shall be regarded as the valid survey for the Works.

The Survey Diary prepared by the Contractor shall be revised and signed by the Supervisor or his Representative within 14 days of its receipt. The Contractor shall participate, at the place and on the date requested by him, in the examination and approval of the Diary by the Supervisor's Representative and shall agree with him the eventual corrections to be entered into the Survey Diary by the Supervisor.

The Contractor shall ascertain all conditions relevant to the Works.

All information obtained by the Contractor regarding site conditions, subsurface information, groundwater elevations, existing construction of site facilities as applicable, and similar data, are the complete responsibility of the Contractor. Neither the Supervisor nor the Contracting Authority assumes any responsibility for the completeness and faultlessness or interpretation of such supplementary information.

3.8 WATER SUPPLY

The Contractor shall provide a clean and sufficient supply of fresh water, both for construction of the Works and for all facilities. He shall undertake all arrangements including pipe lines and meters for connecting to local water mains and the provision of pumps, storage tanks and water conveyance where necessary, payment for all fees and water charges and the satisfactory removal of all such arrangements and provisions on completion of the Works.

3.9 WATER SUPPLY TEST

When fixing of all water supply installation end, before the isolation is done, pipe colouring, it must be waterproof tested and water supply net functionality. This test is done by the special pump, with which is done pressure in water and installation. The pump is connected in valve behind water meter and pressure goes in direction of water flow when net is at work.

Before test net must be filled with water, during that time air goes out from net. Not to come to the hydraulic hummer, filling is done with time to time opening of main valve, during this time must be open valves in the highest point for air to go out. Valve stays open till the water flow, after that it close. If in highest point is placed air valve, so that air during net filling goes out till to this valve.

Pressure is made by the pressure rod, pressure it can be read in manometer. In net is done appointed pressure for longer or short time. Pressure highness and his time extension during test are arranged according to rules of municipality water company. Usually its rule that pressure during test to be 50 to 100% bigger than working pressure, but it can't be smaller than 10...15bar. Time extension of test must be 10 to 30 min.

If under this pressure in appointed time comes not to the pressure fall, net is waterproof. If pressure fall (with which it can be seen in manometer), net release the water. With inspection we see the discharge place and water installer fix that damage and testing must repeat.

According to rule is foreseen that test to be done in presence of water supply municipality

3.10 SEWERAGE TEST

Sewerage net testing for home in waterproof is done in interests of user and building. This testing is reasonable, because appointed net parts in appointed moments can be filled with water till to sanitary elements. Like this case it can be in whole net when is closed main pipe, mostly in appointed net places where the branch or some water collectors are closed. If is closed storm water vertical or his manhole, than whole vertical can be filled with water. In this cases the net that is installed not straight, it comes to the water flow, blocking and damage of building.

Testing must be done in all branches and verticals.

Testing and sewerage check must be done after finishing or net installation. Even better is that during building of net parts, to be tested siphon in waterproof, especially WC and urinal connection.

Testing of sewerage net for home is done mostly and easy with water, but in special cases also with air.

Test with water can be done in whole net or in his one part. At first all holes must be closed, besides vertical. Than the whole net will be filled with water. Under appointed pressure net is hold usually at least 15min, after that starts check. Places where flow water are marked, net must be discharged, it must be repair, after witch testing till the whole net can be waterproof.

Closing in best way can be done with special closer witch are made in different size. Closer it self is placed through the pipe hole with fixing. Beside those closers, for pipes with bigger diameters are used gum diaphragm, bags with sand or clay. Gum valve has also his discharger with valve, but it can be placed also gum pipe. With valve can be checked water contents, to discharge water or to be filled with water pipes that must be investigated.

Filling with water is done in most commode place, till the water flow in the higher point of vertical. Filling is done by the gum pipe through vertical element or in other place (example through valve). If the water level fall, and nowhere is discharge, it means sewerage net somewhere is releasing water.

Testing with air is done in case if for different reason it can't be done water test. Testing is done with device with air compressor. This device can be connected in every adapted place, and the other holes must be closed. Air comes till to pressure from 3.5dbar and it must be hold 15min, for that time pressure cannot fall down. Air testing has one big defect, because it can't be appointed the place of air discharge. That is done with soap spume or aroma, but that need a long time.

To be tested not only net, but also siphons for sanitary elements it must be done finishing sewerage test.

Finishing test it must be done with smoke or aroma.

3.11 ELECTRIC POWER SUPPLY

The Contractor shall provide all temporary power, light, and telephone service required for his work. The Contractor shall make all necessary applications, obtain required permits for temporary services and pay all fees and charges for such services and their use.

The Contractor shall provide all wiring, lamps, switches, fuses, receptacles, etc., as may be required for his work. Temporary power and light circuits shall be thoroughly insulated and waterproof.

The temporary power and light system shall be subject to the inspection and approval of the appropriate Authority. The Contractor shall be the sole responsible for the provision of Electricity from whatever source for all his Specifications under the Contract. The cost of provision of electricity is deemed to be included in the contract rates.

3.12 USE OF THE SITE AND SURROUNDING PROPERTY

The Contractor shall restrict his activities to within the Sites and shall avoid entry on to any other lands except where the Contractor has made his own arrangements for such entry or the owner has arranged for this entry. Any trespass, damage or claims arising from such entry shall be the sole responsibility of the Contractor, who shall hold the Contracting Authority indemnified against all claims arising from such trespass or damage.

The Contractor shall arrange at his own cost the supply of electricity, fresh water, telephone, compressed air and other services as are necessary to the Site establishment and shall provide, maintain and remove on completion all pipes, cables and fittings which carry such services to his operations. The Contractor shall provide an adequate supply of safe drinking water on the Site. All electrical installations forming part of the Temporary Works shall comply with the current local regulations.

Prior to the commencement of Works, the Supervisor shall supply to the Contractor the names and addresses of relevant owners and occupiers of any private lands that constitute part of the Site. The Contractor shall notify the Supervisor in writing 14 days in advance of his intention to start work within each area of ownership or occupation.

The Contractor shall keep records of the dates of his entry on to and departure from all property and lands of each owner and occupier, together with the dates of the erection and removal of all enclosures, and shall furnish copies of these records when required by the Supervisor. He shall keep and furnish copies of similar records in respect of roads, footpaths and thoroughfares.

The Contractor shall restrict his activities to within the Sites and shall avoid entry on to any other lands except where the Contractor has made his own arrangements for such entry or the owner has arranged for this entry. Any trespass, damage or claims arising from such entry shall be the sole responsibility of the Contractor, who shall hold the Employer indemnified against all claims arising from such trespass or damage.

3.13 HEALTH, SAFETY, ACCIDENTS, SECURITY

3.13.1 General Specifications

The Contractor shall maintain arrangements whereby he can quickly call out labour outside normal working hours to carry out any work needed for an emergency associated with the Works.

The Supervisor shall be provided at all times with a list of addresses and telephone numbers of the Contractor's staff who are currently responsible for organizing emergency work. The Contractor shall acquaint himself and his employees with any relevant local arrangements which are in existence for dealing with emergencies.

The Contractor is also obliged to observe all the stipulated measures pertaining to protection at work as well as fire protection, hygienic and technical conditions all in accordance with the local legislative and best available practice.

The Contractor shall ensure to the satisfaction of the Contracting Authority and relevant local legislative, the health, safety and welfare at work of his and subcontractor employees, third parties and representatives of Contracting Authority.

3.13.2 Labour Safety and Protection

The Contractor shall provide for conditions necessary for health and safety while working. To prevent accidents on public roads and for pedestrians, working sites must always be limited by protective railing. This includes the residents of the existing buildings on the site.

The Contractor is also obliged to observe all the stipulated measures pertaining to fire protection, protection at work as well as hygienic and technical conditions such as Fire Protection Regulations Rule Book on general Measures and Normative of Protection at work concerning building facilities intended for the work and other subsidiary premises (Official Gazette of SFRY 27/67, 29/67, 41/68), Rule Book on general Measures and normative of Protection at work concerning building facilities intended for the work and other subsidiary premises, Rule Book on Protection at work in civil engineering sector (Law No.2003/19). The Contractor shall ensure, so far as is reasonably practicable and to the satisfaction of the Contracting Authority, the health, safety and welfare at work of his employees including those of his sub-Contractors and of all other persons on the Site. His responsibilities shall include:

- the provision and maintenance of equipment and systems of work that are safe and without risks to health;
- the execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances;
- the provision of protective clothing and equipment, first aid stations with such personnel and equipment as are needed and such information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on the Works, all in accordance with Laws and all local By- Laws;
- designation as safety Officer of one of his senior staff who shall have specific knowledge of safety regulations, and experience of safety precautions on similar works and who shall advise on all matters affecting the safety of workmen and on measures to be taken to promote such safety;

- the provision and maintenance of access to all places on the Site in a condition that is safe and without risk of injury;
- the provision of adequate water-borne sanitation, refuse collection and disposal, complying with the Laws and all local By-Laws and to the satisfaction of the Supervisor, for all site offices, workshops erected on the camp site;
- the provision of suitable latrines and other sanitary arrangements at the site where work is in progress to the satisfaction of the Medical Officer in the area and of the Supervisor;
- the execution of appropriate measures in consultation with the appropriate Public Health Authority to control within the site;
- reporting details of any accident to the Supervisor as soon as possible after its occurrence;
- The provision and maintenance of adequately equipped first aid station on the site of the works.

3.13.3 Accidents, Extraordinary Events

The Contractor shall give immediate written notice to the Supervisor of any accident or extraordinary event occurred on the work site giving details of the same whether or not such an accident or event affects the progress of work. The Contractor is also obliged to report on any measure taken.

3.14 DEMOLITION AND SITE CLEARANCE

3.14.1 General information

This Section covers all demolition and site clearance forming part of the Permanent Works. “Demolition” is the demolition required solely for the Permanent Works.

“Site clearance” is the separation, sorting and transportation of the demolished material to an agreed stockpiling site required solely for the Permanent Works.

Any existing structures shown on the Drawings to be demolished or dismantled and the debris disposed in an adequate manner. The existing buildings on the site, as specified on the Demolition Plan, are to be demolished and removed off site by the Contractor. The elements of the existing building structures such as roof, walls, slabs, foundation and other structural or nonstructural elements within the building footprint shall be removed by the Contractor. A detailed site clearance methodology should be presented by the Contractor for the approval of Supervisor. Other parts of the Site shall be cleared to the extent indicated on the Drawings or as instructed by the Supervisor. A detailed refurbishment methodology should be presented by the Contractor for the approval of Supervisor.

Special attention regarding the safety measures shall be given during the demolition of the reinforced concrete underground structure as specified in the drawings.

The contractor shall be responsible for ensuring that the existing buildings on the site are made safe and are adequately protected during the construction works. The contractor must ensure that the existing buildings foundations are protected and that the existing buildings are not subject to subsidence caused by excavation works.

Other parts of the Site shall be cleared to the extent indicated on the Drawings or as instructed by the Supervisor.

Where underground structures, manholes, wells, services and similar items are discovered, their presence shall be reported immediately to the Supervisor and they shall not be disturbed until the Supervisor has given his instructions for their disposal, re-routing or protection. Where such underground structures, manholes, wells and similar items are demolished and removed from areas which are to be occupied by buildings, roads, hard standings and other Permanent Works, any holes or depressions resulting from such removal shall be filled with material similar to that in the surrounding ground and compacted to a density equal to that of the surrounding ground, unless other treatment is shown on the Drawings or instructed by the Supervisor.

The Contractor shall take ownership of all unwanted material and dispose of it to a registered landfill.

The contractor is to consult with the municipality and to mark out and establish the site extents prior to site clearance work being commenced.

The Contractor is required to perform the works in an equivalent or higher quality than the recommended and designed. Recommendations of the manufacturer, materials and products listed in positions are not compulsory. The Contractor may, in accordance with their bid range, offer

products from other producers of an equivalent or better quality and performance. Before contracting the works, the Contractor is required to submit certificates for the offered substitutes.

All the positions of the BoQ imply the execution of each work position unconditionally professionally, accurately and efficiently, and entirely according to the approved drawings, technical descriptions and explanations in this BoQ, technical requirements and details of the study for building physics, structural analysis, details, as well as Supervisor's subsequent details, applicable technical regulations, standards and guidelines of the Supervisorbodies and the Supervisor, if the position doesn't require otherwise.

All the provisions of these general conditions, as well as other listed general descriptions, are integral part of the contract concluded between Investor and Contractor.

All works and materials specified in the descriptions of individual position of the BoQ must be included in Contractor's offered price. Contractual prices are Contractor's sale prices and they include all costs for labour, materials with typical loss, external and internal transport, scaffolding and formwork for the execution of works (unless they are otherwise foreseen for a particular position in this BoQ), water, lighting, fuel material and machinery energy, excavating and filling of the lime pit, warehouses for storage of materials, temporary construction site facilities, offices, workers' room, expenses, contributions, all state and municipal taxes, Contractor's earnings and any other expenses caused by the existing regulations for the establishment of sales prices of a construction product, including all expenses arising from the special working conditions that provide for standards in the construction industry.

The Contractor shall not be entitled to claim any additional payment to the bid and the contract price, unless specifically stated in the BoQ that certain specified work is paid separately and is not foreseen in another position. No fees or extra charges in addition to the agreed price shall be approved, in the name of increased norm values from Average Standards in Construction Industry.

Calculation and classification of executed works will be carried out according to Average Standards in Construction Industry, mandatory for Investor and Contractor, unless the descriptions of individual positions in BoQ do not otherwise specify.

All building and construction work is conditioned with the use of appropriate skilled workforce and quality of materials that must conform to existing technical regulations, standards and descriptions of the corresponding position in the BoQ, or the technical description and details of the project documentation. Contractor must previously submit a certificate to the Supervisor for each material to be used, according to the applicable regulations and standards in the construction industry. In cases of disputed quality of materials, samples will be submitted to the Institute for Testing of Materials, whose findings are authoritative for Investors and Contractor. If the Contractor despite the negative findings of the Institute for Testing of Materials continues to use substandard materials, Investor/Supervisor shall order demolition, and the demolition damage shall be borne by the Contractors - without the right to complaints and objections to the demolition ordered by the Investor or building inspection.

All building and construction work is conditioned with the use of appropriate skilled workforce foreseen by Average Standards in Construction Industry. The Contractor shall, upon the request of Investor remove from the site negligent and incompetent workers. Before the start of every work,

site manager is required to promptly request from the Investor representative for an explanation of plans and information for all the works that are not defined in the design study.

If the Contractor performed incorrectly some of the works, or executed them contrary to the instructions given in the Construction Diary, or contrary to the prescribed specification, plans and details without consulting the Investor (Supervisor), no justification shall be accepted. In this case, the Contractor shall, regardless of the amount of work executed, demolish and remove all at his own expense, and execute again as provided for in the plans, descriptions and details, at its own expense, unless such changes are not approved of by Investor representative /Supervisor in the Construction Diary.

If the Contractor executes any work to be better and more expensive than anticipated quality, he has no right to demand additional payment, if the work was carried out on his own, without having previously obtained an approval or order from the Investor representative/Supervisor in the Construction Diary.

Contractor must maintain the facility and the whole site neat and clean, and upon the completion of the works, before the handover of the facility the Contractor shall fill, compact and level the entire surface well so that settlement does not occur later, all pits, toilet pits, scaffolding and fencing holes.

For inspection and handover, the Contractor must clean the entire facility and site from debris, surplus materials, all working tools and ancillary facilities. All access to the facility, plateaus, stairwells and walkways, as well as floors in all the rooms must be clean, as well as all the woodwork, metalwork, glass surfaces and all roof surfaces.

Driveway and sidewalks damaged by the execution of works or transport must also be returned to a proper condition before the inspection and handover of the facility.

All of the above finishing works are not paid separately, as they must be included in the contract price. Any potential damage, caused by the Contractor during the execution of works on the site or adjacent buildings, shall be reversed and restored to its original condition at his own expense.

It is underlined that the Contractor is the sole responsible party for damages on adjacent existing buildings caused by reckless and irresponsible work. If there is a need to secure existing adjacent structures (piering, slabjacking, etc.), the costs of such work will be borne by the Investor, but only the Contractor will be responsible for all damages if he does not take timely all the necessary measures to ensure the adjacent buildings.

In case of structural changes, as well as in case of an increase, reduction or cancellation of certain works from BoQ, occurring surplus or deficit, the Contractor is required to adopt without objections and limitations, and without the right to compensation, with the proviso that any surplus or any deficit shall be calculated at the negotiated rates.

In case a need to perform works without a negotiated price in the BoQ occurs, the Contractor shall obtain the approval from the Investor representative, determine the price and register it in the Construction Diary, according to the pricelist for materials and labour, which is attached to the bid.

The Investor is entitled to require a written guarantee that derivative works be durable and of high quality from the Contractor for special works (roof insulation, new materials, etc.). The Supervisor is

entitled to require from the Contractor for new and specific materials to submit a sample (flooring, paint, etc.) based on which it will make a choice. Acquisition of these samples is not paid separately.

The Contractor is obliged to coordinate the work of the subcontractors who independently perform certain types of work, so they do not to inflict damage to each other, and if this does happen, he shall immediately regulate the remedy and compensation to be borne by the responsible party. In contrary, the cost of remedy of such damage shall be borne by the Contractor. This applies to all faults and damages that may arise due to non-compliance with the agreed dynamics and schedule for individual works.

Besides all the temporary facilities that the Contractor needs for the execution of works, the Contractor is required to provide office space for the Supervisor and to maintain it properly during the construction of the facility, and to provide the necessary security lighting, heating, cleaning, and necessary office inventory.

Upon the completion of works the Contractor shall submit payment orders to confirm to the Investor that consumed water, electricity and other fees that are charged to the Contractor during the execution of works have been paid, unless otherwise regulated in the contract.

The Contractor shall keep the Construction Book and the Construction Diary on the basis of existing legislation, registering daily the necessary information, which will be inspected daily and certified by the Investor representative and the Supervising Authority by their signature on each page.

All works must be executed with all the structural parts in a completely flawless manner and according to Supervisor's details. Before handing over the facility to the Investor, the Contractor is responsible for absolutely everything on it; in case of any damage or defect the Contractor shall return all to the proper state at his own cost.

The Contractor is required to place on the site for the entire duration of construction works of highly qualified and experienced professional who will be responsible for the technical control and accurate fulfilment of all the Contractor's obligations.

For all the works in the BoQ where formwork and scaffolding is necessary, the Contractor shall supply it in a solid construction, which shall not be paid separately, as it is calculated in the bid for the given works.

All necessary holes and grooves in the walls and ceilings for the installations and various devices the Contractor shall make true to details and disposition plan, and after the installing, the Contractor shall fill in and plaster all the holes and grooves. This shall not be paid separately, as it is included in the price of given structure, construction and plastering, unless the Project Documentation or BoQ stipulate otherwise.

3.14.2 Dust Control and Health Hazards

Dust shall be controlled and reduced by periodically spraying demolition works with water.

Site operatives and general public shall be protected from hazards associated with vibration, dangerous fumes and dust arising during the course of the Works.

Notice of any asbestos based materials discovered during the demolition works shall be immediately given. Disturbing such materials shall be avoided.

3.14.3 Drains and Services

The Contractor shall remove or divert drains and services as shown on the Drawings or as instructed by the Supervisor. Each diversion shall be complete before the original drain or service is cut and shall be connected into the original line with the least possible interruption to its operation. Drains and services which are to be removed shall be cut and stopped off at points shown on the Drawings, or as instructed by the Supervisor, in a manner acceptable to the Supervisor. Such cutting and stopping off shall only be carried out upon receipt of a written notification from the Supervisor.

3.14.4 Final Clearance

Upon completion of each section of the Works, the Contractor shall clean up the site; remove all temporary buildings, plant and debris. He shall level off and fine grade all excavated materials which is surplus to Specifications. The whole of the site shall be left in a clean and workmanlike condition to the satisfaction of the Supervisor. A Final Certificate will not be issued before the Contractor has removed all his machinery, equipment, plant, waste material from the site and the site reinstated to the satisfaction of the Supervisor.

3.15 TRAFFIC SPECIFICATIONS

Throughout the Contract Period, the Contractor shall co-operate with the State Roads Directorate and Police Authorities concerning works in, or access to, any national roads. The Contractor shall inform the Supervisor of any specifications of, or arrangements made with, the State Roads Directorate and Police Authorities.

The Contractor shall take all reasonable steps to prevent vehicles entering and leaving the Site depositing mud or other debris on the surface of adjacent roads or footways, and shall remove expeditiously any materials so deposited. The surfaced areas of the Sites shall also be covered by the Specifications of this clause.

The Contractor shall not make use of the public streets, roads, verges, thoroughfares or footpaths for disposing or storing equipment or materials.

The Contractor shall allow in his rates, where appropriate, for the provision and maintenance of any temporary works including structures and diversions, and for the provision, erection and maintenance of road signs for safe passage of traffic during the construction of the road and ancillary works.

The Contractor shall allow in his rates for providing and maintaining a suitable running surface at all times over a width of at least 3 meters for the passage of single lane traffic during any construction operations on the road. Traffic flow shall be maintained and controlled by traffic lights or other methods that are approved by the Supervisor. Prior to entering any section the Contractor shall submit to the Supervisor a detailed plan of his proposals to maintain and control the traffic flow.

The Contractor's attention is drawn to the fact that the entire road including all diversions used under the Contract and regardless of their distances from the works under the Contract, and including all drainage facilities, structures and bridges handed over to the Contractor shall be maintained throughout the construction period and until the Provisional Acceptance Certificate for the Works is issued.

The Contractor further understands that all such diversions, drainage facilities, structures, road furniture and road markings, are to be reinstated by the Contractor to at least the condition they were in at the time of the handover to the Contractor at his own cost.

3.16 CONTRACTOR'S EQUIPMENT AND MATERIALS

Details of all Contractors' Equipment to be used by the Contractor in the execution of the Works shall be submitted to the Supervisor prior to its use.

The Supervisor's consent to use the Contractor's Equipment will not be unreasonably withheld, but if in the Supervisor's opinion circumstances arise which make it desirable that the use of the Contractor's Equipment should be suspended either temporarily or permanently, the Contractor shall change the method of performing the work affected and he shall be deemed to have no cause for claims against the Contracting Authority on account of having to carry out the work by another method, nor shall he be deemed to have cause for claim if any order issued by the Supervisor results in the Contractor's Equipment having to stand idle for a period of any duration whatsoever or having to be removed. In particular, where it is impossible due to the proximity of, and danger to, existing roads, structures, or services, to excavate except by hand methods, then in such cases it shall be deemed reasonable for the purpose of this clause for the Supervisor to withhold consent to use the Equipment.

The Contractor shall provide, erect, service and maintain all necessary buildings as offices, housing or plant yard/stores for himself, his staff and his employees. These buildings shall be, from the time of their erection until the completion of the Contract, the property of the

Contracting Authority and the Contractor shall not demolish or remove any buildings or part of any buildings without the written permission of the Supervisor. All buildings shall comply with the appropriate local regulations and the Contractor shall provide the appropriate Authority with sufficient details of the establishment so that the approval of the appropriate Authority can be obtained by the Contractor prior to construction.

The Contractor shall also construct and maintain adequate roads or paths to all buildings. All hutments, buildings, fixtures and fittings provided under this Clause shall be removed and the site reinstated at the end of the Contract. The site is to be left either graveled or grassed.

The following general Specifications shall apply:

- The Contractor shall provide adequate lighting where work is being executed at night and shall provide and install any additional lighting which the Supervisor may require in order to watch and supervise the Works and carry any testing and examination of materials.
- Materials available on the Site or materials made available or supplied by the Contracting Authority shall be used solely for the execution of the Works.
- The Contractor shall minimize the pollution of and disturbance to roads and other places on and around the Site. No trees or other vegetation shall be removed except with the express permission of the Supervisor
- The Contractor shall ensure that access is provided to all buildings and properties adjacent to the Site for the duration of the Contract.
- All temporary buildings erected by the Contractor upon the Sites and the layout of the buildings and the site, shall comply with Laws and all local By-laws in so far as they are applicable.

The Contractor shall be absolutely and solely responsible for the safety and security of Temporary Works and for the equipment in connection therewith which may be erected or provided for the carrying out of the Contract and for the execution of the Works.

This provision shall be applicable to all temporary works and equipment whenever provided and erected by the Contractors for the purpose of or in connection with the Works. Examination and acceptance by the Supervisor of the Contractor's Temporary Works or of the drawings connected therewith shall not absolve the Contractor from his responsibility for those works and his liability for the consequences of any failure.

3.17 BILL-POSTING AND ADVERTISEMENT

The Contractor shall not undertake or allow bill posting or advertising of any kind upon the works without the written consent of the Supervisor.

3.18 WARRANTY FOR MATERIALS INCORPORATED IN THE WORKS

Over and above the Design Life specified for the Sites, a written warranty may be asked by the Supervisor at his discretion and shall be provided by the Contractor via the manufacture of Materials which will be incorporated as part of the Permanent Works. The warranty shall include appropriate dimensioning of components, correct choice of materials (including auxiliary materials like ancillary materials of welding, rust preventing coats) and workmanlike installation for the periods shown.

3.19 EARTH WORKS

3.19.1 General provisions for earthworks

Earthworks must be carried out immediately prior to the start of construction, professionally and in good quality in accordance with applicable technical requirements and standards as well as to the instructions of a study on the geotechnical investigations and according to the data sheet for the construction and the drawings.

Before beginning the excavations, Contractor is obliged to carry out the marking of the object on the ground, and then, together with the Investor representative to record the existing altitude elevations of the entire site in all directions. These elevations should be included in the Construction Book, based on which the earth excavation is calculated. The Supervisor shall submit to the Contractor fixed points that specify the position of the structure and the level of the completed structure. The Contractor shall maintain these markings and will re-mark the site if required.

Marking of the structure, maintenance of the markings and recording of the site before the start of the excavation are not calculated separately but are included in the excavation price. When the site surveying is done, the Supervisor shall authorize the start of excavation.

Excavation must be properly and fully horizontal, in all according to the details in the plans and elevations in the plans. Double digging is not permitted, and if the Contractor digs deeper than anticipated or doesn't level the excavation properly, he is obliged to fill in the overly excavated or badly levelled part with a material determined by the Supervisor (crushed stone or equivalent) and compact to the required density and load capacity, according to the study given in the structural analysis, as well as to ensure a testing in the competent Institute for Testing of Materials in the construction industry, which will not be paid separately, as the Contractor will provide for it at his own expense and with his material.

Excavation is to be carried out with all the necessary security measures by sloping or shoring, according to the description and details provided in the design documents. Any necessary support or shoring of the excavation will not be paid separately but is included in the excavation price.

Any damage caused by incompetent or unsound work due to the omission to shore any endangered segments, or any cause stemming from his fault, Contractor shall bear its cost of remediation.

All excavations must be free of all foreign materials and bulk materials, and they must be levelled and flattened.

The development of foundations and the like, may not commence before the Supervisor has reviewed and accepted the excavation, and registered them in the construction book with the necessary calculation data.

Extraction of meteoric water or groundwater in a greater inflow shall be considered as additional work, and it will be separately calculated and paid, unless it is listed as an item in the BoQ, which is an integral part of the design documentation.

If during excavation unforeseen items, i.e. parts of buildings, archaeological or other finds appear, the Contractor is required to comply with the order of the Supervisor. In case an existing installation

(electrical, water and sewer line or the like) are run into, which are not indicated in the layout plan, they are to be protected or relocated with the approval of the Supervisor. All works that may arise from the above shall be considered as additional and will be separately calculated and paid. The material from the excavation is to be used for filling next to foundations, under floors, etc. provided that it is suitable for the construction of embankments. Such material is to be left by the edge of the excavation or to be transported a temporary landfill and used later for filling. Excess material from excavation is to be transported to a permanent disposal site.

Note: Filling in next to the foundation walls is to be done immediately and without undue delay, to avoid unnecessary soaking of the excavation. The calculation of the excavation is to be carried out on the basis of the excavation profile surveyed before and after excavation, according to the excavation lines shown in the drawings.

3.19.2 Execution

Removal of humus, shrubs, trunks, stumps and other waste material on the construction site has to be done on all the shown and designated surfaces, as well as on certain places the Supervisor determines.

The works are done using machines suitable for pushing, moving and loading of materials, and using means of transport suitable for transport of such material.

The place of depositing is to be determined in accordance with and as ordered by the Supervisor, with noting it down in the Construction Diary. All the precaution and safety measures are to be taken for workers and in transport when executing works, loading and transporting.

Digging has to be proper and fully horizontal, fully in accordance with the details and elevations in plans.

Compacting is done with mechanical compactors, vibrating plate, vibrating roller and such, with surface wetting and compacting to the required density. The surface is to be levelled according to elevations given in design document, with accuracy $\pm 5\text{cm}$. Healthy soil is to be added as necessary, from a borrow pit on the construction site.

Crushed stone is to be carefully backfilled in layers, be wetted and compacted with a vibrating plate or roller, up to the required density, while the upper surface is to be finely planned with accuracy $\pm 1\text{cm}$. Each individual layer has to be spread out in the longitudinal direction horizontally, or with a slope equal to the designed longitudinal slope. Transversely, each individual layer has to have a two-sided or one-sided slope of 2-5% due to drainage of atmospheric water. All the works are to be done according to the design, instructions of the Supervisor.

3.19.3 Control during Execution

During the execution of works, a representative of the Investor occasionally controls the progress of works and gives additional instructions, or possible remarks.

3.19.4 Handover of the Completed Works

After the finished works, a representative of the Contractor and Investor jointly inspect the construction site and structure in question, ascertain the state and make records about it, which are

an integral part of construction documents. Potential faults or remarks, if there are any, have to be repaired by the Contractor as soon as possible. If it is determined that the Contractor caused damage through his negligence, he has to repair it at his own expense, according to instructions of the Supervisor.

3.19.5 Measurement and Payment

According to the above description, the amount will be paid according to actually executed quantities, which are determined by measuring, at the price whose payment is envisaged in accordance with the demands of the Contract or the offer, which is an integral part of the contract, as well as all the material and transport.

Materials and works for this Chapter shall be performed according to the respective drawings, design technical specifications given in this document, other binding applicable national rules/regulations, and in the quantities and other relevant data described in the BOQ and Particular Specification.

This Chapter includes the following works:

3.19.6 Mechanical Cleaning of Terrain and Humus Removal

3.19.6.1 Description of Works

Cleaning or excavating of surfaces includes cleaning surfaces from humus, trees, shrubs, debris and all the excessive plant material, and has to include digging out of stumps, roots and removal of all the harmful material that remained while removing shrubs, trunks and stumps.

This work includes removing a 10cm thick layer of humus, shrubs, cutting trees of all sizes (including cutting of branches, and cutting the trunk to a specified size, etc.), excavation, pulling out and relocating of stumps of new and previously cut trees, and all the other works needed for preparing the surface. Surfaces that have to be cleaned or excavated have to be shown in drawings, or to be determined by the Supervisor before the start of works.

Before the start of excavation, the Contractor has to mark the structure on the field, and then together with a representative of the Investor to record the current height elevations of the entire field in all the directions. These elevations should be entered into the construction log, according to which a calculation of land excavation will be done. the Supervisor will hand over the Contractor the fixed points that specify the position of the structure and level of the finished structure. The Contractor has to maintain these marks and to do on his own the necessary re-markings of the field if needed.

Field marking, maintenance of marks and recording the field before the start of excavations are not calculated separately, but are included in prices of excavations. When the field recording is finished, the Supervisor will approve of the excavation.

3.19.7 Mechanical Wide Excavation of Soil

3.19.7.1 Description of works

The work includes all wide excavations of all types of soil envisaged by the project with transportation which is pushing of the excavated material to embankments, stockpiles for various purposes depending on how the materials will be used during the execution of works. The works include all

excavations of the cuts, track widening, borrow pits, watercourse corrections, road deviations, as well as wide-hand excavations in the execution.

3.19.7.2 Execution

All excavations are to be carried out according to profiles, registered dimensions, inclinations envisaged by the design, observing the characteristics required for use of the excavated materials and under these technical conditions.

The excavations disregarding the project (smaller or bigger) may be carried out only upon order of the Supervisor. The Contractor will bear the expenses for repairing the damage caused by earth collapse or excavation disregarding the project, that is order by the Supervisor.

The excavation should be carried out using the required mechanisation and other equipment, depending on the type of soil. Mechanical pushing, that is loading of materials and transportation to the place of usage, that is the disposal site should be taken into account. All the excavated materials must be adopted to the requirements of the intended use according to the design and these technical conditions.

During the excavation all safeguards for full safety at work should be carried out, as well as all measures required to ensure the adjacent buildings and communications.

In all phases of work, efficient drainage must be enabled. More complicated working conditions, due to appearance of water during excavation will not be charged separately. The inclinations of slopes in excavation should be in accordance with the design, that is the order of the Supervisor. This work also requires cleaning of

all inappropriate places in soil which require special safety solutions, over which the Contractor is not entitled to change of the agreed unit prices.

During execution of works undermining, imbalance or damage to the designed inclinations of the excavation should be avoided. The Contractor is obliged to carry out the rehabilitation for any such case later, in accordance with the instruction of the Supervisor, but they are not entitled to any compensation or acceptance of payment for larger or unplanned work.

In case of double digging of the formation level, any repair with by returning and compacting of the layer is banned, but the formation level must be former on the level of double-digging, and the drainage needs to be deepen if required, while the lower bedding should be thicker, with the extra work caused by double digging being borne by the Contractor.

Before and during the work relevant samples should be taken for all changes in excavation that is quality of materials for testing whether the material can be used for intended purpose.

3.19.8 Tamping of Subgrade, Natural Subsoil

3.19.8.1 Description of Works

This work includes preparation of the subsoil, subgrade for making the embankment, after clearing the field and removing the humus layer, in order to prevent settlement or leaning of the structure that will be placed on the embankment.

3.19.8.2 Measurement and Payment

According to the above description, the amount will be paid according to actually executed quantities, which are determined by measuring, at the price whose payment is envisaged in accordance with the demands of the Contract or the offer, which is an integral part of the contract.

3.19.9 Backfilling the Large Crushed Stone in Layers

3.19.9.1 Description of Works

This work includes procurement of materials, transport to the construction site, backfilling, spreading out, rough and fine planning, wetting and compacting the material in the embankment according to dimensions determined in the project. All the work has to be done in accordance with the Design.

3.19.9.2 Material

Inorganic material of the required quality will be used for embankment construction. Material that would change its physical and mechanical properties over time due to biochemical effects cannot be embedded in the embankment.

3.19.9.3 Compacting

Each layer of the embankment has to be compacted in full width with a suitable mechanical means. In principle, the compacting is to be done from the edge towards the middle. All the inaccessible places of mechanization of places where the use of heavy compacting means would be inappropriate for other reasons (backfilling behind the structure, support walls, etc.) should be compacted with other suitable means or methods, whose use will be granted by the Supervisor. Before the start of compacting, material of each layer has to be crushed, mixed, wetted or dried to the moisture level that is in accordance with previous testing and for which the used material can be compacted to the required density. If backfilling of the next layer is not done right after compacting and quality control, but backfilling is continued after a longer time period, the quality of compactness of the layer that was already done should be controlled again before the backfilling. In the case, compacting can start only after quality of compactness has been proven. When there is a chance of rain during the day, the Supervisor will cancel further work on the embankments if required, without compensation of expenses. On the embankment from a cohesive material, the upper surface of the layer should be smooth and without dents in which atmospheric water could collect. Before backfilling a new layer, a surface smoothed this way should be roughened in order to achieve a better connection among layers. This also applies for other major halts of work on the embankment construction (due to termination of the construction season and such).

3.19.9.4 Control during Execution

Compactness of layers is tested on every 50-100m with two tests in close proximity that give one result. The same goes for embankments whose length is less than 50m.

Wetness of materials is tested daily. Construction of the next layer cannot start until the required quality of the previous one is proven.

In case the Supervisor determines bigger deviations of results from prescribed during control tests, the scope of tests can be subsequently changed. In agreement with the Supervisor, the quality of the embedded layers can be determined by using other recognized methods, too. In that case, criteria of the embedding quality and the manner and scope of testing have to be stated, in agreement with the Supervisor.

3.19.9.5 Handover of the Completed Works

Reception of each layer of embankment will be done by the Supervisor, with verification and entering into the Construction Diary according to prescribed criteria, while test results are submitted with the construction document.

3.19.10 Backfilling and Compacting of Tampon Layer of Gravel

3.19.10.1 Description of Works

This work includes procurement of material (natural gravel), transport to the construction site, backfilling, spreading out, rough or fine planning, wetting and compacting of material in the embankment according to dimensions determined in the project. All the work has to be done in accordance with the Project and Standard – Earthworks for embankment construction.

3.19.10.2 Material

Inorganic material of the required quality will be used for embankment construction. Material that would change its physical and mechanical properties over time due to biochemical effects cannot be embedded in the embankment.

3.19.10.3 Execution

Gravel is to be carefully backfilled in layers, to be wetted and compacted with a vibrating plate or roller, up to the required density, while the upper surface is to be finely planned with accuracy ± 1 cm. Each individual layer has to be spread out in the longitudinal direction horizontally, or with a slope equal to the designed longitudinal slope. Transversely, each individual layer has to have a two-sided or one-sided slope of 2-5% due to drainage of atmospheric water. All the works are to be done according to the design, instructions of the Supervisor.

3.19.10.4 Compacting

Each layer of the embankment has to be compacted in full width with a suitable mechanical means. In principle, the compacting is to be done from the edge towards the middle. All the inaccessible places of mechanization or places where the use of heavy compacting means would be inappropriate for other reasons (backfilling behind a structure, support walls, etc.) should be compacted with other suitable means or methods, whose use will be granted by the Supervisor. Before the start of compacting, material of each layer has to be crushed, mixed, wetted or dried to the moisture level

that is in accordance with previous testing and for which the used material can be compacted to the required density. If backfilling of the next layer is not done right after compacting and quality control, but is continued after a longer time period, the quality of compactness of the layer that was already done should be controlled again before the backfilling. In the case, compacting can start only after quality of compactness has been proven.

When there is a chance of rain during the day, the Supervisor will cancel further work on the embankments if required, without compensation of expenses. On the embankment from a cohesive material, the upper surface of the layer should be planned and treated. Before backfilling a new layer, a surface smoothed this way should be roughened in order to achieve a better connection among layers. This also applies for other major halts of work on the embankment construction (due to termination of the construction season and such).

3.19.10.5 Control during Execution

Compactness of layers is tested on every 50-100m with two tests in close proximity that give one result. The same goes for embankments whose length is less than 50m.

Wetness of materials is tested daily. Construction of the next layer cannot start until the required quality of the previous one is proven.

In case the Supervisor determines bigger deviations of results from prescribed during control tests, the scope of tests can be subsequently changed. In agreement with the Supervisor, the quality of the embedded layers can be determined by using other recognized methods, too. In that case, criteria of the embedding quality and the manner and scope of testing have to be stated, in agreement with the Supervisor.

3.19.10.6 Handover of the Completed Works

Reception of each layer of embankment will be done by the Supervisor, with verification and entering into the Construction Diary according to prescribed criteria, while test results are submitted with the construction document.

3.20 BUILDING WORKS

3.20.1 General provision for masonry works

The works have to be executed professionally and in high quality, fully in accordance with the applicable regulations, standards, approved drawings, technical description, technical conditions from the study for building engineering physics and construction norms.

Material for masonry works have to be of high quality, and execution has to be professional and conscientious. Bricks and clay products have to be of the specified brand, well-burnt, without lime and saltpeter, river sand and without organic impurities and mud. Lime should be well-burnt, hydrated and matured.

The process of these works includes three work operations: making of mortar, bricklaying and plastering, and transport of materials for bricklaying (bricks, blocks, mortar, etc.). For each of the operations there are ancillary masonry services that include fetching water, occasional mixing of mortar in the mortar trough, wetting of bricks, moving of the trough, moving the mobile scaffolding up to 2.00m, cleaning of the work place upon the finished work. All of these works are included in the price of the final work position and will not be charged additionally.

Bricks and all the other clay products and materials used for masonry works have to be fully in accordance with the accepted standards. The Contractor has to confirm them with a submitted official certificate and records on the performed tests on the embedded materials by the Institute for Testing of Materials in the construction industry.

The water used for works has to be clean, without any impurities and organic ingredients that could affect the quality negatively.

Samples of bricks and blocks have to be submitted to the Supervisor for inspection before being delivered to the construction site.

At the request of the Supervisor, the Contractor has to submit appropriate laboratory samples of all the materials needed for tests.

Samples of all the materials will be tested from time to time. All the unusable ones will be removed from the construction site at the expense of the Contractor.

3.20.2 Bricklaying

Bricklaying using bricks, clay blocks and aerated concrete blocks is to be carried out according to plans and structural analysis. Bricklaying should be clean, with straight connections, in completely horizontal rows, without small pieces smaller than 1/4 of a brick. Broken bricks and pieces may not be placed next to each other in a wall. Joints – vertical and horizontal – have to be completely filled out, without cavities. Mortar in joints may not be thicker than 1 cm. External grout lines are to be left empty 1.5-2 cm for better connection of mortar when plastering walls. The leaked out mortar from the joints is to be removed with a trowel while fresh.

The price of bricklaying includes all the openings and grooves for vertical sewage lines, central heating, electricity lines, rain gutters and such, with subsequent walling up with bricks or patching

up of grooves, plastering or scrimming after installation distribution. No special payments will be made for these works.

All the masonry works should be done vertically using a plumb line and leveled on all the right angles in the line and grout lines.

Bricks are to be laid flatwise to an equal layer of mortar, and vertical sides of all the bricks have to be in line and well-coated in mortar in every layer.

When laying bricks during great heat, bricks are to be wetted by dipping them into water. In case bricklaying is halted due to cold, all the walls at the place where the work was stopped have to be protected from getting wet and freezing by covering them over the entire width with plank formwork and such. If walls are damaged due to water or frost because they were poorly protected, when works continue the damaged walls have to be demolished and rebuilt at the expense of the Contractor.

The price for 1m³ and 1m² for walls includes all the labour, material with usual loss, tools, transport, mobile scaffolding, earnings, all the contributions and fees. Ring beams on partition walls will not be paid separately since they are included in the unit price of walls. The calculation and payment method will be done fully in accordance with the general conditions for executing construction and craft works, this general description, applicable average norms in the construction industry, adequate positions of bill of quantities of works per m³ or m² of the constructed wall, unless the positions in the bill of quantities state otherwise. Openings for doors, windows and partitions are subtracted from the volume of masonry works, together with the beam above them. Window latches are included in the volume of masonry works along the entire thickness of the wall, according to measures entered in the plan. Reduction of wall thickness in window sills is not subtracted.

3.20.3 Plastering

Mortar will be made only in the amount that can be spent during the same day. Hardened mortar must not be used. Mortar should be made exactly according to regulations and in the ratio required in the adequate position in the bill of quantities. Regular mixing is obligatory both during making and during use, so as to avoid lime paste from creating.

The sand used for making mortar has to be sharp and clean river sand, while the lime has to be well-matured and filtered through thick screen.

Walls are plastered only after they are completely settled and dried, at the most favourable temperature, because in high temperatures the mortar dries too fast and cracks, while on low temperatures it freezes and falls off.

Plastering should start from the highest floor down.

Before plastering, all the surfaces on which mortar is to be placed have to be well-cleaned with a brush from dust and dirt, while in the summer they should be poured with water (especially the walls treated with cement mortar). Joints are to be cleaned from excess mortar.

If saltpetre appears, walls should be well-cleaned with wire brushes and washed with water and 10% hydrochloric acid. When the walls dry, cover them in bitumen emulsion using a brush so as to prevent

moisture from getting into walls again and salt from surfacing. These works are not paid separately, but are borne by the Contractor.

Plastering has to be done in layers of prescribed strength and processing. the first layer from mortar with rough, sharp filtered sand, while the other, fine layer is with fine sand. The mortar for the other layer has to be filtered through thick screen and is applied over a well-dried first layer.

The flat surface of the sub-layer is achieved through the use of a straight edge. Wet mortar of adequate thickness is first applied to the wall, after which it is levelled with a straight edge. When the first layer of mortar is well-dried, the wall is made wet and then mortar is applied and levelled with a large plasterer's float, with wetting until the surface becomes flat.

All the concrete surface that are plastered (cast of built out of bricks), regardless of whether it was mentioned in the position of the bill of quantities in question or not, have to be previously roughened as needed and sprayed with thin cement mortar, which is included in the unit price and is not paid additionally.

Surfaces have to be made wet in accordance with the use so as to achieve the necessary moisture level before applying the first plaster layer. Pay special attention to concrete of high compressive strength, which should be specially wet before the binder is applied.

In the places where it is necessary, the wire mesh will be fixed with galvanized steel staples, and fixed with galvanized steel wire. The mesh surface should be at a straight angle against the staples. Everything has to be set up in a way that enables undisturbed plastering.

After plastering, the surfaces have to be flat and smooth, without waves, dents and bulges. The edges have to be a little rounded – radiused and straight, while corners where walls meet and where walls and ceiling meet have to be sharp and straight. Cement and mortar should be stored in a dry place and used as they are delivered. Sand should be stored separately, in accordance with type, on a firm and dry surface, protected from any contamination.

Masonry works must not be done on temperatures under 3°C, except in the case there is an approval of the Supervisor to continue the works with certain precaution measures, in order to insure a minimal temperature of 4°C until mortar hardens.

For the other construction method, calculation of executed works and payment, the general conditions for executing construction and craft works apply, as well as general description for masonry works and the applicable average norms in the construction industry.

3.20.4 Control during Execution

During manhole construction, the Supervisor controls certain stages of construction, while for the embedded material the Contractor submits certificates and test results, which remain an integral part of construction documents.

3.20.5 Reception

Reception of every manhole will be conducted by Supervisor, with verification and entering in the Construction Diary, according to prescribed criteria.

3.20.6 Building a Manhole

3.20.6.1 Description of Works

Construction of manholes for the water meter and sewage includes procurement of material (full bricks, cement, lime, river sand, gravel, climbers, manhole cover), transport to the construction site and construction. All the work has to be done in accordance with the design and Standard.

All the material used when constructing manholes has to correspond to the applicable regulations and standards.

3.20.6.2 Execution

After taking over of the excavation and approval of the Supervisor, construction of manholes can begin.

Brick is to be wet with water before embedding. During the building, climbers are to be embedded every 30 cm. Make a benching cut at the top of the manhole for the cover over the concrete ring beam. Before casting the upper slab, make a wooden formwork for it.

3.20.7 Building of a Septic Tank

3.20.7.1 Description of Works

Construction of a septic tank includes procurement of material (full bricks, cement, river sand, gravel, climbers, manhole cover, air vent), transport to the construction site and construction. All the works have to be done according to the project and applicable standards.

The material used when constructing the septic tank has to correspond to the applicable regulations and standards.

3.20.7.2 Execution

After taking over of the excavation and approval of the Supervisor, construction of the septic tank can begin. For sewage manholes, make sure that the ends of sewage pipes are not damaged or clogged.

Brick is to be wet with water before embedding. During the building, climbers are to be embedded every 30 cm.

3.20.8 General provision for concrete works

All the concrete and reinforced concrete works have to be done fully in accordance with the 'Rulebook on the Technical Requirements for Concrete and Reinforced Concrete' and the 'Rulebook on Technical Requirements for High-Rise Construction in Seismic Areas'.

All the works have to be done according to the approved drawings, construction details, structural analysis and technical description, properly and professionally with adequate and professional labour force and under professional supervision.

3.20.8.1 Materials

All the used material for conducting concrete and reinforced concrete works has to be in accordance with technical conditions and applicable standards.

3.20.8.2 Aggregate (granules)

For making concrete use the aggregate that meets the quality conditions according to regulations on the applicable standards.

Gravel for making concrete has to be river gravel, completely clean of silt and bclay, granulated according to regulations for the type of concrete in question.

3.20.8.3 Cement

The cement that meets the quality conditions set in the regulations in applicable standards is used for making the concrete. Standard consistency, the beginning and end of bonding and consistency of cement volume is tested according to the regulations on the applicable standard. Cement samples are tested during each daily delivery of cement of the same class or kinds, or if cement was stored for over three months.

One testing can be done at a maximum of 250t of delivered or used cement. During testing of cement, the manufacturer has to separate a special cement sample and store it for 6 months according to regulation on the applicable standard. The structure design can envisage storing the cement sample until the structure handover.

The cement used for these works on the facility has to be completely fresh and brought to the construction site in original bags. The cement in the construction site should be stored in the manner and under conditions that do not affect its quality negatively – in premises well-protected from water and moisture, according to instructions and regulations for concrete and reinforced concrete. Cement is stored separately, according to types, and is used for making concrete according to the schedule of arrival to the construction site. Cement that has been stored at the construction site for over three months must not be used, unless a previous test has determined that its quality is in accordance with the prescribed conditions.

3.20.8.4 Water

Water that meets the conditions determined by regulations in the applicable standard is used for making the concrete.

The amount of used water has to be in accordance with the prescribed ratio of water and cement in the mixture itself, sufficient but not more than required to produce thick concrete, suitable for work, which can be cast and compacted without difficulties around the reinforcement and in corners, without segregation or loss of water on the surface.

3.20.8.5 Admixtures for concrete

Admixtures for concrete that meet the quality conditions according to regulations and applicable standards are used for making concrete. Before making concrete with admixtures, it has to be checked whether the admixture for concrete suits the designed concrete mixture, according to regulations and applicable standard.

3.20.9 Concrete

Concrete quality is determined in the structure design, based on technical conditions for executing concrete works, as well as conditions for that structure and elements during the exploitation.

The design document has to specify the concrete class (for the given structure or element) that includes only the concrete compressive strength (MB) or both the compressive strength (MB) and other properties according to regulations. Concrete compressive strength is tested according to regulations and the applicable standard, on cubes with edges of 20 cm, which have been kept in water or at least 95% moisture, at the temperature of 20 ± 3 °C. These test records are kept at the construction site and they identify all the tests with adequate parts of works.

For reinforced concrete, it is not allowed to use concrete with the following compressive strength under MB 15. The properties that concrete has to have in special environmental conditions are tested and rated according to regulations and applicable standard:

- waterproof
- abrasion resistance
- frost resistance
- salt-frost resistance

Concrete compressive strength can be tested on test bodies of other dimensions and shapes that are not 20 cm cubes, and it is then recalculated according to regulations.

Concrete consistency can be measured with:

VEBE test apparatus for settlement, spreading, settlement through vibration, Concrete consistency is chosen so that good concrete compacting, easier embedding without segregation and good surface finish are enabled with available means for embedding. The adopted concrete composition can be changed only based on statistically processed data of concrete control tests.

The manufacturer has to control each type of concrete made in the concrete plant whose production meets the conditions determined in regulations and applicable standards.

The manufacturer examines concrete ingredients. The granulometric composition of concrete aggregate is tested at least once a week according to regulations. Content of silty and clay particles of concrete aggregate is tested at least once a week, according to regulations. Moisture of concrete aggregate is tested at least once a week or during every visible change. Concrete admixtures are tested according to the regulation for every batch when delivering concrete admixtures to the construction site, or if the time of maturing of concrete admixtures at the construction site is longer than six months.

In the production of concrete, the manufacturer tests its compressive strength on a sample taken for every type of concrete, on each day the concrete is produced or on each 50 m³ of the concrete produced, i.e. on every 75 mixtures, and the case given by a larger number of samples applies.

Tests are done on concrete compressive strength, waterproof property, frost resistance, abrasion resistance and resistance to harmful environmental influence, by the manufacturer, in a way determined by the concrete design and according to suitable regulations and applicable standards.

The rating of the achieved concrete compressive strength (MB) is done in parties, in accordance with the control program and regulations.

3.20.10 Execution of Concrete Works

The contractor who makes structures and elements out of concrete and reinforced concrete has to keep proper documents that prove the quality of material and work execution, as well as other documents envisaged by the project.

Concrete works are done according to the design project and concrete design. Concrete design is made before the start of concrete works and has to contain all the attachments envisaged by regulations:

- -composition of concrete mixtures, quantities and technical conditions for the designed concrete compressive strength
- plan of concreting, organization and equipment
- means of transport and embedding of concrete mixture
- means of maturing of embedded concrete
- program of control tests of concrete components
- program of concrete control, sampling and testing concrete mixture and concrete in parties
- plan of assembly of elements, scaffolding design for complex structures and elements from concrete and reinforced concrete, if not given in the structure design, as well as the formwork design for special types of formwork

Concrete design is not made for individual construction of one story buildings, huts, sheds and similar facilities.

3.20.10.1 Concrete plants

For production of concrete, devices are used that meet the conditions determined by regulations and applicable standard. Transport of aggregates, depositing, storing and use will be done fully according to regulations. Each cement shipment has to have all the data on cement required in accordance with regulations. Cement is stored at the construction site as prescribed. Concrete admixtures have to be stored according to the manufacturer's instructions.

Organization, equipment and projects for execution of concrete works on the construction site have to be harmonized with the structure design and concrete design. Concreting may begin upon inspection of the base, scaffolding, formwork and reinforcement.

3.20.10.2 Scaffolding and formwork

Scaffolding and formwork have to be constructed and executed in the way that they can withstand the burden and influences during the execution of works, without harmful sinking and deformations, and to ensure accuracy envisaged in the structure design.

Cambers of scaffolding and formwork, construction and removal of formwork, quality and everything else related to formwork has to be done in accordance with regulations.

Formwork and support for all the concrete and reinforced concrete works are not paid separately, but are included in the price of concrete, unless the bill of quantities envisages otherwise. All the formwork for concrete works has to be accurately and precisely made according to drawings and

details. Accuracy of the horizontal and vertical position of the formwork, as well as axes of poles have to be checked by the Contractor, using instruments.

There should be a sufficient number of supports, so that the formwork is capable of withstanding the weight of concrete without sinking or buckling in any direction. Support reinforcement should be done in both directions. The inner

side of the formwork has to be flat. Boards of different widths cannot be used for one surface. Formwork has to be placed in such a way that it can be easily removed, without disturbances. Supports must not be placed directly on the ground or a plate floor, i.e. on a structure that is not stable; instead, planks 5 cm thick have to be placed below them. Formwork for parts of reinforced concrete structures that remain visible has to be smoothened, while damaged concrete surfaces have to be patch worked. Wood used for formwork has to be in accordance with suitable technical regulations for wooden structures, and dimensions according to structural analysis. The required scaffolding for concrete beams is not paid separately but is included in the price of concrete. Formwork and supports, as well as scaffolding, have to be made by a professional, experienced person.

Before the start of concrete embedding, dimensions of scaffolding and formwork, and their quality have to be checked.

3.20.10.3 Reinforcement

During transport and storing of steel, there can be no mechanical damages, cracks at the place of welding, or dirt that can reduce adhesion, or the loss of marks and reduction of sections due to corrosion.

Reinforcement is bent cold and the work is continued as determined in structure design.

Before placing, reinforcement has to be cleaned of dirt, grease, corrosion and such.

Before starting with concreting, the reinforcement has to be inspected and entered into records that it meets all the conditions according to regulations. The reinforcement that has been soiled with concrete, cement mortar and such, has to be cleaned before concreting.

3.20.10.4 Concrete embedding

Concrete is embedded according to concrete design. If concreting is halted due to unforeseen circumstances, all the measures have to be taken that such halts in concrete embedding do not affect the load capacity and other features of the structure and elements in a negative way. Concrete has to be transported and embedded in formwork in the way and under the conditions that prevent concrete segregation, changes in its composition and properties.

3.20.10.5 Curing of the embedded concrete

Special attention has to be paid to curing of concreted elements so as to achieve a suitable quality and reduce the negative influences of concrete, burnout, cracking, peeling and such. Right after concreting, concrete has to be protected from:

- drying too fast
- rapid heat exchange between concrete and air

- rain and water flows
- high and low temperatures
- vibrations that can change the internal structure and adhesion of concrete and reinforcement, as well as other mechanical damages during bonding and initial hardening

After embedding, the concrete has to be protected so as to insure a satisfactory hydration on its surface and avoid damages due to early and fast shrinkage.

Unless the concrete design envisages otherwise, curing of concrete has to last at least 7 days or not less than the time needed for the concrete to reach 60% of the envisaged concrete compressive strength.

If concrete is heated in winter conditions, by electrical energy or hot air, it has to be protected from sudden loss of moisture. Removing the formwork can be done only upon approval of an authorized person.

FINAL RATING OF QUALITY OF CONCRETE IN A STRUCTURE

For concrete, a final rating of quality has to be given in accordance with regulations. Based on the final rating of quality of concrete in a structure, safety and durability of the structure is proven, or an additional proof of quality of concrete is requested.

Calculation of executed works is done based on units of measurement as stated in each position of the bill of quantities. Production, assembly and removal of formwork, supporting and all the necessary scaffolding (except for the facade scaffolding) will not be calculated and paid separately because they are included in the price of finished concrete cement, except in the case when the mentioned works are included as a special position in the bill of quantities, which is the integral part of the technical document.

In case of a change to the structural analysis due to stronger or weaker terrain than envisaged, the Contractor has to fund it fully in accordance with the structural analysis, but the actually executed volume will be calculated at contract prices in the given positions without the right to complain. In case of constructive changes or amendments, the Contractor also has to execute everything according to the structural analysis and details, without the right to change the prices. Payment is done according to executed quantities and contract prices, unless there is a point for such works in the bill of quantities.

Control during Execution

During the construction, the Supervisor performs control of certain stages of construction, while for the embedded material the Contractor submits certificates and test results, which remain the integral part of construction document.

Reception of the Completed Works

The reception will be done by the Supervisor, verifying and entering it into the Construction Diary, according to prescribed criteria.

3.20.11 General Conditions for Insulation Works

All positions of insulation works must be executed professionally and in good quality on site where their execution is envisaged by the design.

Insulation works are to be done by qualified workforce and using adequate tools, as well as materials which correspond with the technical regulations, norms and standards. Contractor is to present to the Investor the certificates for all materials which will be used during the execution of works, prior to the start of works. Certificates must be issued by institutions authorized for this type of works. Certificates must not be older than one year starting from the day of issuance of attests to the day when the Contractor started executing works on the facility.

All agreed positions of insulation works will be done in accordance with the design details, thermal calculations and individual descriptions of works with each position. These can also be done according to the Contractor's details if the supervisor accepts the details as a better solution.

In all cases, Contractor is to warn the supervisor of all possible deficiencies in the details and in the execution plans which can affect quality of works and safety of the facility and in agreement with them, the Contractor performs the necessary changes, prior to the start of insulation works.

Layers of insulation must not be laid on the concrete base surface until the bonding period is finished.

Prior to the start of execution of any of the agreed positions of insulation works, base surface must be dusted and carefully cleaned of all the impurities.

Cold bitumen coats based on organic solvents, or emulsions, are to be used as the basic coat for hydro-insulation works.

Contractor is to apply the procedure of rolling the strips by unwinding them in embedded, hot bitumen. By unwinding the strips, the thicker embedded bitumen layer is constantly pushed and the strip is pressed into that layer with a roller of adequate weight, starting from the middle towards the ends, covering the entire surface to make sure even the smallest parts do not remain loose. Perforated and equivalent strips do not have to be laid with overlaps, they can be laid by placing one after another. These strips can be placed on any side and in any direction.

When whole non-perforated and impregnated, bituminized, bitumen coated and other insulation strips are laid on slope surfaces, the laying starts on the downstream side and the laying direction is perpendicular compared to the direction of the slope and water drainage, so each next strip overlaps with the previously downstream-laid strip.

All other bituminized, or bitumen coated, strips, if they are powdered with some of the mineral powders, must be developed and free from powder on both sides, after which they are taken to the installation site for adjusting the length and width, and for cutting. Strips prepared in such a way are again folded so that they can be installed, and installation of such prepared strips is done on the same day so that they do not stick to each other. Perforated strips can be laid on vertical surfaces. Contractor is to pay special attention to the following:

- Places for heating up the bitumen and bitumen masses must be kept at a distance from disposed materials ;

- Storage of inflammable insulation material must be done adequately to avoid fires, deterioration of the material and worker injuries ;
- HS measures are to be taken ;
- dilatation is to be done in the best possible way and in agreement with the supervisor and the investor in places where uneven settling of the facility is expected.

3.20.12 General Conditions for Locksmith Works

All positions of the locksmith works shall be executed and performed professionally and in high quality, with qualified workforce, relevant tools and materials which fully correspond to the technical regulations, rules and standards for this kind of works.

Dimensions, instalment manner, processing and equipment should fully comply with the design, details, specification and instructions of the Supervisor. The cost of works includes complete fabrication, processing, glazing, installation and equipping with fittings, equipment and shades, according to specific descriptions and instructions of the Supervisor.

Locksmith positions are to be made of from standard iron profiles, sheet metals, extruded Kumanovo boxes of different cross-sections, hollow tube, filling of the steel crimped wire mesh and other materials provided by the description of the position or material which were not provided by the description of the position, and need to be installed.

Details of connections, joints, anchoring etc., should be in full compliance with the provisions of standards and technology of the manufacturer, and with the consent of the Supervisor.

Making and welding must be done in high quality. With bending and shaping, incisions or transverse plaits may not appear. Joints must be transversally processed, comply with the form and provide good connection. Welded connections must be carried out by the approved regulations of welding technique, must be solid and unbreakable and must not have errors. Parts of welding strips shall be removed from surfaces that remain visible after installation if they are not structurally needed, and if it was not otherwise prescribed in the description of the works.

The installation of all elements at the construction site should be performed professionally, whereas the instalment of the elements of special fabrication is to be carried out according to the instructions of the manufacturer. When fastening the metalware to stone, brickwork or concrete, the materials that may adversely affect the metal must not be used.

All positions of locksmith works are to be protected against corrosion and finally painted. Anti-corrosion protection implies:

- cleaning of metal profiles from rust and degreasing by a washing agent, and
- fundamental colour coating (anti-corrosion agent) in two layers.

Unit price of the corresponding position includes the delivery and installation of anchors and anchor plates, consoles, girders, etc., that the Contractor is to install when concreting walls and plate floors, rosettes, edging fillets, sealants, etc., and it is not to be separately paid.

All positions of the locksmith works, other than those procured from other suppliers, are to be done in the workshop of the locksmith works Contractor, including protection against corrosion and

painting. The regulations and standards for the execution of the finishing works in the construction industry apply to everything else.

3.20.13 General Terms for Sheet Metal Works-Gutters

These general provisions include all the works which refer to all types of covering and hemming with metal sheets, as well as making and mounting of horizontal and vertical gutters, ventilation pipes and processing of openings and equivalent. Sheet metal works included in these provisions must be performed in good quality, according to all the valid regulations and provisions of these terms.

All works which precede sheet metal works must be entirely completed.

Material which shall be built in by the Contractor must be new, unused, unless the design envisaged otherwise. Auxiliary - adhesive materials - tin, rivets, bolts and other, must also meet relevant YUS provisions/ Standards.

Prior to the start of works, the Contractor is obliged to align the details with the design, to check all construction elements on or to which sheet metal is fastened to, as well as to prepare sheet metal from required material which will meet the envisaged way of adhering and all other requirements.

Parts of different metals must not come into contact in order to avoid corrosion and other hazardous effects. All elements for fastening must correspond to the type of sheet metal.

Joints of sheet metal and fastenings must be done accordingly to allow the elements to freely dilate during thermal changes, whilst remaining impermeable. On all the arches and windowsills, drip should be done, unless the detail indicates otherwise.

Gutter canals must be placed in balanced fall, but the edge of the gutter next to the roof should be at least 10mm higher than the outer edge. Gutter fall amounts to at least 0.5%. General Conditions for Dry Construction Works

All positions of the dry construction works shall be executed and embedded professionally and in high quality, with qualified workforce, adequate tools and materials which fully correspond to the technical regulations, rules and standards for this kind of works.

Dimensions, instalment manner, processing and equipment should fully comply to the design, details, specification and instructions of the Supervisor. The price of the works comprises the complete making, transport, tools, materials, scaffolds, etc.

Work on the preparation of suspended ceilings and light partitions must be done professionally and in high quality.

3.20.13.1 Material

Materials used for these works must comply with the requirements of applicable standards.

Materials that are not covered by standards must possess certificates of quality.

3.20.13.2 Execution

The works must be carried out in accordance with the standards and technical conditions, and in everything according to the design, instructions of the Supervisor and descriptions of the design documentation.

3.20.14 General Conditions for Carpentry Works

This general description includes all the conditions of making and mounting of façade carpentry. Interior and façade carpentry is to be done according to specifications, schemes and details from the architectural design verified by the Supervisor.

Carpentry which is not attested must not be mounted on the facility.

In terms of level of sound insulation, all façade and interior carpentry must meet the requirements given in valid regulations.

Interior and facade carpentry is done from top class material, and it is selected based on the description outlined in carpentry schemes, from the design documentation. Interior carpentry is mounted under the dry mounting system, according to the description from the design documentation.

When making and mounting interior, i.e. façade carpentry, material of high quality, resistant to effects of the weather and exploitation, adequately protected depending on the type of material from which it is made, and according to the data given in the technical documentation, must be used.

Carpentry made of full wood will be painted, lacquered, with veneer strips and similar, while carpentry made of other material, PVC, ALU, will be finished according to the details from the interior design. Price of one individual element contains complete making, mounting and processing according to the requirements defined by the interior Supervisor, along with all the preparation works for this type of works.

All the glass works will be done with thermal insulating multi-layer glass or some other type of glass selected and detailed by the Supervisor. Mounting of glass is included in the price of carpentry so it is not separately covered in positions. This applies to special requirements related to glass works.

All the accompanying frames of luxury production, quality, material and design as selected by the interior Supervisor. All cover battens should be set after the finish of painting and ceramic works. Doors and windows should be calculated per piece of installed element complete with the glass and needed frame selected by the Supervisor.

3.20.15 General Conditions for Dry Flooring Works

This general description includes all works in making flooring from laminate.

Floors must be done in good quality and professionally, fully corresponding to technical regulations, norms and standards in the rooms where this is prescribed by the design. These works are to be done with appropriate tools and materials, which also meet technical regulations, norms and standards. Otherwise, Contractor undertakes to remove them from the construction site.

Contractor is obliged to submit to the investor samples of flooring and attests for all material to be built in before the start of works. Contracting is done per m², and calculation is done according to the actual used quantities. Before the start of works, Contractor is obliged to test the quality of the base and its suitability for its covering. Surface must be firm, flat, without cracks and damages, dry with max 3% of humidity at the moment of mounting, clean and without mechanical impurities and grease.

Covering of floors is done according to the description from the design documentation, instruction of the Supervisor and floor tile manufacturer, on the prepared surfaces. Between the tile and the wall during installation, leave a joint, 18-20 mm wide. Around the pipe penetration, Contractor is responsible for tailoring the flooring neatly and precisely so that the penetration is entirely covered with a cover rosette.

Contractor undertakes to preserve the works of other Contractors from damages during the execution of its works. Otherwise, Contractor will be obliged to remove all damages at its own expense. Contractor is responsible for preserving its works against damages up to the handover to the investor.

3.20.16 General Conditions for Ceramic Works

Ceramic works are to be performed professionally, in high quality and precisely, in full compliance with technical conditions for performing ceramic works.

3.20.16.1 Material

Ceramic tiles that are delivered and installed at the facility must be new (unused), and must conform to existing Yugoslav standards, unless the description of the works envisages otherwise. If there is no Yugoslav standard for certain tiles, they must meet the following requirements:

- edges must be sharp, parallel, straight and undamaged,
- tiles must not contain soluble salts and other harmful substances,
- the surface must be free of notches and bubbles,
- the bottom surface must be treated so that it is suitable for the installation,
- the colour should be uniform,
- tiles should not exceed the limit of water absorption on the surface prescribed by standards for the appropriate type,
- when choosing tiles, it is, first of all, in addition to aesthetic demands, necessary to take into account that the tiles in their physical, chemical and mechanical features are appropriate for the relevant areas (in order that, due to solely aesthetic reasons, wall tiles do not get installed in the floor, inner tiles to outer surfaces or ordinary floor tiles in the floor with high frequency of traffic, etc.).

Cement mortar shall be made of a mixture of cement, sand and water and, if necessary also with the addition of a means of accelerating the binding or laminating. Volume ratio of cement and sand shall depend on the application.

- Cement must conform to the provisions of the standard
- The accelerator for binding mortar or concrete, plasticizers and the like, should not cause any adverse effects.
- The sand must be washed, of granulometric composition according to the purpose.

- Water must not contain ingredients that would adversely affect the base, ceramic tiles and sealing weight .

3.20.16.2 Adhesives (glues)

Only those adhesives which are by manufacturer declared for a particular type of works, can be used for the gluing of ceramic tiles.

Sealing material

Sealing materials are the materials used for sealing of the joints between ceramic tiles, for sealing of dilatation dividers between the limited sizes of slabs, as well as joints of walls covering to the floor or ceiling. Only sealing materials that meet the requirements with the instalment according to the manufacturer's instructions may be used.

Execution

Prior to tiling, the accuracy and quality of the bases over which the covering is done must be checked.

When coating the interior of the facility, ceramic works are carried out only after the rooms are plastered, frames for doors and windows set and installation tested, unless otherwise stipulated in the Description of Works. Covering of wall surfaces should be performed completely in flat and vertical manner, without waves, bulges and recesses, with uniform and sufficiently wide connecting parts.

Finishing work, as well as verges, outages and protruding corners are coated by rounded (one-edge, two-edge) tiles or tiles with a "downcast" edges.

Covering of the floor surfaces is to be done horizontally, without waves, bumps, with flat surfaces or surfaces with needed slopes, with uniform and sufficiently wide connecting parts.

Upon completion of the covering, joints should be treated with appropriate sealing material. At places of the penetration of installation pipes and bottoms of grids, tiles must be accurately tailored and set.

In order to protect the work performed, it is necessary to prevent any traffic and movement of people within 3 days after covering. Until the moment of use, in order to protect the surface, the floor should be sprinkled by the sawdust.

3.20.16.3 General description

These terms and conditions are an integral part of the description per the individual items of works and refer to the covering of walls and floors by all types of ceramic tiles inside the facility and out of it. Ceramic works must be performed in high quality, with a suitably qualified workforce, in line with applicable standards and technical regulations for this kind of execution of works.

All material installed in the facility must be new - unused, unless it was not otherwise provided in the description of the individual works, and must comply with existing standards for YU standards for quality and dimensions. If certain tiles are not according to the standard, the approval of the competent institution for them must be obtained, which must confirm the following characteristics:

- that edges must be sharp, parallel, straight and undamaged,
- that the tiles must not contain soluble salts and other harmful substances,
- that the surface must be free of notches and bubbles,
- that the colour should be uniform
- that tiles should not exceed the limit of water absorption on the surface prescribed by standards for the appropriate type.

3.20.16.4 Binding materials

Binding material - cement mortar and adhesive have by quality to meet the prescribed standards and possess certificates. Cement mortar and adhesive must be applied in the standards in thickness prescribed or declared by the prospectus so as to provide a complete and permanent adhesion of the ceramics to the base, and must not change or damage the surface. Adhesive for ceramic tiles must be declared for a particular type of work and certified by the authorized institution.. The manufacturer shall provide detailed instructions for application of adhesives, as well as the necessary preparations to which the Contractor must strictly stick. Water must be clean and must not contain any ingredients that may adversely affect the surface, ceramic tiles or sealing mass. To determine the width of joints between the ceramic tiles, PVC crosses that should necessarily be removed before grouting, should be used.

3.20.16.5 Preparation of the base surface

Before starting work, it should be ensured that the base surface is prepared for the acceptance of binding material and ceramic tiles covering. When covering walls by tiles in cement mortar, the concrete walls should be previously roughened by pick hammering and sprayed by laitance and with brick walls, the wall joints should be hollowed out and surfaces should be sprayed by weak cement mortar of sifted gravel. When covering walls by tiles, it should be ensured on adhesive that the base surface of the cement mortar remains undamaged and flat enough for acceptance of the binding material, clean, scrubbed with a mild solution of detergent to remove all impurities, thoroughly rinsed with clean water and dry. Covering of the walls and floors inside the facility should start after the rooms are plastered, frames for joinery and locksmithery set, and all types of installations carried out and tested. Covering of the wall surfaces are to be performed perfectly straight and vertical, with no waves, with joints. Horizontal joints should be followed over the entire volume of the room and vertical ones are to be performed by the pendulum. All edges also must be vertical. Covering of the walls in sanitary facilities shall be in cement mortar, unless by the individual items it has not been specified otherwise. Covering of the walls in the kitchen will be done by appropriate adhesive over the plastered or concrete base surface. Tiling of floors should be performed in a flat manner, without waves and horns, with a completely flat surface, or in slope in places envisaged by the design. In order to protect the floors, any traffic and movement of people for at least three days after completion of tiling is prohibited.

After completing tiling, the walls and floors should be grouted by white cement, unless otherwise specified in the priced bill of quantities. The Contractor shall preserve the performed works from damage until the handover to the investor, as well as it will remove any incurred damage at his own expense. Every fractured, scratched or grazed tile shall be deemed damage.

Prior to commencement of work the Contractor is obliged to submit to the Supervisor samples of the materials to be installed, and their attests to their consent.

3.20.17 Covering of walls by ceramic tiles

3.20.17.1 Execution

Tiling is to be done by gluing to the flat base surface by construction adhesive appropriate for this kind of works. The arrangement according to which the tiles are to be installed is to be determined by the Supervisor. The tiles should be incised on corners, on the places of joints for installation, i.e. openings are to be cut in the tiles. When covering, the PVC or other kind of battens, are to be put in corners, according to the instruction of the Supervisor. Grout lines are to be treated by grout mass, in colour and tone by the choice of the Supervisor. In the end, the wall should be cleaned and washed. The surface covered by ceramic tiles is to be flat, grouted and cleaned.

3.20.17.2 Control during the execution

The Supervisor shall perform control of the execution of works and for the installed materials, the Contractor shall submit certificates or test results, which remains an integral part of construction documentation.

3.20.17.3 Handover of the Completed Works

Acceptance shall be made by the Supervisor, with certification and entering into the construction log daily, according to the prescribed criteria.

3.20.18 Covering of Floors With Ceramic Tiles

3.20.18.1 Execution

The tiles are to be installed in the cement mortar on a flat base surface. The arrangement according to which the tiles are to be installed is to be determined by the Supervisor. The tiles should be incised on corners, on the places of joints for installation, i.e. protruding and the openings are to be cut in the tiles. Grout lines are to be treated by grout mass, in colour and tone by the choice of the Supervisor. In the end, the wall should be cleaned and washed. The surface covered with ceramic tiles must be flat, grouted and cleaned.

3.20.18.2 Control during Execution

The Supervisor shall control the execution of works and for installed materials, the Contractor shall submit certificates or test results, which remains an integral part of construction documentation.

3.20.18.3 Handover of the Completed Works

Acceptance shall be made by the Supervisor, with certification and entering into the construction log daily, according to the prescribed criteria.

3.20.19 General Conditions for Painting Works

Painting works must be done professionally and in good quality, upholding all the technical conditions for performing painting works.

Painting of new plasterboard walls and ceiling with a dispersive colour, with all the necessary preparation works, in colour and shade as selected by the Supervisor.

3.20.19.1 Material

Materials which are used for painting works must match the standard requirements, which define their quality. Materials which are not included in the standards must have a quality certificate. For

these materials, the Contractor shall submit to the investor a quality certificate. Materials can be used and applied only on surfaces which match their physical and chemical properties.

If there are any changes on completed works due to poor quality and during the warranty period, Contractor will remove the deficiencies at its own expense, provided the deficiencies prove to be the result of inadequate material installation, and if it is proven that the used material is of poor quality, so the responsibility is born by the manufacturer.

For painting of all walls and ceiling surfaces, dispersive colour is to be used, for interior works. When needed, surfaces are covered with dispersive coating and abraded.

3.20.19.2 Execution

Works must be executed in a professional and technically correct manner, with all the envisaged preparation works and finishing works. Works must be done in a standard manner unless the technical description stipulates otherwise or something different is subsequently agreed. Finished, factory-produced materials must be used according to the manufacturer's instruction. Coats must firmly adhere to the surface, to appear as an even surface without traces of brush or roller. Colour must be of equal intensity (without stains). Finishing coats must cover the base surface entirely. Everything else related to execution of works must be done according to standards and technical conditions.

Heads of bolts or nails should be minimized, surfaces should be soaked in varnish and joints should be coated with dispersive coating. New wall surfaces should be smoothed with dispersive coating. Surfaces should be abraded, cleaned and neutralized. Small damages and cracks should be inspected and covered. Dispersive coating should be impregnated and applied in three layers.

First paint should be with dispersive colour. Shaded dispersive coating should be used for correction. Dispersive colour should be painted in three layers.

3.20.19.3 Control during Execution

Supervisor shall perform control during the execution of works, and the Contractor shall submit attests, i.e. test results, which remain an integral part of the construction site document.

3.20.19.4 General description:

All positions of paint works must be done professionally and in good quality, with materials which entirely match the technical regulations, norms and valid standards, specifically on premises where this is envisaged by the detailed design.

Materials can be built in and applied only on surfaces which match their physical and chemical properties. Materials which are not included in the standards must be of top quality and for these materials, the Contractor shall submit attests on the completed tests. Contractor shall submit to the Investor attests for all the materials being built in prior to the start of works. Attests must be issued by organizations authorized for this type of works and must not be older than one year, starting from the day of issuing the attest to the start of works on the facility. Finished, factory-produced materials must be used entirely in compliance with the manufacturer's instruction. Painted surfaces must be clean, without traces of brushes and rollers. Colour and tone must be of uniform intensity, without stains.

Paint must cover the base surface entirely, all finishes of painted surfaces must be smooth and straight, as well as joints on doors, windows, etc. Prior to the start of works, Contractor shall clean the surface from mechanical impurities, dust and grease. Distempers and emulsified, i.e. facade, semi-dispersive, as well as varnishes, paints and wood protections, must not peel and must be resistant to obliteration if the manufacturer's instruction allows light wiping with a mop after curing. Dispersive paint, oil and oil-free varnishes, oil paints and dim oil paints must be resistant to washing if the manufacturer's instruction allows washing with a soft sponge and water with a small supplement (about 1%) of a neutral washing agent, without colouring the water, after the curing period.

Painted surfaces must be resistant to light, temperature impact, various chemical and mechanical influences and weathering. Oil paints must not have bubbles and crack. For all types of coats, paint with light-resistant pigments should be used. Colour selection is done by the Supervisor or responsible representative of the investor, as agreed. Contractor shall submit the colour charts for appropriate materials. Contractor shall make test samples, with 1.0m² in size, for each type of paint. Final painting can only be started after a written approval by the person responsible for selecting colours is obtained. During execution of works, the Contractor must take care not to taint the already performed works of other Contractors through worker's negligence. Otherwise, the Contractor shall accept the value of completed repairs on these works.

3.20.20 General Conditions for Finishing Works

Cleaning and washing of the facilities and construction site, upon the completion of all works, is carried out with appropriately qualified workforce.

Cleaning of the entire construction site means cleaning of debris, dust, around and inside the facility, washing of all surfaces, dusting, cleaning and fine cleaning of all internal and external surface areas, removing of excess material, rough terrain planning around the facility.

When washing around the buildings and the facility itself, chemicals that will not adversely affect the surface areas should be used. Removal of any damage that might occur during cleaning, and would be caused by improper operation, is to be removed by the Contractor.

When executing the works, care should be taken on HS measures and protection Chemicals that do not adversely affect the surface are to be used for cleaning, clothes, brushes, buckets and the like.

3.20.20.1 Execution

Thorough cleaning of the entire construction site, cleaning of all glass surfaces, dusting, cleaning and fine washing of all interior spaces, surfaces and outside surfaces is to be performed.

3.20.20.2 Control during the execution

The Supervisor shall perform the control of works during the construction, provide suggestions and guidelines for their smooth execution.

3.20.20.3 Handover of the Completed Works

Reception shall be made by the Supervisor, with certification and entering into the construction diary, according to the prescribed criteria.

3.20.21 General Conditions for Metal Works

All positions of metalwork must be performed and done professionally and efficiently, with a skilled workforce, the appropriate tools and materials that fully meet all technical regulations, norms and standards for this type of work.

Dimensions, setting mode, processing and equipment, must fully meet the requirements of the design, details, specifications and instructions of the Supervisor. The cost of works includes complete fabrication, processing, glazing, installation and placing fittings, equipment and pelmets, according to a separate description and instructions of the Supervisor.

Metalwork positions are to be made from standard iron profiles, sheets, extruded pipes with different cross sections, hollow pipes, steel wire mesh fill and other materials provided to describe the position or materials that were not provided in the position description, but need to be installed.

Details of connections, joints, anchoring etc.. all in accordance with the provisions of the standards and technology of the manufacturers, and with the consent of the Supervisor.

Fabrication and welding must be done in good quality. Cuts or transverse wrinkles may not appear on the point of bending and shaping. Joints must be cross-processed, fit the form and facilitate a good connection. Welded connections must be carried out according to welding technical regulations, they must be strong and unbreakable and may not have faults. Parts of the welding strips shall be removed from surfaces that remain visible after installation, if there is no static need for them, and if the description of works doesn't indicate otherwise.

Installation of all elements on the site is to be performed professionally, whereas the installation of special mounting elements is performed in line with the instructions of the manufacturer. When securing the hardware to stone, brick wall or concrete, materials that may adversely affect the metal should not be used.

All positions of metalwork shall have corrosion protection and paint finish. Corrosion protection foreseen:

- Cleaning of metal profiles from rust and degreasing with a detergent agent, and
- Primer coating (anti-corrosion agent) in two layers.

All metalwork positions, other than those purchased from other suppliers, are made in the metalwork workshop, including protection against corrosion and painting. PTP for Execution of finishing works in construction are applicable to everything else.

3.20.22 Marking and Measuring

3.20.22.1 Description of Works

Marking of the space in the terrain is to include all the measuring with the goal of transferring all the data from the design to the terrain, as well as ensuring, renewing and maintenance of all markings already established on the terrain during the whole period of construction, or until the works are handed over to the Investor.

3.20.22.2 Handover

Investor shall hand over the operative polygon and fixed points (benchmarks) to the Contractor, with all the necessary data in the form of drawings, sketches, tables etc. The handover of operative polygon and fixed points data is to be done in written form, which is to be signed by representatives of the Investor and of the Contractor. The Investor is to hand over to the Contractor the following drawings:

- Situation plan, scale 1:1000 (or equivalent). The connections of all main markings with the main traverse are to be drawn, including all the necessary data for staking out;
- Calculation for main markings, or in case of an electronic calculation, coordinates of main markings and security points, including survey marks and curve coordinates;
- A list of traverse points and coordinates of vertices, including topographic points;
- A list of height markings, of gradients, including field gradients;
- Sketch of traverse and trigonometric points.

3.20.22.3 Execution

Before the beginning of works, and after removing a layer of humus, the Contractor is obliged to make the corner profile and mark the necessary points on it (dimensions of the structure, axes, border directions, etc.) transferred from the Technical Design Document. Corner profile shall be strong and stable, made of baulks and sweeping poles, or equivalent material, at least 150 cm from

the external border of the future structure. If the corner profile is damaged, or if there is a doubt in the transferred data, it shall be repaired and the points shall be measured again.

3.20.22.4 Control during Execution

The Contractor will regularly control the profiles, fixed points (benchmarks) and traverse points. The Contractor will restore any destroyed or damaged mark at his own expense. The Supervisor will control the accuracy of the restored marks.

3.20.22.5 Handover of the Completed Works

Contractor will renew survey marks, traverse and fixed points at the Investor's request, upon completion of all works and will turn them over to the Investor before technical commissioning. Due record of the acceptance, handover is to be made and enclosed with the construction documents.

3.20.23 Backfilling and Compaction of Soil Around and Above Foundations

Description of works

Backfilling and compaction of soil, next to and over the isolated footings, with healthy soil from the excavation, in layers of 20 cm.

3.20.23.1 Execution

After the completion of the RC foundations, backfilling and compaction of soil around and above them is to be done.

Backfilling will be done with healthy soil from the excavation, deposited next to the foundation. Soil should be filled in layers of 20 cm and compacted with mechanical compactors, up to the required density; soil is to be watered as necessary.

The surplus from the excavation is transported by a wheelbarrow to the construction site, up to 30m, and this is not charged separately, but is included in the price of backfilling and compacting.

3.20.23.2 Handover of the Completed Works

Reception of backfilling shall be performed by the Supervisor, with verification and entering in the Construction Diary, according to prescribed criteria.

3.20.24 Making and Assembly of The Steel Structure

Procurement of the needed material and mounting of the steel structure of control facilities, and all according to the design documents, structural analysis and design details.

Protection of steel elements of the canopy will be done by painting – applying the basic and finishing layers. Demanded life span of the protection is defined as H – long, i.e. over 15 years, with the category of anti-corrosion protection C4-H.

3.20.24.1 Execution

The structure is to be made in the workshop according to the design technical document, details, description from the structural analysis, based on the workshop drawings, instruction of the Supervisor. Making and welding must be done in a quality manner. Welds must be done according to recognized welding techniques, must be firm and unbreakable and must not have mistakes. Parts of the welding strip must be removed from the surface which remain visible, i.e. on parts with covers, after installation. All parts should be protected with anti-corrosion and finish painted. When installing, axes and height elevations given in the design documents should be upheld. Structure should be made from joints suitable for transport to the construction site and for mounting, and

they should make a firm structure. When mounting joints, appropriate machinery should be used, mobile crane, hydraulic basket and similar, as well as mobile scaffolding and other aids when mounting parts.

3.20.24.2 Control during Execution

Supervisor shall perform controls during the mounting of structure, and the Contractor furnishes certificates or test results for the embedded material, which remain part of the construction site documents.

3.20.24.3 Handover and acceptance

Reception will be carried out by the Supervisor, with verification and entering in the construction diary, according to the prescribed criteria.

3.20.25 Making and Mounting of Exterior Facade Cladding

3.20.25.1 Control during Execution

Supervisor shall perform controls during mounting of the cladding and transparent parts of the facade. The Contractor furnishes certificates, or test results for the material, which remain an integral part of the construction document.

3.20.25.2 Handover of the Completed Works

Reception will be carried out by the Supervisor, with verification and entering in the construction diary according to the criteria.

3.20.26 Dry Construction Works

Partition of non-bearing walls from plasterboard

3.20.26.1 Execution

During execution, pay attention to openings and substructures, envisage the positions and dimensions of them. Substructure must be firm and vertical. Between verticals and horizontals, mineral wool is placed, by interference, and breathable foil is placed on both sides. A wall formed this way is covered in plasterboard on both sides. Panels need to be cut to the length, fastened by bolts intended for this purpose, joints must be processed with joint tapes and smooth coating. Wall must be flat, firm, vertical.

3.20.26.2 Control during Execution

The Supervisor shall control the assembling of the construction and for the installed materials, the Contractor shall submit certificates or test results, which remain an integral part of construction documentation.

3.20.26.3 Handover of the Completed Works

Reception shall be done by the Supervisor, with verification and entering in the construction diary, according to the prescribed criteria.

3.20.26.4 Measurement and Payment

Measurement and calculation are done per square meter (m²) of finished partition wall. Amounts described above are paid per unit price. Unit price is full compensation for all the work and all other work from this description, Labour, material and transport to the construction site, hired machinery for mounting, mobile scaffold and other aids, possible additional transport costs in terms of permits

or tracking, thus the Contractor is not entitled to additional claims for the execution. After the completion of partition walls, debris and possible remaining material, is to be collected and transported from the construction site, which is not paid separately, but is an integral part of the item.

Cladding of external walls with plasterboard panels

3.20.26.5 Execution

Single metal substructure of galvanized profiles is to be fastened to the supporting structure of the building, (RC floor, RC plate floor, steel structure, etc), using screws and rawls. Vertical and horizontal substructures are connected by screwing. In making, take care of the holes, and in substructure envisage their places and dimensions. Substructure must be solid and vertical. Mineral wool is to be placed between verticals and horizontals by embedding and on both sides the breathable foil is to be put. Prepared and ready substructure is to be coated with plasterboard panels, from the inside. Plates are to be cut to fit the needed length, fastened by screwing, using screws provided for this purpose, joints processed by bandage tapes and by plastering, benches, and thresholds around the windows and doors are to be processed. The wall must be flat, solid, vertical.

3.20.26.6 Control during the execution

The Supervisor shall control the assembling of the construction and for the installed materials, the Contractor shall submit certificates or test results, which remain an integral part of construction documentation.

3.20.26.7 Handover of the Completed Works

Reception shall be made by the Supervisor, with certification and entering into the construction diary daily, according to the prescribed criteria.

3.20.27 Preparation of the Substructure For Mounting the Door Jamb

3.20.27.1 Description of Works

When making frames and cladding, openings for installing doors and windows are left. In such prepared openings, substructures are to be built in, blind door post, which serves for further building in, i.e. support of the carpentry and locksmith elements.

Blind door post is set up in the pre-formed opening and bolted to the metal construction of the wall. If needed, plaster around the blind door post is cut and after the mounting, surrounding plaster surfaces should be fixed with drywall tape and smoothing paste. In case of new openings in the partition walls, substructure in these places should be reinforced. Built-in door post must be flat in all directions (vertical, i.e. horizontal), and dimensions, so that the belonging carpentry, i.e. locksmith elements can be built in them.

3.20.27.2 Control during Execution

The Supervisor shall control the assembling of the construction and for the installed materials, the Contractor shall submit certificates or test results, which remain an integral part of construction documentation.

3.20.27.3 Handover of the Completed Works

Reception shall be made by the Supervisor, with certification and entering into the construction diary daily, according to the prescribed criteria.

3.20.28 Carpentry

Fabrication and mounting of interior doors

3.20.28.1 Execution

Before making the door, measures of openings should be taken on the construction site. Carpentry according to these measures, and the description from carpentry schemes should be made in the workshop. Supervisor is to be consulted during making. Doors and parts should be transported to the construction site and mounted in the prepared opening, according to the carpentry scheme from the design documentation. After mounting and equipping with the frame, leafs should be adjusted.

3.20.28.2 Control during Execution

Supervisor shall perform controls, during installation of carpentry, and the Contractor shall submit, certificates, or test results for the embedded material, which remain an integral part of the construction document.

3.20.28.3 Handover of the Completed Works

Reception shall be made by the Supervisor, with certification and entering into the construction diary daily, according to the prescribed criteria.

3.20.29 Floor Installing Works

Laying of laminate flooring

3.20.29.1 Execution

Laminate flooring is placed as a floating floor. Laminate must be strong, durable and highly-pressed, and the base plate must be of high density, HDF, edges must be impregnated with nut and spring. Before laying the flooring, floor material should be carried in, unpacked and left to adjust to the atmosphere of the room for 24 hours. Before laying the flooring, make a flattening layer from a self-spreading synthetic coating, with 2mm thickness. Over the dry and flat surface, layer of gas permeable membrane should be placed, floor base consists of hard-pressed plates of high density, 2 cm thickness. Plates are with nut and spring, edges are impregnated. Breathable felt and foil should be laid over the surfaces prepared in this way, and then the finishing layer of laminate should be laid. Laminate is laid dry, as per the CLICK system, next to walls a dilatation rail of 8-10mm should be left. In places where floors made from different materials meet, wide brass battens should be placed. Next to walls, battens should be placed and fastened to the wall per every 80 cm. Boards should be adjusted by cutting at the meet position.

3.20.29.2 Control during Execution

Supervisor shall perform control, during the laying of the flooring, and the Contractor shall submit certificates, i.e. test results for the embedded material, which remains the integral part of the construction site documentation.

3.20.29.3 Handover of the Completed Works

Reception shall be made by the Supervisor, with certification and entering into the construction diary daily, according to the prescribed criteria.

3.20.30 Placing of Plinths at Wall Base

3.20.30.1 Execution

Tiles should be glued onto the wall, on a flat surface. Order of tiles will be defined by the Supervisor. Tiles are to be cut in the corners, in places where installation connections are, i.e. penetrations, thus openings should be cut in the tiles. Joints should be processed with joint mass, in colour and shade as selected by the Supervisor. At the end, the plinth should be wiped and washed. Surface covered with ceramic tiles must be flat, covered with joints and cleaned.

3.20.30.2 Control during Execution

Supervisory board shall perform the control of executed works, and for the built-in material, Contractor shall submit attestations, i.e. test results which remain the integral part of the construction documents.

3.20.30.3 Handover of the Completed Works

Acceptance shall be made by the Supervisor, with certification and entering into the construction log daily, according to the prescribed criteria.

3.20.31 Cleaning of the Construction Site

3.20.31.1 Description of Works

During the works, the rough cleaning of the construction site of construction debris with the transfer of debris to the disposal site is to be performed several times. Payment is made once regardless of the number of cleanings.

3.20.31.2 Execution

During the works, the rough cleaning of the construction site of construction debris with the transfer of debris to the disposal site, or by loading to the vehicle and transport to the city dump is to be performed several times. Payment is made once regardless of the number of cleanings.

3.20.31.3 Control during the execution

The Supervisor shall control, and construction site manager shall give suggestions for the performance of the work.

3.20.31.4 Handover of the Completed Works

Reception shall be made by the Supervisor, with certification and entering into the construction diary, according to the prescribed criteria.

3.21 TAMPING OF THE SUBSOIL

3.21.1 Description of Works

This work includes preparation of the subsoil, subgrade for making of the embankment after cleaning of the ground and removal of a layer of top soil to prevent the settlement, inclining of the facilities that will be built on the embankment.

3.21.2 Execution

The compaction is carried out with mechanical compactors, vibrating plates, vibrating rolls etc. with sprinkling of surface and compaction until desired level of compactness is achieved. The bedding is to be levelled according to dimensions given in the design documentation, with $\pm 5\text{cm}$ accuracy, with healthy soil being added if required from the borrow pit on the construction site.

3.22 ROADWAY

3.22.1 Preparatory Works

This session includes the following works:

3.22.1.1 Staking Out and Marking of the Route and Facilities

Before the start of works, the Contractor has to perform the required marking of axes of roads, crossroads and facilities. Marking is to be done based on the marking plan from the design. During the execution of works, the traverse points, benchmarks and fixed points are to be secured and maintained. If the project does not give information on traverse points and benchmarks.

3.22.1.2 Cutting Shrubs

At the width of the area included in construction of the roadbed, shrubs are to be cut. The cut shrubs are to be sorted out, arranged and disposed of in a place suitable for loading and transport where they will not obstruct the execution of works. The place of disposal is to be determined in agreement with the Supervisor.

3.22.1.3 Cutting Trees

At the width of the area included in construction of the roadbed, trees are to be cut. Cutting of trees is to be done using machines and the cut trees are to be carefully felled. Cutting of branches, sorting out the lumber and preparing it for transport is to be done next. The place of disposal is to be determined in agreement with the Supervisor. Protection measures are to be taken during the works so as to avoid potential damages to neighbouring facilities and property in general.

Calculation of works is done per piece of felled trunk for all the work, material and transport according to the description above and trunk diameters.

3.22.1.4 Removing Stumps and Roots

At the width of the area included in construction of the roadbed, stumps of the cut trees and the old stumps are to be removed. Stumps are to be taken out using machines. The lumber is to be sorted out, loaded into a means of transport and transported to the landfill whose place will be determined by the Supervisor.

3.22.1.5 Demolishing of Asphalt or Concrete Roads

The current roads of all types, which are to be removed according to the design, are to be demolished using machines, together with the bed, of different composition. The material gained through demolition of current roads is to be loaded into a vehicle, transported to a landfill determined by the Supervisor, unloaded and spread out, or if possible use for making an embankment.

Calculation of works is done per square meter of demolished road for all the work, material and transport according to the description above.

3.22.1.6 Curb Demolition

The current curb, regardless of type, which is to be removed according to the design, are to be manually demolished together with the concrete surface below the curb. The demolished curbs to be cleared of concrete and mortar, loaded into a vehicle, transported to a landfill, unloaded and arranged into regular shapes. The debris made after curb demolition is also to be loaded into a vehicle and, transported to a landfill, determined by the Supervisor, unloaded and spread out at the landfill.

If the demolished curb can be used again, it is to be transported to the place of new embedding.

3.22.1.7 Preparation of Construction Joints for Continuation of Asphalt Works

On the parts where the current road, according to the project, is being expanded or continued, stepwise indentation of asphalt roadway is to be done with a pneumatic hammer with excavation blade or circular cutter. The line of cutting at the roadway surface should be straight. The degree of cutting per height is equal to the height of the derived layers, with a horizontal space for asphalt layers. The material gained through demolition is to be loaded into a vehicle, transported to a landfill or used at the construction site.

3.22.1.8 Removing Debris and Waste

Remove the debris and waste that is in the area of construction of the future road, and which was not created due to works envisaged in this design. The material is to be collected, loaded into a vehicle, transported to a landfill, unloaded and spread out, per instruction of the Supervisor.

3.22.1.9 Relocation of Overhead and Underground Power Lines

Relocation is to be done fully in accordance with a special design or instructions of the owner of power lines and the Supervisor, and regulations that apply to this type of installations.

Calculation of works is to be done per piece of relocated power line (lump sum according to subcontractor's offer, which should be entered in the bill of quantities when making an offer).

3.22.2 Earthworks

This session includes the following works:

3.22.2.1 Humus excavation

Humus excavation is to be done 95% using machines and 5% manually, within the designed thickness and width below and above the roadbed-street.

Humus excavation is to be started only after marking of the designed widths, slopes and surveying the terrain at cross-sections is done. Thickness of the humus layer being removed is determined as a rule in the design, based on geotechnical testing, and is determined on the spot together with the Supervisor, per profiles or road sections.

If the need for change of thickness is determined during the construction, the Supervisor will enter this change into the construction diary. Pushing off of humus has to be done so that it is not mixed with soil for the embankment, as well as to enable drainage of water at the roadbed.

The excavated humus is to be deposited in regular shapes in the amount that will be used for topsoiling green surfaces, shoulders and slopes, while the excess humus is to be prepared for transport.

3.22.2.2 Wide excavation

This work includes wide excavation envisaged in the project or request of the Supervisor: in the cuts, side cuts, borrow pit and larger deviations. Perform the wide excavation according to designed elevations and slopes according to cross-sections. Before starting with excavations, check the cross-sections marks.

It is envisaged that 95% of excavations is to be done using machines and 5% manually. The excavated soil is to be placed into shapes suitable for loading.

3.22.2.3 Compacting of subsoil

After excavating humus, subsoil is compacted below the embankment and side cut. Subsoil compaction is to be done mechanically. The required subsoil compactness is according to standard Proctor procedure 100% of the maximum laboratory compactness, in the depth up to 50cm. In case the required compactness cannot be achieved in some places, compaction will be done by adding sand and gravel until the required compactness is achieved. This additional work is not paid separately, only expenses of procurement of sand and gravel. Testing the compactness of subsoil.

3.22.2.4 Construction of sand embankment

The work on constructing a sand embankment includes procurement of sand, its transport, backfilling, spreading out, required wetting, planning, compacting according to regulations and control testing. Embankment construction is done according to designed cross-sections, elevations and slopes from the design, with allowed deviations up to 5cm. Embankment is to be made in horizontal layers. Compacting of embankment is to be done using vibration means with compacting up to required compactness. The amounts for embankment construction include the part of embankment below the shoulders. Control of compactness of the derived layers.

3.22.2.5 Construction of soil embankment

The work on constructing a soil embankment includes backfilling of land from the side cut or transported from the borrow pit, spreading out, red wetting or drying, planning, compacting according to regulations and control testing. Embankment construction is done according to designed cross-sections, elevations and slopes from the design, with allowed deviations up to 5cm. Embankment is to be made in horizontal layers thick with a slope for water drainage. Compacting

of embankment is to be done using vibration means or static rollers, with compacting up to required compactness. The amounts for embankment construction include the part of embankment below the shoulders. Control of compactness of the derived layers..

Calculation of the executed works is done per cubic meter of the finished embankment in the compacted state for all the work, material, transport and control tests in accordance with the description above. (Drawings no.R5 and R6)

3.22.2.6 Planning and rolling of subgrade

Processing of subgrade includes planning the subgrade based on designed elevations and additional compaction over the entire width of subgrade to the required compactness. The final rolling is to be done using a smooth drum roller to get a flat subgrade surface, with allowed deviations of $\pm 2\text{cm}$ compared to designed elevations. Testing compactness of the subgrade.

3.22.2.7 Planning of shoulders, flat surfaces and slopes

The work includes planning of shoulders, flat surfaces and slopes on embankments and side cuts where topsoiling is not envisaged. Planning is to be done with accuracy of $\pm 3\text{cm}$.

Calculation of the executed works is done per square meter for all the work and material.

3.22.2.8 Topsoiling of flat surfaces, slopes and shoulders

The work includes topsoiling of flat surfaces, slopes of side cuts and embankments, and shoulders, with required grassing, in layers. Topsoiling of surfaces is to be done using humus that was previously removed from the route and deposited into figures. If the humus at the landfill is dry, it is to be spread out and wet with water. After spreading out and planning of the humus layer, its light compaction can start. If there is not enough humus on the location, it should be transported from the borrow pit or a place determined by the Supervisor. Procurement of material from the borrow pit is calculated especially per position of transport of soil.

3.22.2.9 Transport of soil

The excess humus and soil, and transport of material from the borrow pit for making the embankment or topsoiling to category III, is to be loaded and transported to the landfill or the place of embedding, up to the distances from the bill of quantities. This position includes loading into vehicles, transport, unloading and rough spreading out.

3.22.2.10 Excavation for foundation of roadway

The work includes excavations for foundations of the roadway up to 2.0m, of different depths in all the soil categories. Excavations are done precisely in accordance with measures and height elevations from the project. Timbering and shoring is done as needed. The work includes additional work on water drainage, vertical transport of the excavated material and its depositing. If obstacles appear during the excavation, such as cables, drainage, waterworks, sewage pipes and such, the Contractor is obliged to inform the Supervisor, which will give the required instructions.

Calculation of the performed works is done according to actually performed excavation, ingrown, according to the project. The unit price includes all the work on the excavation, shoring, timbering, draining water and depositing of excavated material. Unit prices for excavations differ depending on the depth and width of excavations and soil category.

3.22.3 Construction of Roadway Structure

This session includes the following works:

3.22.3.1 Construction of a tampon layer of crushed stone

The work includes procurement and embedding of grainy stone material in the roadbase. Works can only start when the Supervisor receives the subgrade in the sense of flatness, designed elevations and slopes, as well as compactness. The materials used for making the roadbase can be: natural gravel, crushed stone, mixture of natural gravel and crushed stone and mixtures made out of several fractions. All the stated materials have to meet certain conditions regarding mechanical features, granulometric composition, capacity and other conditions according to applicable standards.

Granulated stone is placed on the planned and rolled subgrade, spread out with a grader or other suitable means, wetted and compacted to the required compactness with a suitable static and vibrating means. The roadbase is made in layers, which is determined in the design. The material has to satisfy the conditions regarding frost resistance. The upper surface of the roadbase has to be made according to designed elevations and slopes, while the flatness of the derived layer is controlled with a plank 4m long, with the allowed deviation being $\pm 1\text{cm}$. Control tests of compactness are to be done, and the minimal compressibility modulus for crushed stone.

3.22.3.2 Construction of a tampon layer of crushed stone

The work includes procurement and embedding of crushed stone in the roadbase. Works can only start when the Supervisor receives the subgrade or the lower roadbase out of gravel, in the sense of flatness, designed elevations and slopes, as well as compactness. The crushed stone has to meet certain conditions regarding mechanical features, granulometric composition, capacity and other conditions according to applicable standards.

Stone is placed on the planned and rolled subgrade or the lower roadbase, spread out with a grader or other suitable means, wetted and compacted to the required compactness with a suitable static and vibrating means. The roadbase is made in layers, which is determined in the design. The upper surface of the crushed stone layer has to be made according to designed elevations and slopes, while the flatness of the derived layer is controlled with a plank 4m long, with the allowed deviation being $\pm 1\text{cm}$. Control tests of compactness are to be done using a circular plate, and the minimal compressibility modulus for crushed stone.

Calculation of the executed works is done per cubic meter of the finished derived roadbase from a mechanically compacted grainy material, for all the work, material procurement and transport of stone and control tests.

3.22.3.3 Building the Road Base

Description of works

These works include procurement of materials, transport to the construction site, filling, rough and fine planning, sprinkling and compaction of the material in the embankment according to dimensions given in the project. All work must be in accordance with the design and the standards in force.

Materials

Used for construction of the embankment will be non-organic material of required quality. The material of which the physical-mechanical characteristics would change in time due to bio-chemical effects cannot be built into the embankment.

Execution

The crushed stone is to be filled carefully in layers, sprinkled with water and compacted with the roller until the required compactness is achieved and the upper surface is supposed to be finely levelled with $\pm 1\text{cm}$ precision. Each of the layers is supposed to be spread in longitudinal direction horizontally, or, with inclination not higher than the designed longitudinal inclination. Transversely, every layer must have two-sided or one-sided 2-5% inclination for drainage of atmospheric water. All works are supposed to be carried out according to the design and the instructions by the Supervisor.

Compaction

Each layer of the embankment is supposed to be compacted in full width with adequate mechanical equipment, with the compacting, in general, being conducted from the edge to the middle. In all places unavailable to the mechanisation or where use of heavy compacting tools would be inappropriate for other reasons (filling behind the facilities, retaining walls etc.) compacting should be conducted with other appropriate equipment or methods the use of which will be approved by the Supervisor. Before the beginning of compacting the materials of every layer have to be grained, mixed, sprinkled with water or dried to the degree of humidity according to previous testing and with which the type of material is used which enables required compactness to be achieved. If after compacting and control of quality the filling of the next layer is not continued immediately, but the filling is continued after a long period, before the filling, the quality of the compactness of the already compacted layer should be controlled again. In that case, the compacting can start after the quality of compactness is proven with testing.

In the case of threat of rain during the day, the Supervisor will, if required, order suspension of further works on the embankments, without compensation of expenses. On the embankment consisting of coherent material, the upper surface of the layer should be planned and rolled in so that the surface is with 2 to 5% inclination toward the edge, even and without recesses in which atmospheric water could stay. Before filling the new layer, surface thus smoothed should be made rough in order to achieve as good connection as possible between the layers. This applies, also, to other long-lasting cessations of work on the embankment (due to the end of the construction season etc.)

Control During the Execution

The compactness of the layers of the embankment is tested on every 50-100 metres with two tests in immediate nearby area, which constitute one result. The same applies to the embankments shorter than 50 metres.

The material humidity is checked every day. The making of the next layer cannot start until the required quality of the previous layer is established.

In case of the Supervisor establishing bigger deviations of results from those prescribed, the scope of testing may be changed subsequently. In agreement with the Supervisor, the quality of the built in layers may be established also with other recognised methods. In that case, in agreement with the Supervisor, the mounting quality criterion, as well as the manner and scope of testing must be stated.

3.22.3.4 Construction of Wearing Layer

Description of works

Bituminized mixtures defined in these technical conditions can be installed only on an adequately prepared bearing surface both in new building and in rehabilitation and renewal of the existent road structures.

Basic materials

Types and quality of basic materials in the process of placing asphalt layers built with bituminized mixtures were defined:

- crushed stone mixtures,
- bitumen binder
- supplements and
- asphalt grains.

Execution

The asphalt track is built with machines suitable for this type of operations with all required preparatory work. The asphalt mixture is mixed in the asphalt mixing plant and brought with suitable means of transportation. Spreading is carried out with mechanisation intended for these operations and the compacting that is rolling with rollers on motor drive.

3.22.3.5 Arranging Shoulders

Description of works

These works include procurement of materials, transport to the construction site, filling, rough and fine planning, sprinkling and compaction of the material in the embankment according to dimensions given in the design, with the roller. The embankment is formed so that it has 2% inclination from the finished asphalt track toward the edge of the road and will serve for draining of the water from the asphalt and, if needed, for vehicle bypassing. All work must be in accordance with the design and the standards in force.

Materials

Used for construction of the embankment will be non-organic material of required quality. The material of which the physical-mechanical characteristics would change in time due to bio-chemical effects cannot be built into the embankment.

Execution

The material to be laid cautiously in layers, and pressed with the roller until required compactness is achieved, and the upper surface is supposed to be finely planned with $\pm 1\text{cm}$ accuracy. Every layer is supposed to be spread in longitudinal direction horizontally, or with inclination not higher than the designed longitudinal inclination. Transversely, every layer must have two-sided or one-sided 2-5% inclination for drainage of atmospheric water. Average thickness of the embankment is 5cm. All works are supposed to be carried out according to the design and the instructions by the Supervisor.

Compaction

Each layer of the embankment is supposed to be compacted in full width with adequate mechanical equipment, with the compacting, in general, being conducted from the edge to the middle. In all places unavailable to the mechanisation or where use of heavy compacting tools would be inappropriate for other reasons, compaction should be conducted with other appropriate equipment or methods the use of which will be approved by the Supervisor. Before the beginning of compaction the materials of every layer have to be grained, mixed, sprinkled with water or dried to the degree of humidity according to previous testing and with which the type of material is used which enables required compactness to be achieved.

If after compaction and control of quality the filling of the next layer is not continued immediately, but the filling is continued after a long period, before the filling, the quality of the compactness of the already compacted layer should be controlled again. In that case, the compacting can start after the quality of compactness is proven with testing.

In the case of threat of rain during the day, the Supervisor will, if required, order suspension of further works on the embankments, without compensation of expenses. On the embankment consisting of coherent material, the upper surface of the layer should be planned and rolled in so that the surface is with 2 to 5% inclination toward the edge, even and without recesses in which atmospheric water could stay. Before filling the new layer, surface thus smoothed should be made rough in order to achieve as good connection as possible between the layers. This applies, also, to other long-lasting cessations of work on the embankment (due to the end of the construction season etc.)

Control During the Execution

The compactness of the layers of the embankment is tested on every 50-100 metres with two tests in immediate nearby area which constitute one result. The same applies to the embankments shorter than 50 metres.

The material humidity is checked every day. The making of the next layer cannot start until the required quality of the previous layer is established.

In case of the Supervisor establishing bigger deviations of results from those prescribed, the scope of testing may be changed subsequently. In agreement with the Supervisor, the quality of the built in layers may be established also with other recognised methods. In that case, in agreement with the Supervisor, the mounting quality criterion, as well as the manner and scope of testing must be stated.

3.23 DRAINAGE

This session includes the following works:

3.23.1 Making a drain with grates

After construction of a tampon layer, the drain location is to be marked, and a drain is to be made out of compacted concrete according to annex from the design, and steel grates are to be placed. The drain is connected to the sewage.

3.23.2 Laying of sewage pipes

The work on laying of sewage pipes consists of excavating the trench, laying of pipes and backfilling and compacting the trench. Depending on the depth of excavation, trenches have to be shored. The manner of shoring is proposed by the contractor and approved by the Supervisor. During the

excavation, drainage of water has to be insured if necessary. For sewage pipes, types and diameters from the design are used. All the pipes have to be certified, and their use approved by the Supervisor. Sewage pipes are laid on the bottom of the excavated trench, where a layer of sand is previously placed. The manner of connecting pipes is according to design details. Sewage functionality has to be tested before backfilling, according to regulations for sewage works. After successfully carried out tests, sewage pipes are backfilled. Backfilling is done in layers, where the first layer must not contain rocks that can damage pipes. Backfilling depends on the position of sewage compared to other facilities.

3.24 TRAFFIC SIGNALISATION

Preamble

3.24.1 General provision

- The technical conditions for preparation, acquisition and installation i.e. marking of individual elements of traffic signalization and traffic equipment are defined in the respective sections of this paper.
- Ordering of the elements of traffic signalization and traffic equipment is done according to the bill of quantities for the material and works on the elements of traffic signalization and traffic equipment, given in the total estimated bill of quantities.
- Preparation of individual elements of traffic signalization and traffic equipment is done in accordance with the running Serbian standards and detailed drawings attached to the project.
- Installing, i.e. placing, the individual elements of traffic signalisation should be performed based on the Layout plan and the detailed drawings attached to the project, as well as based on the Regulations concerning traffic signalisation and running Serbian standards.

3.24.2 TRAFFIC AND TRAFFIC SIGNALING DESIGN (BOOK 8)

This part of the object processes horizontal, vertical and light traffic signaling and equipment for construction of objects within the international border crossing of "Kotroman" between Republic of Serbia and Bosnia and Herzegovina.

The existing border crossing Kotroman is located on IB state road no. 28 at km 498+183. The existing border crossing has inadequate capacity and flow of traffic surfaces, and content and objects necessary for adequate functioning of the border crossing are missing.

Following technical solutions are realized in order to improve the functioning of the border crossing:

Vehicles crossing the border crossing from Republic of Serbia towards Bosnia and Herzegovina, with the aim of faster and easier leaving of vehicles, each vehicle category has its own traffic lane so the customs business runs smooth per each category of vehicles.

Vehicles at the entrance in Republic of Serbia are divided in two zones. The first zone includes separate truck terminal on the right side in direction of vehicle movement and that space is fenced by a special regime entrance, movement and control of trucks and cargo. A parking space with 14 parking spots is organized within the truck terminal. The second zone includes terminal for entrance of passenger cars and buses. A berth for one bus is formed for additional inspection of buses.

Two business parking positions with total capacity of 12 parking spots are defined within the border crossing.

3.24.2.1 Vertical signaling

Standard type vertical signaling is designed. Front side of the sign with all symbols, letters and numbers must be light-reflecting with standard retroflexion. Traffic signs are made according to detailed design in line with applicable standards and applicable Regulation on traffic signalization.

According to requirements in Regulation on traffic signalization for making of traffic signs in the streets, usage of materials with retroflexion features class 2 is envisaged (except for some signs listed in Regulation for which class 3 is used).

Vertical signaling is designed with following basic elements:

- Triangular traffic sign, dimensions a=900mm
- Circular traffic sign, dimensions Ø600mm
- Square traffic sign, dimensions 600x600mm
- Rectangular traffic sign, dimensions 600x900mm
- Regular octagonal traffic sign, dimensions 600mm

The design envisages vertical signaling in line with new Regulation on traffic signalization.

3.24.2.2 Standard vertical signalization

3.24.2.2.1 Description of works

The applied standard vertical traffic signals and signs corresponds to the prescribed standards with regard to its size, shape and colour and it conforms to the Rulebook on traffic signals and signs (Official Gazette of RS 134/14).

Vertical signals and signs are comprised of traffic signs which are placed in the vertical plane and serve to regulate traffic flow. Position and content of vertical signals and signs traffic signs should completely correspond to horizontal signals and signs.

Traffic signs are as follows:

- Danger warning signs
- Traffic signs of explicit order
- Information signs

The danger warning traffic signs are used to alert traffic participants of potential danger at specific place or road section and to warn of such danger nature.

Sign background is white and triangle border is red. Warning symbols on the danger warning traffic signs are black.

Traffic signs of explicit order are used to warn traffic participants of bans, limitations and obligations they must comply with.

The background of traffic signs of explicit order used to warn of bans or limitations is white, while the background of traffic signs of explicit order used to warn of obligation is blue. Symbols and letterings on signs with white background are black, while they are white on signs with blue background. Traffic signs of explicit order have red circular border and stripes, if any.

Information traffic signs provide necessary information to the traffic participants on the road they are travelling, name of the places they are passing through and relevant distances, end of traffic signs of explicit order validity area and other information which may be useful for the road users.

The background of the information traffic signs is white with black symbols and letterings or yellow with black symbols and letterings or green with white symbols and letterings.

In the Rulebook on traffic signals and signs are specified signs which differ from the appearance thereof (Official Gazette of RS, No.134/2014).

A traffic sign can be accompanied by additional panel which is the integral part of the traffic sign specifying it in more detail.

Traffic signs placed on the same support must be uniform, irrespective of whether they are reflective or have their own light source.

Traffic signs are placed on the right side of the road adjacent to the roadway in direction of travel.

This part of Technical conditions contains instructions, conditions and explanations related to vertical road signs placement.

The placement, use and application of traffic signs on roads are defined by the following regulations and laws: Road Traffic Safety Act (Official Gazette of RS, No. 41/2009, 53/2010, 101/2011, 32/2013 (Decision of the Constitutional Court), 55/2014); Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014) and Serbian standards.

3.24.2.2.2 Materials

The traffic signs and panels can be made up of the following materials: steel sheets, aluminium sheets or plastic with or without glass-fibre in case that the required strength, durability and persistence under different atmospheric conditions have been provided.

Materials for the sign face manufacture – foils and plastic materials with built-in retro-reflective components, glue to attach the image on the sign base and protective surface layer for protection against external influences. Material class is the classification of material according to retro-reflection coefficient. According to retro-reflection coefficient materials used for manufacture of sign face can belong to class 2. When the sign with its own light source is manufactured, sign face is made on the transparent surface. Materials for manufacture of sign housing for changeable message sign must be resistant to corrosion in accordance with applicable regulations and standards for material used.

The colour of traffic signs, panels and all supporting elements backing is gray and matt in order to prevent drivers of being temporary blinded.

Placed traffic signs should be secured against *shear* and *reversion*.

No fastening elements and perforations may be visible on the sign face.

Fastening elements for mounting of the sign on the sign post can be integrated in one-piece with the sign or can be assembled with the bolts and screws or are attached by welding.

The basic geometric shapes of traffic signs placed on the roads are: equilateral *triangle*, *circle*, *square*, *rectangle*, *rectangle with arrow ending* and *regular octagon*.

Elements and their measures for graphic signage of the traffic signs on the roads are defined by the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014) and Serbian standards SRPS.Z.S2.301 – SRPS.Z.S2.322.

Deviation from the indicated overall dimensions is allowed within limits of 2%. The overall impression given by the symbols and letterings shall not be changed by permitted deviations.

Colourimetric and photometric properties of material for traffic signs are set forth in Serbian Standard SRPS.Z.S2.330.

Letters and numerals used for inscriptions on traffic signs and additional panels shall fully comply with Serbian Standards SRPS.U.S4.201 – SRPS.U.S4.204

Traffic signs have edge for individualization of the sign with regard to the background colour.

3.24.2.2.3 Material quality

Technical conditions for traffic signs manufacture and inspection are set forth in the Serbian Standard SRPS.Z.S2.300. This standard is related to traffic signs made of normal or retro-reflective (light-reflective) material, as well as on the signs with internal and external sign lighting system. All components of variable message traffic signs, as well as the quality system and signs quality examination are set forth in the Serbian Standard SRPS EN 12966-1.

3.24.2.2.4 Work performance technology

Traffic signs are placed in such a manner that their plane deviates from horizontal line for 3 to 5 from the axis perpendicular to the road axis.

Distance between the roadway edge and the most prominent edge of the traffic sign which is placed on the road, intersections and built-up area, out of pedestrian surfaces ranges from 0.75m to 1.50m. Exceptionally, it can reach 0.50 m if there is a protective fencing or if the cross-section comprises emergency lanes. Distance between the roadway edge and the most prominent edge of the traffic sign which is placed on the pedestrian surfaces ranges from 0.30 m to 1.50 m.

When placing traffic sign on the individual sign post (traffic sign support) it should be ensured that the bottom sign edge is at a minimum height of 2.2m from the pavement surface.

Traffic signs and panels are manufactured for the application under climatic conditions of ambient temperatures between -40C and + 50C and relative humidity of up to 95%.

3.24.2.2.5 Quality control

Traffic sign life expectancy should be at least five years from the date of its placement or seven years from the date of manufacture.

The manufacturer is bound to affix the code on the traffic sign backing according to the Rulebook on traffic signals and signs, as well as manufacturer's mark.

The manufacturer is bound to possess an attestation for all materials used for manufacture of standard traffic signs. Quality control is performed in line with the Serbian Standard SRPS.Z.S2.300.

The price includes sign delivery with all components for mounting the sign on the signpost (clamps, screws, reinforcements, cufflinks, etc.).

3.24.2.2.6 Measurements and payment

Payment is made in strict accordance with the Construction Contract.

3.24.2.3 Non-standard vertical traffic signals and signs

3.24.2.3.1 Description of works

Non-standard traffic signs are manufactured according to the drawings given under item 8 of the content, in accordance with the Rulebook on traffic signals and signs (Official Gazette of RS, No.134/2014). Direction arrows and panel signs in the manner set forth in SRPS.Z.S2.314. "The name of the place and the end of the built-up area" in the manner set forth in SRPS.Z.S2.321.

3.24.2.3.2 Materials

Instruction signs and special signs are manufactured from materials and in the manner prescribed by SRPS.Z.S2.300 (Technical conditions—general requirements for manufacture and testing).

The traffic sign base must be made of foil having Class 2 retro-reflective properties.

3.24.2.3.3 Material quality

Technical conditions for manufacture and testing of traffic signs mounted on the roads are set forth in the Serbian Standard SRPS.Z.S2.300. This standard is related to traffic signs made of normal or retro-reflective (light-reflective) material, as well as on the signs with internal and external sign lighting system. All components of variable message traffic signs, as well as the quality system and signs quality examination are set forth in the Serbian Standard SRPS EN 12966-1.

3.24.2.3.4 Work performance technology

Traffic signs are placed in such a manner that their plane deviates from horizontal axis for 3 to 5 from the axis perpendicular to the road axis.

Distance between the roadway axis and the most prominent edge of the traffic sign which is placed on the road, intersections and built-up area, out of pedestrian surfaces ranges from 0.75m to 1.50m. Exceptionally, it can reach 0.50 m if there is a protective fencing or if the cross-section comprises emergency lanes. Distance between the roadway edge and the most prominent edge of the traffic sign which is placed on the pedestrian surfaces ranges from 0.30 m to 1.50 m.

When placing traffic sign on the single sign post (traffic sign support) it should be ensured that the bottom sign edge is at a minimum height of 2.2m from the pavement surface.

Traffic signs and panels are manufactured for the application under climatic conditions of ambient temperatures between -40C and + 50C and relative humidity of up to 95%.

3.24.2.3.5 Quality control

Traffic sign life expectancy should be at least five years from the date of its placement or seven years from the date of manufacture.

The manufacturer is bound to affix the code on the traffic sign backing according to the Rulebook on traffic signals and signs, as well as manufacturer's mark.

The manufacturer is bound to possess an attestation for all materials used for manufacture of standard traffic signs. Quality control is performed in line with the Serbian Standard SRPS.Z.S2.300.

3.24.2.4 Standard traffic sign posts

3.24.2.4.1 Description of works

Traffic signs are mounted on the sign posts adjacent to the road. Exceptionally, traffic sign can be mounted on the mounting bracket, portal frame, traffic light column, road barrier, direction pointers, horizontal or vertical vertical traffic barrier.

No more than two traffic signs should be mounted on a single sign post per one direction, with or without additional panel per sign.

Traffic signs mounted on sign post adjacent to the road are placed along the roads, intersections and built-up areas, out of pedestrian surfaces, at the height which ranges from 1.2m to 1.4m.

Traffic signs in the built-up areas, out of pedestrian surfaces are mounted at the height which ranges from 1.4m to 1.8m. When they are placed on the pedestrian surfaces, the height ranges from 2.2m to 2.4m.

The height is calculated from the road surface to the traffic sign bottom edge, i.e. to the additional panel bottom edge if the additional panel is placed adjacent to the traffic sign.

Exceptionally, specific traffic signs are placed at heights defined by the Rulebook on traffic signals and signs.

3.24.2.4.2 Materials

Sign posts are tubular and they are made of cold drawn steel tube with uniform diameter and wall thickness.

As a general rule, sign posts must be made of steel tubes protected by hot zinc coating both internally and externally or protected in some other manner (plastic coated, painted or metalized).

The outside sign posts diameters are:

- 60,3 mm (63,5 mm), 88,9 mm or 102 mm.
- The minimum sign post wall thickness:
 - for sign post having diameter of 60,3 mm (63,5 mm) – 2 mm,
 - for sign post having diameter of mm – 2,5 mm; and
 - for sign post having diameter of 102 mm – 2,5 mm

Traffic sign posts can be protected by applying primer and dark gray varnish.

3.24.2.4.3 Material quality

Traffic signs (including sign posts and supports) must be manufactured to ensure bearing capacity and stability pursuant to Part 5 of the Standard SRPS EN 12899-1:2011.

Traffic signs (including sign posts and supports) as a whole and applied single materials must maintain sizes within permitted limits and after actions resulting from mechanical stress. Variation of sizes of up to $\pm 2\%$ is allowed unless otherwise agreed or ordered by the competent Supervisor.

Traffic sign mounting must tolerate a load of:

- vertical force of 7,5 MN and
- horizontal force of 3 MN.

3.24.2.4.4 Work performance technology

The open end of the post must be closed off to precipitation and debris so to protect the post from environmental damage.

Sign post diameter cannot be below $\Phi 60\text{mm}$.

Columns are mounted on the concrete foundations, minimum concrete class MB 20.

Supporting column foundation dimensions are determined based on the number and size of the specific sign.

Sign post length is determined based on the number and size of the specific sign and foundation depth.

When calculating traffic sign post the linear meter shall be applied.

Number of grid supports is determined based on the length of traffic sign panel which is mounted on this type of post.

3.24.2.4.5 Quality control

The manufacturer is bound to possess an attestation for all materials used for manufacture of traffic sign posts.

3.24.2.4.6 Measurements and payment

Payment is made in strict accordance with the Construction Contract.

3.24.2.5 Non-standard traffic signs posts

3.24.2.5.1 Description of works

Non-standard traffic signs are placed in the same manner and under the same conditions as the standard traffic signs.

3.24.2.5.2 Materials

Traffic sign posts are tubular and are made of tubular and they are made of cold drawn steel tube with uniform diameter and wall thickness.

Traffic sign posts can be protected by applying primer and dark gray varnish.

3.24.2.5.3 Material quality

Traffic signs (including sign posts and supports) must be manufactured to ensure bearing capacity and stability pursuant to Part 5 of the Standard SRPS EN 12899-1:2011.

Traffic signs (including sign posts and supports) as a whole and applied single materials must maintain sizes within permitted limits and after actions resulting from mechanical stress. Variation of sizes of up to $\pm 2\%$ is allowed unless otherwise agreed or ordered by the competent Supervisor.

Traffic sign mounting must tolerate a load of:

- vertical force of 7,5 MN and
- horizontal force of 3 MN.

3.24.2.5.4 Work performance technology

Supporting column must be closed on the upper side, i.e. protected from the rain.

Sign post diameter cannot be below $\Phi 60\text{mm}$.

Columns are mounted on the concrete foundations of minimum class MB 20 concrete.

Supporting column foundation dimensions are determined based on the number and size of the specific sign.

Sign post length is determined based on the number and size of the specific sign and foundation depth.

When calculating traffic sign post the linear meter shall be applied.

Number of grid supports is determined based on the length of traffic sign panel which is mounted on this type of post.

Calculations of elements of foundation and construction of non-standard vertical traffic signs are given under item 3 of the content of this project for each traffic sign.

3.24.2.5.5 Quality control

The manufacturer is bound to possess an attestation for all materials used for manufacture of traffic sign posts.

3.24.2.6 Light signaling

When deciding of characteristics of IT equipment elements, achieving maximum reliability and efficiency of the system was taken in consideration.

The border crossing system consists of several LED displays connected in local LAN with additional manual commands.

Each of the devices in signaling system owns internet communication module and is connected as a node into unique signaling LAN. This local internet network provides possibility of managing and acquisition of data from each device in the network and can be a part of the existing LAN at the border crossing.

Controlling the operation of each device is possible from each computer in the network that has software for control of signaling system installed.

The software has levels of authorization and access to device control, so individual computers can be allowed to control only some of the devices. For example, only LED displays in the related traffic lane are controlled through the computer in the cabin. While from one computer, which is used as a central control point, each device in the system is controlled.

Each of the devices must have a counter with manual commands (switches) which can be installed at on central point or in appropriate command house.



Display dimensions are 1600 x 800 mm. Display is mounted on the canopy at minimum height of 5.50m.

3.24.2.7 Equipment

Passage of vehicles at the border crossing is controlled by half barriers.



Basic half barrier colour is reflective red and white with fluorescent characteristics of Class 3 material. Half barrier arm length at the cargo terminal is 4,50 meters and 3,50 meters on the remaining terminals.

Base color of the half-gate is reflecting red and white color with fluorescent features, material class 3. Length of the ramp on the cargo terminal is 4.50m and 3.50m on every other terminal.

3.24.2.8 Safety barrier elements

3.24.2.8.1 General description of works

Safety barrier elements comprise the following equipment:

3.24.2.8.2 Protection devices,

Guardrail end terminals constructions

Description of works

Protection device is the part of the road equipment designed to prevent vehicles from the run-off-road accidents, i.e. to hold and stop the vehicle that departed the carriageway, to protect adjacent

road environment from undesired crashes caused by the run-off-road, as well as to prevent pedestrians and fauna from entering and crossing the road.

Defining, manufacture and mounting of safety barrier elements are performed in accordance with the Standard SRPS EN 1317 and Technical instruction BS04. Safety barrier placement is performed in accordance with the Serbian Standards SRPS.U.C4.110.

Vehicle restraint system capacity is classified according to the following criteria:

Containment level

Performance class (working width W)

Impact severity level.

All protection device systems shall comply with requirements of Standard EN 1317-1, 1317-2 and 1317-3 and to provide evidence – relevant Test reports issued by accredited institution.

Vehicle restraint system functioning should not be prevented by the environment arrangement (area between carriageway and vehicle restraint system and performance area).

The area in front and under the vehicle restraint system should be reinforced to have sufficient bearing capacity for passenger cars.

The edges and ditches having a difference of level over 7 cm should be avoided in front of the vehicle restraint system. Roadside vegetation, traffic columns or similar facilities within the performance area should not restrict vehicle restraint system functionality.

Material quality

Safety barrier should be made of cold-formed steel 0361 according to SRPS Standard, 3mm wide, having strength of 40N/mm. Safety barrier posts should be made of INP 10 rolled sections, steel quality 0361, sizes 70x140*4(6), Corrosion protection by hot zinc coating with a minimum layer thickness of 70µm and aluminium-based metalization. Thickness of layer for posts is 80 µm and 60-80µm for remaining components. Complete anti-corrosion layer should be applied to each post placed over ground level.

Work performance technology

Selection of safety barrier type (single-sided, two-sided, one-sided distance safety barrier, double-sided distance safety barrier) is defined by the design. Locations of safety barrier installation are contained in the layout plans. Safety barrier guardrail distance from the carriageway edge and post distance from the shoulder edge line shall not be less than 0.5m. At certain distance posts are folded and placed in the ground – bank. On bridges, facilities and concrete walls posts with square plates are applied (10x300x300). The square plate is welded to the post and anchored to the facility by 4 standard screws. Upper edge of the safety barrier must be placed 0.75m above the ground level.

Retro reflectors (catadioptrics) are installed on the safety barrier channel. Their colour and distances are the same as on direction posts.

3.24.2.8.3 Safety barrier elements:

Safety barrier post is embedded in the shoulder or anchored in facilities, carries guardrails and distance spacers. Posts are made of U steel channels having width of 6 mm and length of 1.9 m. Part of the posts located above ground must be protected by anti-corrosion protection and should not be deformed during the installation. Distance between posts can be 4.0 m, 2.0 m and 1.33 m;

Guardrail is a safety barrier constructive element of certain length, made of material having mechanical properties which assure that in case of crash, thanks to its rigid construction (concrete safety barrier) or deformations (steel and wooden safety barrier), it can reduce crash impact. Guardrail must be protected by anti-corrosion protection;

Distance spacer is the element which connects guardrail with post and has capability to absorb the part of kinetic energy and reduce the impact of the crash into the safety barrier.

Quality control

Safety barrier quality should comply with the common standards for the industrial products quality. Control tests should be carried out at every 1000m of safety barrier in order to test the quality of materials. The anti-corrosion layer thickness is checked at every 100m of the safety barrier. Elements which do not conform to the quality criteria must be replaced. Prior to the commencement of works, the contractor shall obtain quality certificates evidencing the safety barrier quality.

Prior to the installation, the contractor must present an attestation of the safety barrier quality.

Acceptance and rejection of the works are fully performed in accordance with the Construction Contract.

3.24.2.9 Technical report

3.24.2.9.1 Subject matter of the project design

Subject matter of the project design is temporary traffic signals and signs and traffic equipment for traffic regulation during the construction of the Kotroman international border crossing facilities between Republic of Serbia and Bosnia and Herzegovina.

The works are divided in phases and each phase is in function of its importance in the construction of the Kotroman international border crossing. The organisation of the works is conditioned by the obligation to keep the border crossing functioning all the time and traffic flow running uninterrupted during the works. Due to specific requirements of the border crossing, the building design envisages the beginning of the works on the right side of the present border crossing, looking from the B&H border toward the river Beli Rzav.

Terms of reference and Design Project provide extension and reconstruction of the present border crossing by demolition of the old pavement at the border crossing and construction of new one-way access roads (I and II phase) to the IB class state road No. 28 from the initial chainage at km 156+479.00 until the final chainage at km 156+783.488.

The border crossing complex is situated between km 156+479.00 of the IB class state road No. 28 and km 156+783.488.

The existing border crossing is characterised by inadequate capacity and traffic flow within traffic areas, there is a lack of contents and facilities required for appropriate border crossing functioning. Detailed regulation plan foresees the construction of new facilities so the project design includes an upgrading of the traffic areas and construction of new facilities.

The first phase includes the construction of all the border crossing facilities, one part of the traffic areas on the right from the existing carriageway, up to the river Beli Rzav. During the construction of these facilities and traffic areas, the traffic would function normally i.e. the border crossing would work in the current regime and at the entrance in Serbia, instead of two access roads, only one would be used.

Once the construction of traffic areas and facilities are completed, the second phase would be initiated. The second phase includes the construction of control islands on the traffic area towards the exit from Serbia and on the entry area in Serbia for passenger vehicles and coaches. The traffic flow in this phase would run as follows:

All vehicles at the exit from Serbia would use one traffic lane which is at the end used as entry lane for coaches entering Serbia. All vehicles at the entrance in Serbia would use truck terminal for passing through and entering Serbia.

In this way, the content and organisation of vehicle movement along the new reconstruction at the country exit and entry points up to the reconstruction of the remaining part of traffic area will be practically put in operation.

This project design shows the traffic solution which enables safe and undisturbed functioning of the traffic during the works and which guarantees full safety of traffic flow and safty movements of the workers on the site.

The project design is developed in line with Serbian standards, Rulebook on traffic regulation in the area of the works (Official Gazette RS No. 134/14), Rulebook on traffic signals and signs (Official Gazette RS, No. 85/17) and Road Traffic Safety Act (Official Gazette RS No. 41/09, 53/10, 101/11, 32/13-US and 55/14).

All signals and signs posted on the road network are reflective. Considering that they are posted within the settlement, class II (high intensity) retroreflective sheeting is required, size: triangle (a=900mm), circular (\varnothing = 600mm), additional panel 900x350mm, 900h250 mm and 600h250 mm.

3.24.2.9.2 Description of the project design

The project design contains the section intended for the contractor or the agency in charge with maintenance of road safety, having the task to procure, place and maintain the subject signals and signs during the works. Besides the general information and textual part, this section contains layout solutions for the posting of temporary traffic signals and signs, depending on the site where the works are performed and length of the site, and all other necessary details as well.

3.24.2.9.3 General requirements for the posting of traffic signals and signs

The project design solution defines the plans for securing the site outside the settlement, in accordance with the requirements set forth in Terms of Reference.

Traffic signals and signs and traffic equipment warning the traffic participants about the site are placed just before the beginning of the works at 400-meter distance outside the settlement.

Traffic signs and equipment used to mark the site must have reflective properties in order to be visible at night. For the same reason, a traffic sign I-19 with permanent lights TS7 is foreseen to be placed in the site access area.

Considering the length of the site, posts of vertical traffic barrier must be placed as permanent traffic signals and signs i.e. the posts are entrenched and signs are placed at minimum 2.20 m from the pavement/carriageway level.

Traffic signals and signs and traffic equipment are placed by the contractor which is obligated to maintain all the traffic signals, signs and equipment foreseen by the project design. The contractor is obliged to register the site in accordance with the procedure for execution of the works on carriageways issued by the competent Ministry.

The existing traffic signals and signs on the state road will not be changed in the first phase, only complemented with appropriate signals and signs for managing the traffic during the construction works.

In other phases, designed traffic signals and signs should be placed and complemented with appropriate signals and signs for managing the traffic during the construction works.

All the time during the works an authorised and trained worker must constantly stay on watch, and his task is to guard the posted traffic signals, signs and equipment, change and complement the damaged ones and control the permanent lights on horizontal traffic barriers, type TS1. Should any change in traffic conditions occur, corrections are possible to be made, subject to expert consultation with the authorised supervisor and approval of the design engineer.

3.24.2.9.4 Explanation of the variant solution

Variant solutions are typical; the project design shows the solution satisfying the request set forth in Terms of Reference and technology of construction.

3.24.2.9.5 I phase (graphical enclosure 2.1)

The first phase refers to the construction of all the border crossing facilities and traffic areas on the right from the existing carriageway, looking from the B&H. During the construction of these facilities and traffic areas, the traffic would function normally i.e. the border crossing would work in the current regime. The construction site would be separated from the traffic by Jersey barrier for the total length of 296 m. During the works, traffic wouldn't be disrupted and temporary traffic signals and signs and traffic equipment would provide information to the users about nearby works. There is no additional speed limit as the standard signals and signs of the border crossing already require a slow down. At the very entrance from Serbia, a two-way entrance in and exit from the site would be organised. In the first phase of the construction, traffic signals and signs should be posted in accordance with the project design.

3.24.2.9.6 IIa phase (graphical enclosure 2.2)

The second phase includes the construction of control islands on the traffic areas towards the exit from Serbia and in the area of the entrance of passenger vehicles and coaches in Serbia. The construction site would be separated from the traffic by Jersey barrier for the total length of 445 m. During the works the border crossing would work in the new regime. The entrance section would be two-way.

All vehicles at the exit from Serbia would use one traffic lane which is at the end used as entry lane for coaches entering Serbia. All vehicles at the entrance in Serbia would use truck terminal for passing through and entering Serbia.

Temporary traffic signals, signs and equipment would provide information to the users about the nearby construction works. There is no additional speed limit as the standard signals and signs of the border crossing already require a slow down. At the very entrance from Serbia, a two-way entrance in and exit from the site would be organised.

3.24.2.10 General requirements

The contractor is obliged to post the designed traffic signals and signs and to control them constantly during the works.

All the changes on the posted signals and signs must be immediately corrected.

The existing traffic signals and signs on the section under construction, which are contrary to the designed temporary traffic signals and signs during the works, must be covered or removed so to prevent such contradiction. Once the works on certain section are completed, temporary traffic signals and signs are to be removed and traffic signals and signs are to be posted in accordance with the project design solution.

The posting of traffic signals and signs on the road begins with the warning sign I-19 "Road Works" which defines the beginning of the work zone and then all other signals and signs are posted in the direction of traffic flow up to the last sign.

Traffic signals and signs are removed from the road beginning from the last sign posted for the works in progress and then in the direction contrary to the direction of traffic flow up to the sign I-19 "Road Works" at the beginning of the work zone.

3.24.2.11 Technical requirements

3.24.2.11.1 *Traffic signals, signs and equipment within the work zone*

General description of the works

Subject matter of the project design is temporary traffic signals and signs and traffic equipment for traffic regulation during the construction of the Kotroman international border crossing facilities between Republic of Serbia and Bosnia and Herzegovina.

The project design solution defines the plans for securing the site outside the settlement, in accordance with the requirements set forth in Terms of Reference.

The elements of vertical traffic signals and signs are:

Traffic signs

Traffic sign posts.

3.24.2.11.2 VERTICAL SIGNALS AND SIGNS

3.24.2.11.3 STANDARD VERTICAL SIGNALISATION

General description of the works

The spot on the road where the first traffic sign I-19 “Road Works” is posted depends on the length, sight and visibility of the warning zone.

Distance between the first traffic sign I-19 “Road Works” and the narrowing area is at least 50 m, i.e. in this actual case 140 m, for the roads within the settlement.

Description of the works

Vertical signals and signs comprise traffic signs which are placed in the vertical plane and serve to regulate traffic flow. Position and content of vertical signals and signs traffic signs should completely correspond to horizontal signals and signs.

Traffic signs are:

- Danger warning signs
- Traffic signs of explicit order
- Information signs

The danger warning signs are used to alert traffic participants of potential danger at specific place or road section and to warn of such danger nature.

Sign background is white and triangle border is red. Warning symbols on the danger warning traffic signs are black.

Traffic signs of explicit order are used to warn traffic participants of bans, limitations and obligations they must comply with.

The background of traffic signs of explicit order used to warn of bans or limitations is white, while the background of traffic signs of explicit order used to warn of obligation is blue. Symbols and letterings on signs with white background are black, while they are white on signs with blue background. Traffic signs of explicit order have red circular border and stripes, if any.

Information traffic signs provide necessary information to the traffic participants on the road they are travelling, name of the places they are passing through and relevant distances, end of traffic signs of explicit order validity area and other information which may be useful for the road users.

The background of the information traffic signs is white with black symbols and letterings.

In the Rulebook on traffic signals and signs are specified signs which differ from the appearance thereof (Official Gazette of RS, No.134/2014).

A traffic sign can be accompanied by additional panel which is the integral part of the traffic sign specifying it in more detail. Traffic signs placed on the same support must be uniform, irrespective of whether they are reflective or have their own light source.

Traffic signs are placed on the right side of the road adjacent to the roadway in direction of travel.

This part of Technical conditions contains instructions, conditions and explanations related to vertical road signs placement.

The placement, use and application of traffic signs on roads are defined by the following regulations and laws: Law on traffic safety on roads (Official Gazette of RS, No. 41/2009, 53/2010, 101/2011, 32/2013 (Decision of the Constitutional Court), 55/2014); Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014) and Serbian standards.

Material Quality

Technical conditions for traffic signs manufacture and inspection are set forth in the Serbian Standard SRPS.Z.S2.300. This standard is related to traffic signs made of normal or retro-reflective (light-reflective) material, as well as on the signs with internal and external sign lighting system. All components of variable message traffic signs, as well as the quality system and signs quality examination are set forth in the Serbian Standard SRPS EN 12966-1.

The traffic signs and panels can be made up of the following materials: steel sheets, aluminium sheets or plastic with or without glass-fibre in case that the required strength, durability and persistence under different atmospheric conditions have been provided.

Material

Materials for the sign face manufacture – foils and plastic materials with built-in retro-reflective components, glue to attach the image on the sign base and protective surface layer for protection against external influences. Material class is the classification of material according to retro-reflection coefficient. According to retro-reflection coefficient materials used for manufacture of sign face can belong to class 2. When the sign with its own light source is manufactured, sign face is made on the transparent surface. Materials for manufacture of sign housing for changeable message sign must be resistant to corrosion in accordance with applicable regulations and standards for material used.

The color of traffic signs, panels and all supporting elements backing is gray and matt in order to prevent drivers of being temporary blinded.

Placed traffic signs should be secured against shear and reversion.

No fastening elements and perforations may be visible on the sign face.

Fastening elements for mounting of the sign on the sign post can be integrated in one-piece with the sign or can be assembled with the bolts and screws or are attached by welding.

The basic geometric shapes of traffic signs placed on the roads are: equilateral triangle, circle, square, rectangle, rectangle with arrow ending and regular octagon.

Elements and their measures for graphic signage of the traffic signs on the roads are defined by the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014) and Serbian standards SRPS.Z.S2.301 – SRPS.Z.S2.322.

Deviation from the indicated overall dimensions is allowed within limits of 2%. The overall impression given by the symbols and letterings shall not be changed by permitted deviations.

Colourimetric and photometric properties of material for traffic signs are set forth in Serbian Standard SRPS.Z.S2.330.

Letters and numerals used for inscriptions on traffic signs and additional panels shall fully comply with Serbian Standards SRPS.U.S4.201 – SRPS.U.S4.204

Traffic signs have edge for individualization of the sign with regard to the background color.

Work performance technology

Traffic signs and panels are manufactured for the application under climatic conditions of ambient temperatures between -40C and + 50C and relative humidity of up to 95%.

Traffic signs are placed in such a manner that their plane deviates from horizontal line for 3 to 5 from the axis perpendicular to the road axis.

Distance between the roadway edge and the most prominent edge of the traffic sign which is placed on the road, intersections and built-up area, out of pedestrian surfaces ranges from 0.75m to 1.50m. Exceptionally, it can reach 0.50 m if there is a protective fencing or if the cross-section comprises emergency lanes. Distance between the roadway edge and the most prominent edge of the traffic sign which is placed on the pedestrian surfaces ranges from 0.30 m to 1.50 m.

Quality control

Traffic sign life expectancy should be at least five years from the date of its placement or seven years from the date of manufacture.

The manufacturer is bound to affix the code on the traffic sign backing according to the Rulebook on traffic signals and signs, as well as manufacturer's mark.

The manufacturer is bound to possess an attestation for all materials used for manufacture of standard traffic signs. Quality control is performed in line with the Serbian Standard SRPS.Z.S2.300.

The price includes sign delivery with all components for mounting the sign on the signpost (clamps, screws, reinforcements, cufflinks, etc.).

Acceptance and rejection of the works

To be carried out in accordance with the Construction Contract.

Measurements and payment

Payment is made in accordance with the terms and conditions of the Construction Contract.

3.24.2.11.4 *Traffic sign posts*

3.24.2.11.5 *Standard traffic sign posts*

Description of works

Traffic signs are mounted on the sign posts adjacent to the road. Exceptionally, traffic sign can be mounted on the mounting bracket, portal frame, traffic light column, road barrier, direction pointers, horizontal or vertical traffic barrier.

No more than two traffic signs should be mounted on a single sign post per one direction, with or without additional panel per sign.

Traffic signs mounted on sign post adjacent to the road are placed along the roads, intersections and built-up areas, out of pedestrian surfaces, at the height which ranges from 1.2m to 1.4m and on the pedestrian surfaces at the height which ranges from 2.2m to 2.4m.

The height is calculated from the road surface to the traffic sign bottom edge, i.e. to the additional panel bottom edge if the additional panel is placed adjacent to the traffic sign

Exceptionally, specific traffic signs are placed at heights defined by the Rulebook on traffic signals and signs.

The post height is determined by the number and size of the signs and the manner of founding.

Materials

Sign posts are tubular and they are made of cold drawn steel tube with uniform diameter and wall thickness.

Traffic sign posts can be protected by applying primer and dark gray varnish.

The open end of the post must be closed off to precipitation and debris so to protect the post from environmental damage.

Tehnologija izvođenja radova

Columns are mounted on the concrete foundations, minimum concrete class MB 20 or on universal supports used in the zones under construction and serve for mounting traffic sign posts, frontal, horizontal and vertical traffic barriers, and similar.

Quality control

The manufacturer is bound to possess an attestation for all materials used for manufacture of traffic sign posts.

Price of traffic sign posts is calculated based on running metre.

Acceptance and rejection of the works

To be carried out in accordance with the Construction Contract.

Measurements and payment

Payment is made accordance with the terms and conditions of the Construction Contract.

3.24.2.11.6 *Horizontal signals and signs*

General description of works

The term “horizontal” includes all types of carriageway markings which serve for traffic flow regulation, control and channelization. Temporary road markings in the work zone are yellow and are placed in connection with other temporary traffic signals and signs. The existing marking on the road which is not in accordance with the temporary traffic regime is invalidated. Invalidation of the existing traffic markings on the road is carried out by removal, crossing out or covering by application of yellow band as defined by the rules and regulations on road signs posting. Carriageway markings are as follows:

Longitudinal road markings – lines arranged in parallel to the carriageway axis.

Description of works

Longitudinal road markings serve to define in details the use of the road and as an addition or alternative to vertical signals and signs. All longitudinal markings are painted yellow. The longitudinal road marking applied is edge line which in this case serves to separate special-purpose traffic areas.

Transverse road markings – signs in shape of lines or fields set transverse to the carriageway axis.

Description of works

Transverse markings are placed across the direction of carriageway axis or traffic flow and they mark the points where the vehicle motion regime is changed. As a rule, all transverse markings are painted yellow. The transverse road marking applied is marking for pedestrian crossing.

Work performance technology

NO changes of the shapes of markings determined according to Serbian standards, such as deformation of markings, marking painted in error or introduction of new elements are allowed.

Markings which are not in line with a determined shape must be permanently removed.

Once the markings are applied, the traffic may be reinstated within maximum 45 minutes, i.e. after that period vehicles may travel over the markings. Works should be performed under dry weather conditions at temperatures from +10°C to +30°C, relative humidity not exceeding 85% and carriageway temperature from +5°C to +45°C.

Prior to painting, carriageway surface must be completely dry and clean and free of dust and residual salt.

Oil and grease stains must be removed prior to painting.

On the new asphalt driveways only temporary markings are painted, which are replaced by permanent markings after the final asphalt layer is stabilised.

The preparation of the extremely rough carriageway surface is performed by brushing, air blowing and rinsing. In the case of highly polished surface, worn concrete or asphalt surface, the surface must be previously roughened or impregnated.

The minimum thickness of dry thin-layer longitudinal road markings is 0.200 mm (up to 4.000 vehicles/per day) and 0.250 mm (over 4.000 vehicles/per day). The minimum thickness of transversal road markings is 0.250 mm (up to 4.000 vehicles/per day) and 0.300 mm (over 4.000 vehicles/per day).

If it is established that over 10% of marking surface having the layer thickness less than the minimum required thickness, the layer must be reapplied.

The procedure and equipment for carriageway coating application must ensure that the works zones do not affect traffic safety and safety of the workers.

Materials

Technical conditions for materials for asphalt and concrete carriageway markings, requirements and conditions for execution of works and technical properties of carriageway marks are defined by relevant Serbian Standards.

For carriageway markings may be used only materials whose traffic and technical properties and quality ensure good visibility of markings during daylight or night driving. Applied materials should have appropriate coarse texture and durability within the required time frame. Material properties and quality must correspond to the traffic loading.

Paints are liquid or viscous materials composed of pigments, binding agents, fillers, solvents and reflective glass beads.

Plastic materials are plastic-based liquid or viscous materials which are applied on the carriageway surface according to special procedure.

Marking material composition and manner of application must ensure reflective properties of road markings.

Light reflectivity or retro-reflection is obtained by addition of reflective glass beads which can be previously mixed with paint or sprinkled over a fresh paint layer.

Road markings type, shape and position, as well as their meaning and manner of signing conform to Serbian Standards SRPS.U.C4.221 – SRPS.U.C4.234, SRPS EN1436 and to the Rulebook on traffic signals (Official Gazette of RS, No. 134/2014). Properties of materials for road markings depending on the road type, are given under Section 8 of the content of this project, in compliance with the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014 - Annex 1).

Quality control

All materials must conform to durability specifications and quality requirements and Contractor shall provide the Quality Certificate for each type of material. Quality of the material used for application of horizontal markings are sampled and test based on requirements of the Serbian standard SRPS EN 13459:12.

Removal of temporary markings on the road within the work zone is carried out so to avoid any road damage and residues of temporary markings on the road. Gray varnish should be used to cover markings painted yellow.

Acceptance and rejection of the works

To be carried out in accordance with the Construction Contract.

Measurements and payment

Payment is made accordance with the terms and conditions of the Construction Contract.

3.24.2.11.7 *Traffic equipment*

Description of works

- „vertical traffic barrier”

(VII-3.1), (VII-3.2), (VII-3.3) is a panel mounted on its own support, vertically to the pavement, with alternating white and red stripes sloping downward at an angle of 45 degrees, may be single-sided or double-sided and are placed according the Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

- „frontal barrier”

(VII-1) i (VII-1.1) is a bumper with alternating white and red stripes sloping downward at an angle of 45 degrees and are placed according the Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

- „flags for manual traffic control”

are red and green, minimum 40 cm x 40 cm, and are placed according the Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

- Flashing lights (TS-2),

180-mm in diameter, work in flashing regime. Type TS 2 flashing lights have two-sided light emission and are made according to a required technology. They must have a photo sensor which turns them off during good daytime visibility conditions. These flashing lights are mounted on frontal, vertical and horizontal barriers in accordance with the Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

- Flashing lights (TS-3),

180-mm in diameter, work in continuous regime. Type TS-3 flashing lights is used for traffic control in the work zone. They are placed at each of 5 vertical barriers and are made according to a required technology. In order to avoid road users to be blinded, TS-3 flashing lights must have a photo sensor which decreases intensity of the light during nighttime. Should any single light stop working, the operating unit must provide continuous functioning of the system. The direction of lighting must be the same as the direction of the vehicle travel. They are mounted on frontal, vertical and horizontal barriers. The next figure shows the schematic representation of flashing lights operation.

- Flashing lights (TS-7),

300-mm in diameter, work in flashing regime with single-sided light emission, and are made according to a required technology. Tyše TS-7 flashing lights are used to announce the work zone and are mounted at 2.5 meter height, visibility distance: 300 m. These flashing lights are placed in accordance with the Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

- Mobile traffic lights (VI-1),

are placed in accordance with the Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

Work performance technology

Traffic signals and signs which message does not conform to the traffic conditions in the work zone are properly removed or covered with non-reflective band.

In the work zone, every change in the regime of temporary traffic signals and signs during the works must be accompanied by an additional approval issued by the competent authority for traffic issues. Traffic signals and signs in the work zone placed on the road must be functioning all the time during the works.

Traffic equipment is placed on the road after all other traffic signals and signs are mounted.

Traffic signals and signs are placed in the direction of vehicle travel.

The posting of traffic signals and signs on the road begins with the warning sign I-19 "Road Works" which defines the beginning of the work zone and then all other signals and signs are posted in the direction of traffic flow up to the last sign III-17 "End of All Restrictions" at the end of the work zone.

Mounting of the road traffic equipment in the work zone

Frontal barriers are used to fence the beginning or the end of the site and is mounted perpendicularly to the road axis on the spots where the road narrows, or to let vehicles pass at the beginning or at the end of the work zone. Frontal barriers are not recommended for the highway. On a frontal barrier at least three flashing lights are mounted and they must be arranged in a symmetrical line.

Horizontal barriers are used to fence the site laterally in the work zone and on the spots that must be fully closed for traffic.

Horizontal barriers serve to fence the site along the carriageways, pavements, cycle tracks and combined walking/cycle tracks.

On frontal and horizontal barrier only two traffic signs may be posted at the most.

Vertical barriers are used to deviate the traffic, separate directions of travel and mark lateral edges of the site. They are mounted in such a manner that the road users can see the barrier face all the time. There are single-sided and double-sided vertical barriers. On a vertical barrier only one traffic sign may be mounted. Round traffic sign is 40 cm in diameter when the following signs are mounted on vertical barrier: (II-45) „pass on the right only”, (II-45.1) „pass on the left only” and (II-45.3) „pass on both sides”.

Distance between vertical barriers in the work zone is up to 10 m within the settlement.

Traffic guidance by the use of vertical barriers in the transitional and final site zone is carried out with minimum 6 vertical barriers.

During the nighttime or when the visibility is reduced, on vertical barriers within the narrowing area flashing lights are to be mounted. On vertical barriers within the activity zone, there is no need to mount flashing lights on every barrier.

The manner of vertical barriers posting depending on the direction of the vehicle travel in the work zone is shown in Enclosure 5 – Rulebook on traffic signals and signs (Official Gazette RS No. 134/2014).

Universal supports are used in the work zones and serve to mount traffic sign posts, frontal, horizontal and vertical barriers, and similar.

Flashing lights are light emitting traffic signs for marking the works on the road and are mounted individually or with the road traffic equipment. They are divided by types depending on their characteristics, place and manner of application, and may work in continuous or flashing regime. The following flashing light types may be used in the work zone: TS-1, TS-2, TS-3, TS-4, TS-5, TS-6, TS-7, TS-8, TS-9.

Materials

Vertical signs consist of the field of Class 2 retro-reflective material painted yellow and red.

Retro-reflective and colourimetric coordinates values are defined in Serbian standard SRPS EN 12899-1 (Class 2 materials).

Acceptance and rejection of the works

To be carried out in accordance with the Construction Contract.

3.24.2.12 Technical conditions for the selected elements of traffic signalisation and equipment

The elements of the projected traffic signalisation and equipment, for the new projected border crossing point include:

- -Traffic signs
- -Road surface markings
- -Traffic equipment

3.24.2.13 Traffic signs and billboards removal

This session includes the following works:

3.24.2.13.1 General provision for traffic signs and billboard removal

The contractor is bound to safely remove all the elements of a road sign, including its **additional accessories, to safely remove the sign's post with its concrete base, to fill the** base hole and to bring the roadside to its normal state. All the elements of the damaged post and its old base should be moved to the place determined by the supervision authority. The measurement and payment is counted per each removed sign including all the costs of loading, unloading, demounting and transport, as well as the roadside repair.

3.1- Standard traffic signs removal

3.2 - Removal of the pipe-sign post carriers

3.3 - Removal of the traffic sign tables

3.24.2.14- Traffic signs

3.24.2.14.1 *General provisions for traffic signs*

Traffic signs include: danger warning signs, mandatory signs and information signs. Additional panels which may be placed alongside the traffic signs are integral part of the sign which further specifies its meaning.

Roadside traffic signs on posts are placed on the roads, crossroads, and in urban areas, outside the pedestrian surfaces.

The distance between the road edge and the sign's edge closest to the road, for signs placed on roads, crossroads and in urban areas outside pedestrian surfaces, should be from 0.5m to 1.5m. The distance between the road edge and the sign's edge closest to the road for signs placed on pedestrian surfaces should be from 0.3m to 1.5m. This position includes preparation, procurement, transport and mounting of standard traffic signs (the signs manufactured entirely in accordance with the detailed drawings and SRP standards, with their respective names, code names and appearance in accordance with the Regulations concerning traffic signalisation).

The installed traffic signs should be secured against turning and removing. They are placed so that their plane from the horizontal to 3° to 5 ° in the field perpendicular to the axis of the road. Standard traffic sign price includes its procurement and delivery to the location of its placement, with all the elements necessary for fixing the sign table on the traffic sign carrier post, and the mounting of the sign on the built-in carrier. The front side of a sign must not contain any fixing points which could impair the sign's readability and reflection, both in daylight conditions and when car headlight are used. The signs can be hardened by reinforcing the sign edges, bending the edge of the material of which the sign is made, or in any other suitable way. For signs with area exceeding 1m², special constructions (skeleton constructions, frames, etc.) can be used. The elements for fixing the sign on the post or posts can form one unit together with the sign, or be fixed with screws, rivets, or welding.

All Sign faces containing symbols, letters and numerals shall have reflective properties with normal retro reflection. Traffic signs are manufactured based on detailed drawings in compliance with relevant standards, in accordance with the effective Rulebook on traffic signals and signs.

According to the Rulebook on traffic signals and signs requirements in terms of traffic signs construction on the streets, the application of Class 2 retro-reflective material has been envisaged (except for the traffic signs specified in the Rulebook where Class 3 retro-reflective material is applied).

Vertical signals and signs have been designed with the following basic elements:

- Triangle-shaped traffic sign having a=900mm
- *Circular traffic sign having dimensions Ø600mm*
- Square-shaped traffic sign having dimensions 600x600mm
- Rectangle-shaped traffic sign having dimensions 600x900mm
- Octagonal-shaped traffic sign having dimensions 600mm

Designed vertical traffic signals and signs have been harmonized with a new Rulebook on traffic signals and signs.

3.25 LIGHT SIGNALISATION AND TRAFFIC EQUIPMENT

3.25.1 General provisions for signalisation and traffic equipment

The position includes the preparing, procurement, transporting and mounting of the elements of light signalisation and traffic equipment. The price of the elements includes the delivery to the placement location, all the elements for fixing onto the carrier or other object, and mounting onto the built-in carrier.

3.26 ROAD SURFACE MARKINGS

3.26.1 List of applied standards

- SRPS U.S4.221 2012 Road markings - Longitudinal markings - Definitions and classification
- SRPS U.S4.222 2014 Road markings - Longitudinal markings - Continuous lines
- SRPS U.S4.223 2012 Road marking - Longitudinal markings - Broken lines
- SRPS U.S4.225 2011 Road marking - Transverse markings - Stop lines
- SRPS U.S4.227 2014 Road marking - Transverse markings - Pedestrian crossings
- SRPS U.S4.230 2014 Road marking - Other markings - Oblique parallel areas
- SRPS Z.S2.300 2011 Road signs - Specifications
- SRPS Z.S2.301 2011 Road signs - Danger warning signs - Design of signs
- SRPS Z.S2.302 2011 Road signs - Signs regulating priority at intersections, danger warning signs at approaches to intersections - Design of signs
- SRPS Z.S2.304 2011 Road signs - Prohibitory or restrictive signs - Design of signs
- SRPS Z.S2.305 2011 Road signs - Mandatory signs - Design of signs
- SRPS Z.S2.306 2011 Road signs - Informative signs - Design of signs
- SRPS Z.S2.307 2011 Road signs - Standing and parking signs - Design of signs

3.26.2 Horizontal signals and signs

The design envisages pavement marking by horizontal traffic signs in compliance with the Rulebook on traffic signals and signs and the effective standards. The subject matter section is marked by the following horizontal signals and signs elements:

- Continuous border line 0.15m wide
- Continuous dividing line 0.15m wide
- Broken lines grid 3.00m+3.00m 0.15m wide
- Broken lines grid 1.00m+1.00m 0.15m wide
- Continuous stop lines 0.50m wide
- Hatched road markings
- Pedestrian crossings 4.00 meters wide

3.26.3 General provisions for surface markings

The projected elements of the road surface markings, for the new projected border crossing point in question, include the following:

- Longitudinal road surface markings
- Transverse road surface markings
- Other road surface markings

3.27 HORIZONTAL SIGNALING

The design envisages carriageway markings on the road in line with Regulation on traffic signaling and applicable standards. The subject section is marked with following carriageway markings:

- Continuous edge line, 0.15m wide
- Continuous dividing line, 0.15m wide
- Broken line grid 3.00m+3.00m, 0.15m wide
- Broken line grid 1.00m+1.00m, 0.15m wide
- Continuous line for stopping, 0.50m wide
- Hatching on the road
- Pedestrian passing 4.0m wide

3.27.1 White carriageway markings

3.27.1.1 Description of works

Dividing line

is used to divide carriageway surfaces according to directions of travel or to divide one direction carriageway in lanes.

Dividing line can be solid, broken or simultaneous solid and broken.

Dividing solid or broken line can be single or double.

Forms of dividing broken line: short broken line, normal broken line and warning line.

Edge line

is used to point out the carriageway edge or to divide emergency lanes. Edge line may be solid or broken, normal or wide. When separating carriageway for special purposes, such as lanes restricted for public transport, bus bays and similar yellow edge lines are applied.

Transverse markings

Transverse markings are set transverse to the carriageway axis or traffic flow and mark places of change of vehicles travel regime. All transverse markings are white and wider than longitudinal lines in order to offset shortages resulting from driver's field-of-view. Transverse markings include: stop lines, pedestrian crossings, bicycle crossings, sprits and limiters.

Other markings

Other road markings comprise elements with primary role to direct drivers (e.g. fields for traffic directing, pointers) or restrict certain carriageway surfaces for special purposes, such as bus stops or taxi ranks.

This section of Technical conditions includes instructions, conditions and explanations related to carriageway markings.

3.27.1.2 Materials

Technical conditions for materials for asphalt and concrete carriageway markings, requirements and conditions for execution of works and technical properties of carriageway marks are defined by relevant Serbian Standards.

For carriageway markings may be used only materials whose traffic and technical properties and quality ensure good visibility of markings during daylight or night driving. Applied materials should have appropriate coarse texture and durability within the required time frame. Material properties and quality must correspond to the traffic loading.

Paints are liquid or viscous materials composed of pigments, binding agents, fillers, solvents and reflective glass beads.

Plastic materials are plastic-based liquid or viscous materials which are applied on the carriageway surface according to special procedure.

Marking material composition and manner of application must ensure reflective properties of road markings.

Light reflectivity or retro-reflection is obtained by addition of reflective glass beads which can be previously mixed with paint or sprinkled over a fresh paint layer.

3.27.1.3 Material quality

Materials used for road markings must not have adverse impact on materials embedded in the pavement construction wearing course which could cause damages.

Road markings type, shape and position, as well as their meaning and manner of signing conform to Serbian Standards SRPS.U.C4.221 – SRPS.U.C4.234, SRPS EN1436 and to the Rulebook on traffic signals (Official Gazette of RS, No. 134/2014). Properties of materials for road markings depending on the road type, are given under Section 8 of the content of this project, in compliance with the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014 - Annex 1).

Minimum required characteristics and control of thick-layer, medium-layer and thin-layer markings are determined by the standards SRPS EN 1436:2011, SRPS EN 1824:2008 , EN 1871, SRPS EN 13197:2011, SRPS EN 12802:2008 and ZTV M 02.

3.27.1.4 Work performance technology

Modification of the road marking shape determined by Serbian Standards, including marking deformation, erroneous marking or insertion of new elements is not allowed.

Markings which do not conform to the determined shape must be permanently removed.

After application of the marking, the carriageway shall be ready for traffic in maximum 45 minutes. Works should be performed under dry weather conditions at temperatures from +10°C to +30°C, relative humidity not exceeding 85% and carriageway temperature from +5°C to +45°C;

Prior to painting, carriageway surface must be completely dry and clean and free of dust and residual salt. Oil and grease stains must be removed prior to painting.

On the new asphalt driveways only temporary markings are painted, which are replaced by permanent markings after the final asphalt layer is stabilised.

The preparation of the extremely rough carriageway surface is performed by brushing, air blowing and rinsing. In the case of highly polished surface, worn concrete or asphalt surface, the surface must be previously roughened or impregnated.

The minimum thickness of dry thin-layer longitudinal road markings is 0.200 mm (up to 4.000 vehicles/per day) and 0.250 mm (over 4.000 vehicles/per day). The minimum thickness of transverse

road markings is 0.250 mm (up to 4.000 vehicles/per day) and 0.300 mm (over 4.000 vehicles/per day).

If it is established that over 10% of marking surface having the layer thickness less than the minimum required thickness, the layer must be reapplied.

The procedure and equipment for carriageway coating application must ensure that the works zones do not affect traffic safety and safety of the workers.

3.27.1.5 Quality control

All materials must conform to durability specifications and quality requirements and Contractor shall provide the Quality Certificate.

The adequacy of the road markings made of one or more materials and one or more supplements that must comply with requirements related to the intended use, is proved by the testing. The testing methods are based on the requirements of EN 1871 and SRPS EN 13197: 2011, while the characteristics are set forth in the Standard SRPS EN 1436: 2011.

3.27.1.6 Yellow carriageway markings

3.27.1.7 Description of works

All yellow road markings shall be applied in the same manner and under the same conditions as white road markings.

3.27.1.8 Materials

Technical conditions for materials for asphalt and concrete carriageway markings, requirements and conditions for execution of works and technical properties of carriageway marks are defined by relevant Serbian Standards.

For carriageway markings may be used only materials whose traffic and technical properties and quality ensure good visibility of markings during daylight or night driving. Applied materials should have appropriate *coarse* texture and durability within the required time frame. Material properties and quality must correspond to the traffic loading.

Paints are liquid or viscous materials composed of pigments, binding agents, fillers, solvents and reflective glass beads.

Plastic materials are plastic-based liquid or viscous materials which are applied on the carriageway surface according to special procedure.

Marking material composition and manner of application must ensure reflective properties of road markings.

Light reflectivity or retro-reflection is obtained by addition of reflective glass beads which can be previously mixed with paint or sprinkled over a fresh paint layer.

Road markings type, shape and position, as well as their meaning and manner of signing conform to Serbian Standards SRPS.U.C4.221 – SRPS.U.C4.234, SRPS EN1436 and to the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014). Properties of materials for road markings

depending on the road type, are given under Section 8 of the content of this project, in compliance with the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014 - Annex 1).

3.27.1.9 Material quality

Materials used for road markings must not have adverse impact on materials embedded in the pavement construction wearing course which could cause damages.

Road markings type, shape and position, as well as their meaning and manner of signing conform to Serbian Standards SRPS.U.C4.221 – SRPS.U.C4.234, SRPS EN1436 and to the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014). Properties of materials for road markings depending on the road type, are given under Section 8 of the content of this project, in compliance with the Rulebook on traffic signals and signs (Official Gazette of RS, No. 134/2014 - Annex 1)

Minimum required characteristics and control of thick-layer, medium-layer and thin-layer markings are determined by the standards SRPS EN 1436:2011, SRPS EN 1824:2008 , EN 1871, SRPS EN 13197:2011, SRPS EN 12802:2008 and ZTV M 02.

3.27.1.10 Work performance technology

Modification of the road marking shape determined by Serbian Standards, including marking deformation, erroneous marking or insertion of new elements is not allowed.

Markings which do not conform to the determined shape must be permanently removed.

After application of the marking, the carriageway shall be ready for traffic in maximum 45 minutes. Works should be performed under dry weather conditions at temperatures from +10°C to +30°C, relative humidity not exceeding 85% and carriageway temperature from +5°C to +45°C;

Prior to painting, carriageway surface must be completely dry and clean and free of dust and residual salt. Oil and grease stains must be removed prior to painting.

On the new asphalt driveways only temporary markings are executed, which are replaced by permanent markings after the final asphalt layer is stabilised.

The preparation of the extremely rough carriageway surface is performed by brushing, blowing of the area and rinsing. In the case of highly polished surface, worn concrete or asphalt surface, the surface must be previously roughened or impregnated.

The minimum thickness of dry thin-layer longitudinal road markings is 0.200 mm (up to 4.000 vehicles/per day) and 0.250 mm (over 4.000 vehicles/per day). The minimum thickness of transverse road markings is 0.250 mm (up to 4.000 vehicles/per day) and 0.300 mm (over 4.000 vehicles/per day).

If it is established that over 10% of marking surface having the layer thickness less than the minimum required thickness, the layer must be reapplied.

The procedure and equipment for carriageway coating application must ensure that the works zones do not affect traffic safety and safety of workers.

3.27.1.11 Quality control

All materials must conform to durability specifications and quality requirements and Contractor shall provide the Quality Certificate.

The adequacy of the road markings made of one or more materials and one or more supplements that must comply with requirements related to the intended use, is proved by the testing. The testing methods are based on the requirements of EN 1871 and SRPS EN 13197: 2011, while the characteristics are set forth in the Standard SRPS EN 1436: 2011.

3.28 TECHNICAL REQUIREMENTS FOR WORK EXECUTION - SEWERAGE

3.28.1 General Requirements

Technical requirements are an integral part of the design and are mandatory for the contractor. The contractor is obliged to comply with all provisions of technical regulations for ground, construction, water, reinforced-concrete and other works during work execution.

All works and purchase of materials shall be done in line with general requirements, description of bill of quantities, technical descriptions, drawings, details, instructions by the supervisor

For all deviations from the design, the contractor is obliged to obtain Supervisor opinion and written approval from the supervisory organ (investor).

Material for installation must be new, undamaged, for which the contractor is obliged to submit a sample of to the supervisory organ, i.e. a certificate for review and approval, as well as proof on systematic testing of material for installation, and is subject to regulations on testing during installation.

Material that does not comply with technical regulations, conditions and standards should not be installed, and the contractor is obliged to remove it from the construction site at its own expense.

The investor is obliged to obtain timely resolution of administrative tasks for construction of the object (construction permit, etc.)

In case that technical documentation is incomplete or incorrect, the contractor is obliged to warn the investor in a timely manner to supplement and update it otherwise he will bear all the costs and consequences resulting from the inaccuracy. If there are no detailed situational plans in the technical documentation provided to the contractor, it is necessary to survey the terrain by the investor or its supervisory organ prior to commencement of works, and to create appropriate bases with sufficient levels, permanent points, profiles and other elements relevant for the future works on the object.

The investor is obliged to timely vest the contractor in the construction site; as well as to show the contractor the place where the exploitation of certain materials can be performed (sand, pebbles, stone, etc.).

Also, the investor is obliged, for the needs of constructing temporary auxiliary facilities (barracks, warehouses, etc.) to determine with the contractor the most suitable locations; and to submit a list of benchmarks and other geodetic points and to show their locations in the field to the contractor; and timely deliver the technical documentation or parts of the documentation necessary for the execution of the works.

The contractor's duty is to timely deliver the required building materials, tools, machinery and everything else necessary for the construction to the construction site in order to start and finish of construction within the contracted time. In addition to the above mentioned elements, the precondition for quality and timely execution of works is professional and qualified staff, which the contractor must have in sufficient number on the construction site.

The contractor is obliged to backfill all holes, trenches and walls which had to be excavated/open during work execution and to restore them to their original state. Aside from that, the contractor must clean the entire surrounding terrain around the site must of construction material which was used during execution, and hand over the object with clean floors and walls, as well as carpentry, that is node points in the object.

Prior to giving an offer for construction of the object, the contractor should visit the terrain in order to get acquainted with field, climate and other conditions and characteristics, construction possibilities and other elements important for determining realistic unit prices for participation in bidding.

Prior to work commencement, the contractor is obliged to get acquainted with local conditions, regulations, access roads, possible landfills and other factors which could affect smooth work execution.

Calculation of executed works shall be done in line with the offer and the contract, based on measures and quantities entered into the measurement book, certified by the supervisory organ. Construction of access roads and auxiliary objects is not charged separately, but it's included in the unit prices given in the bill of quantities; this must be considered when compiling a bid to participate in the auction.

The contractor is obliged to apply valid technical measures for work safety.

3.28.1.1 Sewerage Route Marking

Sewerage route marking on the site before beginning the works, establishing the benchmark points along the route with marking protocol.

Calculation per m' of marked pipeline.

3.28.1.2 Surveying the As-Built Sewerage Object

Surveying the as-built object with entering the information into KAT-KOM done by organization authorized for this type of work.

In addition to surveying pipelines, record and make a cadastre of the underground installations which should contain all installations and objects located on the sewerage route. Upon completion of works, the Contractor is obliged to hand over a certificate on performed surveying of constructed object to the Investor, issued by an authorized institution.

3.28.2 Preliminary Works

3.28.2.1 Cleaning The Terrain

Prior to work commencement, mark the wire work front, clean the terrain of all obstacles, trash and bushes. Cut and remove other small plants. All other obstacles which interfere with work execution should be removed as appropriate.

3.28.2.2 Stopping of Places with Existing Installations

Prior to work commencement, stop the existing installations. Location of stopes shall be determined after thorough inspection of KAT KOM excerpt. Data obtained by stoping (position and depth of pipes) shall be compared with data from KAT KOM and position of the pipeline route given

in the design. If deviations are larger and present an issue during construction, the Contractor shall notify the installation owner, supervisor, who will provide appropriate solution.

3.28.2.3 Removal of Humus

Removal of humus layer shall be done mechanically, within designed widths and thickness, or per supervisory organ's order. Removal of humus will be done after required marking. Deposit a quantity of removed humus required for topsoiling of green areas to a temporary landfill and prepare the excess for transport.

3.28.2.4 Tree Cutting

Cut the trees in zone width included in work execution for construction of sewerage. Cut notches mechanically at 80 cm from the terrain level, and fell the cut trees carefully. Cut the branches, categorize the wood mass, prepare for transport, load into a transport vehicle and transport it to the landfill. Determine a place for deposition with approval from the Supervisory organ. Take protective measures during works to avoid possible damage on adjacent objects and other property.

Calculation of works per piece of fell tree, for all works, material and transport, categorized according to trunk girth: up to 30 cm, 31-60 cm, and over 60 cm.

3.28.2.5 Removal of Stumps and Roots

Remove the stumps and roots in zone width included in work execution for construction of sewerage. Mechanically remove the stumps. Categorize the wood mass, load into a transport vehicle and transport it to the landfill. Determine a place for deposition with approval from the Supervisory organ.

Calculation of works per piece of removed stump, for all works, material and transport, categorized according to trunk girth: up to 30 cm, 31-60 cm, and over 60 cm.

3.28.3 Ground Works

3.28.3.1 Mechanical Trench Digging

Mechanical trench digging should be done with depositing material to one side on the minimal distance of 2.0m from the edge of the trench or with direct loading into a vehicle for transport to the landfill. Mechanical trench digging should be done according to the data from longitudinal and cross section of the trench to a depth of 0.2m from the designed trench bottom. The width and depth of the trench are in line with the design solution. On parts of the route where the pipeline passes through arable land, remove the humus of the designed thickness and deposit separately for later restoration, after backfilling of the trench. Trench digging should be done with vertical sides which must be protected from collapsing. All excavations should be done exactly to the designed height and the elevations of the trench shall be checked and accepted in writing through a construction log by the supervisor. Incorrect excavation shall not be accepted and over break has to be backfilled and compacted, or in certain cases, on which the supervisor decides, compacted with concrete min. CC 10, at the expense of the Contractor. If, during the excavation, unknown underground structures or lines show up, or the soil composition is different than expected, the Contractor must implement security measures and notify the Supervisor at once, to determine guidelines for further operations.

Remove rocks, roots and coarse turf from the excavated material which is then used to backfill the trench. During the trench excavation, take all safety precautions during operation as well as in cases of inclement weather, so there are no damages to the executed work. The quantity of mechanical excavation for the calculation are obtained by measuring the actual executed excavation in a fused state or according to changes allowed by the supervisor.

3.28.3.2 Manual Trench Digging

Execute the manual trench digging with depositing the material outside the trench. Excavation is done as follows:

at 0.2 m above the designed level;

at points of intersection with existing installations;

at the part of the route specially designated by the design and due to impossibility of mechanical works.

Manual excavation should be done in accordance with the longitudinal profile. The width and depth of the trench are in line with the design. Trench digging should be done with vertical sides which must be protected from collapsing. All excavations should be done exactly to the designed height and the elevations of the trench shall be checked and accepted in writing through a construction log by the supervisor. Remove rocks, roots and coarse turf from the excavated material which is then used to backfill the trench. At the points of intersection with the existing installations, the trench works should be executed in presence of the authorized person who owns the aforementioned installation. Manual excavation is done with mandatory protective support. The quantity of excavation for the calculation is obtained by measuring the actual executed excavation in a fused state or according to changes allowed by the supervisor.

Calculation is done per m³ of excavated material per lamellas 0 - 2 m, 2 - 4 m and 4 - 6 m, depth and category of soil.

3.28.3.3 Manual Trench Digging for House Connections

Execute the manual trench digging with depositing the material outside the trench. Excavation is done on the part of route where there is no possibility of mechanical works.

Manual excavation should be done in accordance with the longitudinal profile. Trench is 0.6 m wide and the depth is determined by design. Trench digging should be done with vertical sides which must be protected from collapsing. All excavations should be done exactly to the designed height and the elevations of the trench shall be checked and accepted in writing through a construction log by the supervisor. Remove rocks, roots and coarse turf from the excavated material which is then used to backfill the trench. At the points of intersection with the existing installations, the trench works should be executed in presence of the authorized person who owns the aforementioned installation. Manual excavation is done with mandatory protective support. The quantity of excavation for the calculation are obtained by measuring the actual executed excavation in a fused state or according to changes allowed by the supervisor.

3.28.3.4 Planning and Compacting Trench Bottom

Planning of the trench bottom is done manually with accuracy up to 1cm according to designed elevations and slopes with deposition of excess material outside the trench. Planning work is done with mandatory protective support. Include average excavation of 0,05 m³/m² in position price. Compacting the subsoil is done after planning the trench bottom, by mechanical means to the required density. Achieved density must be at least 15 MPa. In case that required density can't be achieved at certain points, the compacting should be continued by adding sandy/gravelly material until the required density is achieved.

3.28.3.5 Planning and Compacting Trench Bottom for House Connections

Planning of the trench bottom is done manually with accuracy up to 1cm according to designed elevations and slopes with deposition of material outside the trench. Planning work is done with mandatory protective support. Average excavation of 0,05 m³/m² is included in position price. Compacting the subsoil is done after planning the trench bottom, by mechanical means to the required density. Achieved density must be at least 15 MPa. In case that required density can't be achieved at certain points, the compacting should be continued by adding sandy/gravelly material until the required density is achieved.

3.28.4 Making of The Sand Bed

Spreading and planning of the sand bed according to the designed elevations and slopes with maximum deviation of 1cm. Layer thickness is defined by the design. The position price includes the

purchase of the sand (franko load), transport, unloading along the trench, inserting into the trench, planning and spreading and all in accordance with the regulations for that type of work. Test the load after completed planning and compacting of sand bed. Sand bed density should be at least 95% of maximum laboratory density per standard Proctor procedure. If the testing is done through degree of compactability, then the sand bed load should be $M_s > 15 \text{ MN/m}^2$.

3.28.4.1 Making of The Sand Bed For House Connections

Spreading and planning of the sand bed according to the designed elevations and slopes with maximum deviation of 1cm. Layer thickness is defined by the design. The position price includes the purchase of the sand (franko load), transport, unloading along the trench, inserting into the trench, planning and spreading and all in accordance with the regulations for that type of work. Test the load after completed planning and compacting of sand bed. Sand bed density should be at least 95% of maximum laboratory density per standard Proctor procedure. If the testing is done through degree of compactability, then the sand bed load should be $M_s > 15 \text{ MN/m}^2$.

Note: connections are from regulation line to main route.

3.28.4.2 Backfilling the Trench with Sand

Backfilling the trench with sand is done to the designed level or existing road structure, other public area intended for vehicle and pedestrian traffic or up to the designed level. The backfilling should be done in layers of 20 to 30cm thick, with compacting and soaking. Test the density and deliver the certificates on density to the Supervisory organ upon backfilling of the trench.

Density of trench backfill under city roads should be 100% of maximum laboratory density per Proctor's procedure (in line with SRPS U.B1.046:1969). If the testing is done through degree of compactability SRPS U.B1.046:1969 then the load of installed sand in the trench, at the bed level under the roads should be $M_s = 25 \text{ MN/m}^2$.

Under pedestrian and bicycle paths, passenger vehicle parking and sports and recreation facilities, required density per Proctor's procedure in final 30 cm thick layer should be 98% of maximum laboratory density SRPS U.B1.016:1992, and $M_s = 20 \text{ MN/m}^2$.

Calculation per m^3 of completed work, for all works and material.

3.28.4.3 Backfilling The Trench With Sand, For House Connections

Backfilling the trench with sand is done to the designed level or existing road structure, other public area intended for vehicle and pedestrian traffic or up to the designed level. The backfilling should be done in layers of 20 to 30cm thick, with compacting and soaking. Test the density and deliver the certificates on density to the Supervisory organ upon backfilling of the trench.

Density of trench backfill under city roads should be 100% of maximum laboratory density per Proctor's procedure (in line with SRPS U.B1.046:1969). If the testing is done through degree of compactability SRPS U.B1.046:1969 then the load of installed sand in the trench, at the bed level under the roads should be $M_s = 25 \text{ MN/m}^2$.

Under pedestrian and bicycle paths, passenger vehicle parking and sports and recreation facilities, required density per Proctor's procedure in final 30 cm thick layer should be 98% of maximum laboratory density SRPS U.B1.016:1992, and $M_s = 20 \text{ MN/m}^2$.

Note: connections are from regulation line to main route.

3.28.4.4 Backfilling The Trench With The Soil From The Excavation

Backfill the trench with the material from the excavation. Backfilling should start after checking the quality of the pipeline installation i.e. geodetic surveying of the installed pipeline. According to the execution conditions, it is necessary to backfill the installed pipeline with sand up to 30 cm above the pipe top, the backfilling should be done with disintegrated soil from the excavation, in layers up

to 20cm, with mechanical compression. Smallest allowed density of the backfilled soil should be at least as density of the surrounding soil, where the density should be 95% of maximum laboratory density per Proctor's procedure. The material from the excavation used for backfilling must not contain large pieces of soil, rocks, leaves, roots and other larger pieces.

3.28.4.5 Backfilling The Trench With The Soil From The Excavation, For House Connections

Backfill the trench with the material from the excavation. Backfilling should start after checking the quality of the pipeline installation i.e. geodetic surveying of the installed pipeline. According to the execution conditions, it is necessary to backfill the installed pipeline with sand up to 30 cm above the pipe top, the backfilling should be done with disintegrated soil from the excavation, in layers up to 20cm, with mechanical compression. Smallest allowed density of the backfilled soil should be at least as density of the surrounding soil, where the density should be 95% of maximum laboratory density per Proctor's procedure. The material from the excavation used for backfilling must not contain large pieces of soil, rocks, leaves, roots and other larger pieces.

Note: connections are from regulation line to main route.

3.28.4.6 Topsoiling Of Backfilled Trenches

At places where the trench for pipe installation was dug through green areas, topsoil the backfilled and compacted trench in layer 15 - 20 cm thick with humus deposited during removal of humus. Light roll the humus layer - compact it and green it.

3.28.4.7 Transport Of The Excess Soil From The Excavation (Network And House Connections)

Load, transport, unload and spread the excess soil from the excavation to the city landfill or another landfill whose location is determined by the Supervisor. The transport length is determined by the design. Quantities for calculation are done by measuring really transported material in loose state (soil bulking coefficient $k=1.20$).

3.28.5 Carpentry Works

3.28.5.1 Building The Trench Support

The dug trench should be secured with proper wooden formwork with horizontal planks that are fastened by vertical columns and are strutted by braces. Vertical columns must be made of quality wood and without knots. Ladders should be used for entering and exiting the trench. The trench must not be left unsecured during the holidays, over nights and during breaks within working hours. Once the backfilling of the trench starts, the safeguards should be removed gradually, taking into account the safety of the formwork which remains in use. The formwork should be checked daily and any deficiencies should be removed at once; the work should be continued only upon the approval from the supervisor after the removal of deficiencies and the formwork fastened again.

3.28.5.2 Building The Trench Report Of Sheet Piles

The dug trench should be secured on both sides with sheet piles, fixed in autochthonous soil on the bottom end. Middle and top parts of double side sheet piles shall be secured with horizontal longitudinal and cross supports, all in line with static calculation for support elements in the design.

The trench must not be left unsecured during the holidays, over nights and during breaks within working hours. Once the backfilling of the trench starts, the safeguards should be removed gradually, taking into account the safety of the formwork which remains in use. The formwork should be checked daily and any deficiencies should be removed at once; the work should be continued only upon the approval from the supervisor after the removal of deficiencies and the formwork fastened again.

3.28.6 Installation Works

3.28.6.1 Purchase, Transport And Installation Of Hard Pvc Sewerage Pipes With Sealing Rings

Purchase, transport and install hard PVC sewerage pipes with appropriate rubber sealing rings. Pipelines installation procedure should be done as prescribed by the pipe manufacturer. When placing pipes into the trench and during their installation, check if pipes are placed in the designed fall without horizontal and vertical breaks. The control should be done in the presence of a Supervisor and with a surveying instrument. Pipe category is determined by static calculation in the design.

3.28.6.2 Purchase, Transport and Installation of Hard PVC Short Sewerage Pipes With Sealing Rings

Purchase, transport and installation of short sewerage pipes made of hard PVC, l = 1.0 m, with appropriate rubber sealing rings, all in line with designed diameters, given specification and manufacturer's instructions.

Description of the position like pos. 5.01

Calculation of executed works per piece of purchased and installed pipe, for all works and material, according to type.

3.28.6.3 Purchase And Installation of KGF Shaft Bushing

Purchase, transport and install the KGF shaft bushing with rubber sealing. For connecting the pipes to the shaft use KGF shaft bushing which allows correction of the inverted pipe up to 5° and makes a water-resistant connection. During the installation, the Contractor must work in accordance with the drafts from the design and the instructions from the manufacturer.

Calculation of executed works per installed piece for all works and material.

3.28.6.4 Purchase, Transport and Installation Of Pvc Fittings

Purchase, transport and installation of PVC fittings, for connections to street sewerage, with appropriate rubber sealing rings, all in line with designed diameters, given specification and manufacturer's instructions.

Calculation of executed works per piece of purchased and installed fitting, for all works and material.

3.28.6.5 Purchase, Transport And Installation of Polyester Sewerage Pipes

Purchase, transport and installation of polyester pipes, all in line with designed diameters, given specification and manufacturer's instructions. Pipe category is determined by static calculation in the design.

Pipeline installation is done from shaft to shaft, in sections about 30 m long. Prior to installation, all executed works on the subject section must be completely inspected and accepted by the Supervisory organ.

All purchased polyester pipes with connecting and sealing material and all fittings must hold factory certificates in line with standards and requirements by the Investor. Pipes with visible damages and not conforming to standards must not be installed.

Connecting the polyester pipes is done by a clamp with a double sleeve - "VETO" clamp, with rubber sealing rings and bar chairs.

Pay special attention to connecting the pipes and installing "VETO" clamps, since this enables continuity and functionality of the pipeline.

3.28.6.6 Purchase, Transport And Installation of Short Polyester Sewerage Pipes

Purchase, transport and installation of short polyester pipes, $l = 1.0$ m, all in line with designed diameters, given specification and manufacturer's instructions.

Calculation of executed works per piece of purchased and installed pipe, for all works and material, according to type.

3.28.6.7 Purchase, Transport And Installation Of Polyester Sewerage Clamp ("Veto")

Purchase, transport and installation of polyester sewerage clamp "VETO" with rubber sealing rings and bar chairs, all in line with designed diameters, given specification and manufacturer's instructions.

Calculation of executed works per piece of purchased and installed clamp, for all works and material, according to type.

3.28.6.8 Purchase, Transport and Installation Of Polyethylene Sewerage Pipes With Ring Stiffenings

Purchase, transport and installation of polyethylene sewerage pipes with radial (ring) stiffening. Pipes can be made of polypropylene as well if required by installation conditions (chemical conditions, mechanical conditions, etc.) Pipe category is determined by static calculation in the design. Pipeline installation is done from shaft to shaft. Prior to installation, all executed works on the subject section must be completely inspected and accepted by the Supervisory organ.

All purchased pipes and all fittings must hold factory certificates in line with standards and requirements by the Investor. Pipes with visible damages and not conforming to standards must not be installed.

Connection method is determined by the design, in line with recommendations by the supplier of pipes.

3.28.6.9 Purchase, Transport And Installation Of Cast Iron Sewerage Pipes With Sleeve

Purchase, transport and installation of cast iron sewerage pipes with sleeve SRPS ISO.7186 (DIN EN598) for gravitational pipelines. Pipes are protected on the internal side by cement mortar with high content of aluminates, and on the external side, the pipe is galvanized and protected by epoxy based coatings. Sealing rubber is nitrile rubber (NBR) and is resistant to all polluting matters. Pipeline installation is done from shaft to shaft. Prior to installation, all executed works on the subject section must be completely inspected and accepted by the Supervisory organ.

All purchased pipes and all fittings must hold factory certificates in line with standards and requirements by the Investor. Pipes with visible damages and not conforming to standards must not be installed. Pipes are installed on a prepared sand bed, and it is necessary to dig a niche at points of connection in the bedding. Pipes must lie on the sand bed along the entire length. Pipes are assembled by special devices and tools for assembling.

Contractor must adhere to pipe manufacturer's instructions during transport and installation.

The position description in the bill defines nominal diameter, pressure, connection type and other internal and external protection.

3.28.6.10 Purchase, Transport And Installation Of Short Cast Iron Sewerage Pipes

Purchase, transport and installation of short sewerage cast iron pipes, with or without a sleeve, all in line with designed diameters, given specification and manufacturer's instructions.

3.28.6.11 Purchase, Transport And Installation of Connection Cast Ring On The Shaft For Ductile Cast Sewerage Pipes With Sleeve

Purchase, transport and installation of connection ring to shaft for cast iron pipes "TYTON", all in line with designed diameters, given specification and manufacturer's instructions.

3.28.6.12 Purchase, Transport And Installation of Fittings For Cast Iron Sewerage Pipes With Sleeve

Purchase, transport and installation of cast iron fittings, for connections to street sewerage, with appropriate rubber sealing rings, all in line with designed diameters, given specification and manufacturer's instructions.

Bill of quantities should include type and characteristics of fittings.

3.28.6.13 Purchase And Installation of PVC Drainage Pipes

Purchase, transport and installation of PVC drainage pipes, with appropriate sealing material, all in line with designed diameters, given specification and manufacturer's instructions.

3.28.6.14 Purchase And Installation of Drainage Pipes

Purchase, transport and installation of PE drainage pipes, with appropriate sealing material, all in line with designed diameters, given specification and manufacturer's instructions.

3.28.6.15 Purchase And Installation Of Reinforced Sewerage Vibro Pipes

Purchase, transport and installation of reinforced concrete sewerage vibro pipes with protective CA strip made of geotextile, width equals pipe diameter (D), installed on the joint between two pipes.

Diameter, wall thickness of the pipe and load of the pipe top are defined by the design.

Pipeline installation is done from shaft to shaft, which means the entire section must be completely prepared prior to installation and inspected by the Supervisory organ. Purchase concrete pipes must hold a factory certificate and only such can be delivered and stored on the construction site. Pipes with visible damages and not conforming to standards must not be installed.

Special attention must be paid to connecting the pipes and installing geotextile, all in line with pipe manufacturer's instructions.

3.28.6.16 Purchase And Installation of Protective Steel Pipe

Purchase, transport and installation of protective steel pipe. Protective steel pipe's diameter and wall thickness is in line with the design. Shape and measures of the pipe all in line with SRPS C.B5.240:1973 Pipes are protected on the internal side by U1 type insulation and the external side is insulated by A1 protection. External anti corrosion protection of the pipeline consists of cleaning and repair of basic workshop minimum coat by a brush, on dry and clean surfaces. Mechanical application of two coats in gray tone. Later application of insulation at the point of connection between pipes. Service pipe relies on sliders.

3.28.7 Concrete Works

3.28.7.1 Construction of Round Reinforced Concrete Cc30 Shafts

Making of concrete inspection shaft out of reinforced water-tight concrete CC30, in natural finish, wall thickness $d = 15$ cm, round base, light opening $\varnothing 1000$ mm, with conical end $h = 60$ cm, reduction $\varnothing 100/60$ cm. Channel frame and cover are made of cast iron with rectangular frame. Concrete wreath around the shaft cover is made of reinforced concrete CC 30, $\varnothing 1000$, thickness $d = 20$ cm, and shaft is founded on a square-based concrete slab 1.70×1.70 m, thickness $d = 20$ cm, CC 30. Cover base is made of concrete $d = 10$ cm and gravel tampon $d = 10$ cm. Channel is made of half-pipe poured with concrete CC10, in a slope 1:3. Connections to the shaft are short pipes, diameter of inlet and drain channel. Connection between pipes and shafts is achieved by KGF sleeve. Standard ladders SRPS M.J6.285:1971 are constructed on vertical guide of the shaft.

Position price includes all necessary formwork, additional excavation of the trench and additional backfilling by sand or gravel and necessary fitting.

Described type of the shaft can be composed of installed elements that meet the designed conditions as well.

The bill must contain total and average height of the shaft, measured from foundation level to cover level, type and load of the cover and quantity of reinforcement.

Calculation per piece of completed shaft, for all works and material.

3.28.7.2 Construction of Rectangular Reinforced Concrete Cc30 Shafts

Making of concrete inspection shaft out of reinforced water-tight concrete CC30, in natural finish, rectangular base, with conical end $h = 60$ cm, reduction $\varnothing 100/60$ cm. Channel frame and cover are made of cast iron with rectangular frame. Concrete wreath around the shaft cover is made of reinforced concrete CC 30, $\varnothing 1000$, thickness $d = 20$ cm, and shaft is founded on a square-based concrete slab, CC 30. Cover base is made of concrete $d=10$ cm and gravel tampon $d = 10$ cm. Channel is made of half-pipe poured with concrete CC10, in a slope 1:3. Connections to the shaft are short pipes, diameter of inlet and drain channel. Connection between pipes and shafts is achieved by KGF sleeve. Standard ladders SRPS M.J6.285:1971 are constructed on vertical guide of the shaft.

Position price includes all necessary formwork, additional excavation of the trench and additional backfilling by sand or gravel and necessary fitting.

The bill must contain internal dimensions of the shaft (base and height), wall thickness, top and bottom pads, quantity and type of the entire reinforcement, type and load of the cover.

3.28.8 Other Works

3.28.8.1 Inspection of The Pipeline With A Camera

Inspect the constructed pipeline with a special camera. Engage a professional service from an authorized institution for inspection. The contractor is obliged to submit the recording material (CD) of the constructed object.

3.28.8.2 Securing The Construction Site During The Work Execution

Securing the construction site during the work execution is done by placing wooden columns and protective tape.

3.28.8.3 Installation of Pipeline Marking

Purchase and install marks for marking the pipeline route. Install in such way that position of the sewerage route can be determined with certainty. Shape and dimensions displayed in the detail.

3.28.8.4 Excavation of The Existing Traffic Surfaces

Excavate the traffic structure at points where the pipeline route passes. Mechanical excavation, with adequate tools, flat edge cutting in order to avoid crushing and breaking of the final layer of road (asphalt, concrete, stone cubes, etc.) Excavation width is wider than trench width by 20 cm. All expenses that arise from wrong excavation shall be borne by the Contractor. Excavated material shall be loaded in trucks and taken to a city landfill or per order by the Supervisor.

3.28.8.5 Restoring The Traffic Surfaces Into Technically Correct Condition

It is necessary to restore the excavated public area in technically correct condition after backfilling and compacting the trench up to prescribed density on the sand bed level as well as acceptance by

the Supervisory organ. At the point where pipeline passes through the road body, construct a new road structure, thickness and composition in line with the road and designed traffic load. The sewerage construction contractor is obliged to submit certificates on density of crushed stone layer to the Supervisor prior to constructing the road surface. If the achieved density meets the standards for construction of adequate road, the construction can begin. Structure layers shall be done in line with adequate regulations and with required testing.

3.28.8.6 Excavation Of Existing Road Vehicle Access, Bus Stops And Sidewalks Made Of Concrete, Asphalt, Behaton Or Crushed Stone

Excavation of existing road vehicle access, bus stops and sidewalks made of concrete, asphalt, behaton or crushed stone at points of passing of sewerage route and house connections. Unit price includes excavation of the existing surface with loading and transport of debris to the landfill.

3.28.8.7 Restoring Existing Vehicle Access, Bus Stops And Sidewalks Made Of Concrete, Asphalt, Behaton Or Crushed Stone Into Original State

Excavation of existing road vehicle access, bus stops and sidewalks made of concrete, asphalt, behaton or crushed stone into original state. The position includes preparation of bedding, making of formwork, purchase and installation of gravel or crushed stone for tampon layer which must have required density, and purchase and installation of concrete CC20, asphalt or behaton on the tampon layer.

3.28.8.8 Demolition of Curbs

Demolition of concrete, stone and other curbs and concrete base at sections above the trench. Demolished curbs and concrete debris shall be loaded in vehicles and transported to a landfill designated by the Supervisory organ.

3.28.8.9 Installation of Curbs

Purchase, transport and installation of curbs on a CC20 concrete base, all in line with existing model, i.e. regulations for this type of work.

3.28.8.10 Construction of Temporary Road Structure Made of Crushed Stone

Construction of temporary road structure made of crushed stone $d = 20$ cm over backfilled and compacted trench. The position includes purchase, transport and installation of crushed stone in a layer 20 cm thick. The position includes temporary leveling and adding crushed stone.

3.28.8.11 Installation of Steel Pads Over The Backfilled Trench For Heavy Traffic

Placing and installation of steel pads over the backfilled trench, in traffic zone, for smooth running of heavy traffic during work execution. Pads are removed just before restoring the road structure into its original state. The position includes transport, installation, removal and transport of steel pads.

3.28.8.12 Placing of Temporary Pedestrian Crossing

At points of intersection of sewerage route and existing streets, place temporary wooden pedestrian crossings with fence to enable smooth access to residential buildings for pedestrians and access from side streets. The pedestrian crossing must be constructed of quality wood and safe for temporary use. Unit price includes construction of crossing with a fence and removal when there is no need for it.

3.28.8.13 Installation of Traffic Signs

Install appropriate traffic signs along the trench route while the work is in progress. Traffic sign installation is done according to the separate design for technical regulation of traffic.

3.28.8.14 Maintenance of Traffic Signs

Maintenance of the installed traffic signs, displacement according to dynamics of work progress and possible additional purchase of missing traffic signs, determined by the design for technical regulation of traffic.

3.28.8.15 Pumping of Silty And Waste Water By A Mud Pump

Pumping the silty and waste water by a mud pump from the working pit or shaft. The position includes transport and lowering the pump, installation of suction and pressure pipelines, power supply, pumping the silty and waste water, and disassembly of the mentioned equipment upon completion of works.

3.28.8.16 Lowering The Groundwater Level By Waterpoints

Lowering of groundwater level is done only in case the ground water level is higher than the level of trench bottom. Lowering of water level is done during execution of following works: trench excavation, planning of trench bottom, installation works, strutting of trench sides, and construction of shafts and backfilling of the trench above the ground water level.

Lowering the groundwater level is done by waterpoints stuck on both sides of the trench.

3.28.8.17 Lowering The Groundwater Level

Lowering the groundwater and waste water level, to the level of the excavation bottom, method adequate for work execution technology, all in line with regulations for that type of works and real situation on the terrain. The price includes works, material and equipment required for work execution, including power distribution, generator and similar, and disassembly of the equipment after completion of works.

3.28.8.18 Relocation And Apportioning of Water Supply, Sewerage, Power, Telephone, Gas And Heat Installations

Relocation shall be done all in line with a separate design or instructions by the installation's owner and supervisory organ, and regulations applicable for that type of installations.

Calculation of executed works is done per invoices issued by the installation's owner, upon relocation.

3.28.8.19 Protection of Existing Installations In A Trench

Protection of installations in an open trench which intersect with secondary sewerage. During execution of works, it is necessary to protect the installations which intersect with the designed sewerage. After uncovering the installations, hang them on shaft carrier placed above the trench. Uncovering, method of securing and supervision shall be done in presence and with approval of the owner of subject installation.

3.28.8.20 Connecting The New Sewerage To The Existing

The position includes following works:

- Extension of trench at the point of connection;
- making of temporary partition of a suitable mean (sand bags or other) for directing the water flow during connection, providing work in dry place;. Removal of temporary partition upon completion of works;
- demolishing the wall of the existing shaft made of reinforced concrete and forming an opening for mounting the connection element (KGF or other), cutting and bending the fittings, processing the surfaces and applying new connecting material on new and old concrete;
- Installation of connecting fitting (KGF or other), making the formwork and concreting the space between the existing wall and the connecting element with fine-grained concrete. Existing armature is bent and used for reinforcing the connection;
- Making of channel pipes and processing (fitting) of the existing channel pipe made of fine-grained concrete;
- draining excess water that can endanger works with a mobile pump;
- Removal of rubble from the shaft, loading and transport to the landfill.

3.28.8.21 Making And Reconstruction of House Connection

Purchase, transport and install hard PVC sewerage pipes with appropriate rubber sealing rings. Pipelines installation procedure should be done as prescribed by the pipe manufacturer. When placing pipes into the trench and during their installation, check if pipes are placed in the designed fall without horizontal and vertical breaks. The control should be done in the presence of a Supervisor and with a surveying instrument.

Pipe class is determined by static calculation in the design, as well as profile and average length.

3.28.8.22 Making of As-Built Design Of The Object

Upon completion of works on construction of sewerage, the Contractor is obliged to make an as-built design.

3.28.8.23 Technical Inspection of The Object

Technical inspection of the object will be done by an authorized institution.

3.29 WATER SUPPLY

3.29.1 General requirements

Technical requirements are an integral part of the design and are mandatory for the contractor. The contractor is obliged to comply with all provisions of technical regulations for ground, construction, water, reinforced-concrete and other works during work execution.

All works and purchase of materials shall be done in line with general requirements, description of bill of quantities, technical descriptions, drawings, details, instructions by the supervisor.

For all deviations from the design, the contractor is obliged to obtain Supervisor's opinion and written approval from the supervisory organ (investor).

Material for installation must be new, undamaged, for which the contractor is obliged to submit a sample of to the supervisory organ, i.e. a certificate for review and approval, as well as proof on systematic testing of material for installation, and is subject to regulations on testing during installation.

Material that does not comply with technical regulations, conditions and standards should not be installed, and the contractor is obliged to remove it from the construction site at its own expense.

The investor is obliged to obtain timely resolution of administrative tasks for construction of the object (construction permit, etc.)

In case that technical documentation is incomplete or incorrect, the contractor is obliged to warn the investor in a timely manner to supplement and update it otherwise he will bear all the costs and consequences resulting from the inaccuracy. If there are no detailed situational plans in the technical documentation provided to the contractor, it is necessary to survey the terrain by the investor or its supervisory organ prior to commencement of works, and to create appropriate bases with sufficient levels, permanent points, profiles and other elements relevant for the future works on the object.

The investor is obliged to timely vest the contractor in the construction site; as well as to show the contractor the place where the exploitation of certain materials can be performed (sand, pebbles, stone, etc.).

Also, the investor is obliged, for the needs of constructing temporary auxiliary facilities (barracks, warehouses, etc.) to determine with the contractor the most suitable locations; and to submit a list of benchmarks and other geodetic points and to show their locations in the field to the contractor; and timely deliver the technical documentation or parts of the documentation necessary for the execution of the works.

The contractor's duty is to timely deliver the required building materials, tools, machinery and everything else necessary for the construction to the construction site in order to start and finish of construction within the contracted time. In addition to the above mentioned elements, the precondition for quality and timely execution of works is professional and qualified staff, which the contractor must have in sufficient number on the construction site.

The contractor is obliged to backfill all holes, trenches and walls which had to be excavated/open during work execution and to restore them to their original state. Aside from that, the contractor must clean the entire surrounding terrain around the site must of construction material which was used during execution, and hand over the object with clean floors and walls, as well as carpentry, that is node points in the object.

Prior to giving an offer for construction of the object, the contractor should visit the terrain in order to get acquainted with field, climate and other conditions and characteristics, construction possibilities and other elements important for determining realistic unit prices for participating in bidding.

Prior to work commencement, the contractor is obliged to get acquainted with local conditions, regulations, access roads, possible landfills and other factors which could affect smooth work execution.

Calculation of executed works shall be done in line with the offer and the contract, based on measures and quantities entered into the measurement book, certified by the supervisory organ. Construction of access roads and auxiliary objects is not charged separately, but it's included in the unit prices given in the bill of quantities; this must be considered when compiling a bid to participate in the auction.

The contractor is obliged to apply valid technical measures for work safety.

3.29.2 Geodetic works

3.29.2.1 Water supply route marking

Water supply route marking on the site before beginning the works, establishing the benchmark points along the route with marking protocol.

3.29.2.2 Surveying the as-built water supply object

Surveying the as-built object with entering the information into KAT-KOM done by organization authorized for this type of work.

In addition to surveying pipelines, record and make a cadastre of the underground installations which should contain all installations and objects located on the water supply route. Upon completion of works, the Contractor is obliged to hand over a certificate on performed surveying of constructed object to the Investor, issued by an authorized institution.

3.29.3 Preliminary works

3.29.3.1 Cleaning the terrain

Prior to work commencement, mark the wire work front, clean the terrain of all obstacles, trash and bushes. Cut and remove other small plants. All other obstacles which interfere with work execution should be removed as appropriate.

3.29.3.2 Stopping of places with existing installations

Prior to work commencement, stop the existing installations. Location of stopes shall be determined after thorough inspection of KAT KOM excerpt. Data obtained by stoping (position and depth of pipes) shall be compared with data from KAT KOM and position of the pipeline route given in the design. If deviations are larger and present an issue during construction, the Contractor shall notify the installation owner, supervisor, who will provide appropriate solution.

3.29.3.3 Removal of humus

Removal of humus layer shall be done mechanically, within designed widths and thickness, or per supervisory organ's order. Removal of humus will be done after required marking. Deposit a quantity of removed humus required for top soiling of green areas to a temporary landfill and prepare the excess for transport.

3.29.3.4 Tree cutting

Cut the trees in zone width included in work execution for construction of water supply. Cut notches mechanically at 80 cm from the terrain level, and fell the cut trees carefully. Cut the branches, categorize the wood mass, prepare for transport, load into a transport vehicle and transport it to the landfill. Determine a place for deposition with approval from the Supervisory organ. Take protective measures during works to avoid possible damage on adjacent objects and other property.

3.29.3.5 Removal of stumps and roots

Remove the stumps and roots in zone width included in work execution for construction of water supply. Mechanically remove the stumps. Categorize the wood mass, load into a transport vehicle and transport it to the landfill. Determine a place for deposition with approval from the Supervisory organ.

3.29.4 Ground works

3.29.4.1 Mechanical trench digging

Mechanical trench digging should be done with depositing material to one side on the minimal distance of 2.0m from the edge of the trench or with direct loading into a vehicle for transport to the landfill. Mechanical trench digging should be done according to the data from longitudinal and cross section of the trench to a depth of 0.2m from the designed trench bottom. The width and depth of the trench are in line with the design solution. On parts of the route where the pipeline passes through arable land, remove the humus of the designed thickness and deposit separately for later restoration, after backfilling of the trench. Trench digging should be done with vertical sides which must be protected from collapsing. All excavations should be done exactly to the designed height and the elevations of the trench shall be checked and accepted in writing through a construction log by the supervisor. Incorrect excavation shall not be accepted and over break has to be backfilled and compacted, or in certain cases, on which the supervisor decides, compacted with concrete min. CC 10, at the expense of the Contractor. If, during the excavation, unknown underground structures or lines show up, or the soil composition is different than expected, the Contractor must implement security measures and notify the Investor at once, i.e. the Supervisor, to determine guidelines for further operations.

Remove rocks, roots and coarse turf from the excavated material which is then used to backfill the trench. During the trench excavation, take all safety precautions during operation as well as in cases of inclement weather, so there are no damages to the executed work. The quantity of mechanical excavation for the calculation are obtained by measuring the actual executed excavation in a fused state or according to changes allowed by the supervisor.

3.29.4.2 Manual trench digging

Execute the manual trench digging with depositing the material outside the trench:

- 0.2 m above the designed level of the trench bottom;
- at points of intersection with existing installations;
- at the part of the route specially designated by the design and due to impossibility of mechanical works.

Manual excavation should be done in accordance with the longitudinal profile. The width and depth of the trench are in line with the design. Trench digging should be done with vertical sides which must be protected from collapsing. All excavations should be done exactly to the designed height and the elevations of the trench shall be checked and accepted in writing through a construction log

by the supervisor. Remove rocks, roots and coarse turf from the excavated material which is then used to backfill the trench. At the points of intersection with the existing installations, the trench works should be executed in presence of the authorized person who owns the aforementioned installation. Manual excavation is done with mandatory protective support. The quantity of excavation for the calculation are obtained by measuring the actual executed excavation in a fused state or according to changes allowed by the supervisor.

3.29.4.2.1 Manual trench digging for house connections

Execute the manual trench digging with depositing the material outside the trench. Excavation is done on the part of route where there is no possibility of mechanical works.

Manual excavation should be done in accordance with the longitudinal profile. Trench is 0.6 m wide and the depth is determined by design. Trench digging should be done with vertical sides which must be protected from collapsing. All excavations should be done exactly to the designed height and the elevations of the trench shall be checked and accepted in writing through a construction log by the supervisor. Remove rocks, roots and coarse turf from the excavated material which is then used to backfill the trench. At the points of intersection with the existing installations, the trench works should be executed in presence of the authorized person who owns the aforementioned installation. Manual excavation is done with mandatory protective support. The quantity of excavation for the calculation are obtained by measuring the actual executed excavation in a fused state or according to changes allowed by the supervisor.

3.29.4.3 Planning and compacting trench bottom

Planning of the trench bottom is done manually with accuracy up to 1cm according to designed elevations and slopes with deposition of excess material outside the trench. Planning work is done with mandatory protective support. Include average excavation of 0,05 m³/m² in position price. Compacting the subsoil is done after planning the trench bottom, by mechanical means to the required density. Achieved density must be at least 15 MPa. In case that required density can't be achieved at certain points, the compacting should be continued by adding sandy/gravelly material until the required density is achieved.

3.29.4.3.1 Planning and compacting trench bottom for house connections

Planning of the trench bottom is done manually with accuracy up to 1cm according to designed elevations and slopes with deposition of material outside the trench. Planning work is done with mandatory protective support. Average excavation of 0,05 m³/m² is included in position price. Compacting the subsoil is done after planning the trench bottom, by mechanical means to the required density. Achieved density must be at least 15 MPa. In case that required density can't be achieved at certain points, the compacting should be continued by adding sandy/gravelly material until the required density is achieved.

3.29.4.4 Making of the sand bed

Spreading and planning of the sand bed according to the designed elevations and slopes with maximum deviation of 1cm. Layer thickness is defined by the design. The position price includes the purchase of the sand (franko load), transport, unloading along the trench, inserting into the trench, planning and spreading and all in accordance with the regulations for that type of work. Test the load after completed planning and compacting of sand bed. Sand bed density should be at least 95% of maximum laboratory density per standard Proctor procedure. If the testing is done through degree of compactability, then the sand bed load should be $M_s > 15 \text{ MN/m}^2$.

3.29.4.4.1 Making of the sand bed for house connections

Spreading and planning of the sand bed according to the designed elevations and slopes with maximum deviation of 1cm. Layer thickness is defined by the design. The position price includes the purchase of the sand (franko load), transport, unloading along the trench, inserting into the trench, planning and spreading and all in accordance with the regulations for that type of work. Test the load after completed planning and compacting of sand bed. Sand bed density should be at least 95% of maximum laboratory density per standard Proctor procedure. If the testing is done through degree of compactability, then the sand bed load should be $M_s > 15 \text{ MN/m}^2$.

Note: connections are from regulation line to main route

3.29.4.5 Backfilling the trench with sand

Backfilling the trench with sand is done to the designed level or existing road structure, other public area intended for vehicle and pedestrian traffic or up to the designed level. The backfilling should be done in layers of 20 to 30cm thick, with compacting and soaking. Test the density and deliver the certificates on density to the Supervisory organ upon backfilling of the trench.

Density of trench backfill under city roads should be 100% of maximum laboratory density per Proctor's procedure (in line with SRPS U.B1.046:1969). If the testing is done through degree of compactability SRPS U.B1.046:1969 then the load of installed sand in the trench, at the bed level under the roads should be $M_s = 25 \text{ MN/m}^2$.

Under pedestrian and bicycle paths, passenger vehicle parking and sports and recreation facilities, required density per Proctor's procedure in final 30 cm thick layer should be 98% of maximum laboratory density SRPS U.B1.016:1992, and $M_s = 20 \text{ MN/m}^2$.

3.29.4.5.1 Backfilling the trench with sand, for house connections

Backfilling the trench with sand is done to the designed level or existing road structure, other public area intended for vehicle and pedestrian traffic or up to the designed level. The backfilling should be done in layers of 20 to 30cm thick, with compacting and soaking. Test the density and deliver the certificates on density to the Supervisory organ upon backfilling of the trench.

Density of trench backfill under city roads should be 100% of maximum laboratory density per Proctor's procedure (in line with SRPS U.B1.046:1969). If the testing is done through degree of compactability SRPS U.B1.046:1969 then the load of installed sand in the trench, at the bed level under the roads should be $M_s = 25 \text{ MN/m}^2$.

Under pedestrian and bicycle paths, passenger vehicle parking and sports and recreation facilities, required density per Proctor's procedure in final 30 cm thick layer should be 98% of maximum laboratory density SRPS U.B1.016:1992, and $M_s = 20 \text{ MN/m}^2$.

Note: connections are from regulation line to main route.

3.29.4.6 Backfilling the trench with the soil from the excavation

Backfill the trench with the material from the excavation. Backfilling should start after checking the quality of the pipeline installation i.e. geodetic surveying of the installed pipeline. According to the execution conditions, it is necessary to backfill the installed pipeline with sand up to 30 cm above the pipe top, the backfilling should be done with disintegrated soil from the excavation, in layers up to 20cm, with mechanical compression. Smallest allowed density of the backfilled soil should be at least as density of the surrounding soil, where the density should be 95% of maximum laboratory density per Proctor's procedure. The material from the excavation used for backfilling must not contain large pieces of soil, rocks, leaves, roots and other larger pieces.

3.29.4.6.1 Backfilling the trench with the soil from the excavation, for house connections

Backfill the trench with the material from the excavation. Backfilling should start after checking the quality of the pipeline installation i.e. geodetic surveying of the installed pipeline. According to the execution conditions, it is necessary to backfill the installed pipeline with sand up to 30 cm above the pipe top, the backfilling should be done with disintegrated soil from the excavation, in layers up to 20cm, with mechanical compression. Smallest allowed density of the backfilled soil should be at least as density of the surrounding soil, where the density should be 95% of maximum laboratory density per Proctor's procedure. The material from the excavation used for backfilling must not contain large pieces of soil, rocks, leaves, roots and other larger pieces.

Note: connections are from regulation line to main route.

3.29.4.7 Topsoiling of backfilled trenches

At places where the trench for pipe installation was dug through green areas, topsoil the backfilled and compacted trench in layer 15 - 20 cm thick with humus deposited during removal of humus. Light roll the humus layer - compact it and green it.

3.29.4.8 Transport of the excess soil from the excavation (network and house connections)

Load, transport, unload and spread the excess soil from the excavation to the city landfill or another landfill whose location is determined by the Supervisor. The transport length is determined by the design. Quantities for calculation are done by measuring really transported material in loose state (soil bulking coefficient $k = 1.20$).

3.29.5 Carpentry works

3.29.5.1 Building the trench support

The dug trench should be secured with proper wooden formwork with horizontal planks that are fastened by vertical columns and are strutted by braces. Vertical columns must be made of quality wood and without knots. Ladders should be used for entering and exiting the trench. The trench must not be left unsecured during the holidays, over nights and during breaks within working hours. Once the backfilling of the trench starts, the safeguards should be removed gradually, taking into account the safety of the formwork which remains in use. The formwork should be checked daily and any deficiencies should be removed at once; the work should be continued only upon the approval from the supervisor after the removal of deficiencies and the formwork fastened again.

3.29.5.2 Building the trench support of sheet piles

The dug trench should be secured on both sides with sheet piles, fixed in autochthonous soil on the bottom end. Middle and top parts of double side sheet piles shall be secured with horizontal longitudinal and cross supports, all in line with static calculation for support elements in the design.

The trench must not be left unsecured during the holidays, over nights and during breaks within working hours. Once the backfilling of the trench starts, the safeguards should be removed gradually, taking into account the safety of the formwork which remains in use. The formwork should be checked daily and any deficiencies should be removed at once; the work should be continued only upon the approval from the supervisor after the removal of deficiencies and the formwork fastened again.

3.29.6 Installation works

3.29.6.1 Purchase and installation of hard pvc water supply pipes

Purchase, transport and install hard PVC water supply pipes of nominal pressure and diameter determined by the design. Prior to work commencement for pipe installation, the contractor is obliged to get acquainted with: design documentation, applied standards and all required instructions from pipe manufacturer.

All purchased polyester pipes with connecting and sealing material and all fittings must hold factory certificates in line with standards and requirements and only as such can be deposited on the construction site. Installation of pipes in the trench is done on a prepared, compacted sand bed. When installing the pipes, the pipe should be evenly loaded along the entire length. Before lowering the pipe in the trench, the compacted bed should be lightly sifted up to 2.5 - 5 cm deep, so the pipe could "lie" well during installation. At the point of each connection, dig a niche 5 cm deep in the sand bed, to enable safe rest along the entire length of the pipe. The pipe must not rest on the joints. Upon joining the pipes, the joints should rest well on the bedding and the joint zone should be backfilled with material for backfilling around the pipes.

3.29.6.2 Purchase and installation of hard pvc fittings for water supply

Purchase, transport and install hard PVC fittings for water supply of nominal pressure and diameter determined by the design.

Description for installation as in position 5.01

Calculation per piece of installed fitting, for all works and material, according to type.

3.29.6.3 Purchase and installation of polyethylene (pe) pipes for water supply

Purchase, transport and install polyethylene water supply pipes (DIN 8074/8075) of nominal pressure, diameter and category determined by the design.

All purchased PE pipes with connecting, and all fittings must hold factory certificates in line with standards and requirements and only as such can be deposited on the construction site. Purchase and installation will be done in line with the design and given specification. Installation of pipes in the trench is done on a prepared, compacted sand bed.

Description as position 5.01

Pipes are connected by welding.

3.29.6.4 Purchase and installation of polyethylene (pe) fittings for water supply

Purchase, transport and installation of fittings for water supply made of polyethylene (DIN 8074/8075) with nominal pressure, diameter, and category determined by the design (section elbows, PE sleeve with free flange).

Description for installation as in position 5.01

Calculation per piece of installed fitting, for all works and material, according to type.

3.29.6.5 Purchase and installation of cast iron water supply pipes

Purchase, transport and installation of cast iron GGG400 pipes. Basic protection of pipes includes internal coating made of cement mortar in line with ISO 4179 and external cover made of zinc and bitumen in line with ISO 8179. Purchase and installation in line with design and given specification.

All purchased pipes with connecting and sealing material and all fittings must hold factory certificates in line with standards and requirements and only as such can be deposited on the construction site. Installation of pipes in the trench is done on a prepared, compacted sand bed. When installing the pipes, the pipe should be evenly loaded along the entire length. Before lowering the pipe in the trench, the compacted bed should be lightly sifted up to 2.5 - 5 cm deep, so the pipe could "lie" well during installation. At the point of each connection, dig a niche 5 cm deep in the sand bed, to enable safe rest along the entire length of the pipe. The pipe must not rest on the joints. Upon joining the pipes, the joints should rest well on the bedding and the joint zone should be backfilled with material for backfilling around the pipes.

The position description in the bill defines nominal diameter, pressure, connection type and other internal and external protection.

3.29.6.6 Purchase and installation of cast iron water supply fittings

Purchase, transport and installation of fittings, made of cast iron GGG 400 with clamps, and epoxy based internal and external protection, in line with DIN 30677 standard - part two and DIN 3476, in line with given material specification and nominal pressure defined by the design. Installation of fittings is done per manufacturer's instructions. Fittings which pass through walls of the shaft shall be installed prior to concreting the shaft.

3.29.6.7 Purchase and installation of cast iron water supply armatures

Purchase, transport and installation of armature, made of cast iron GGG 400 with clamps, and epoxy based internal and external protection, in line with DIN 30677 standard - part two and DIN 3476. Type of armature, nominal pressure and diameter are defined by the design. Installation shall be done in line with regulations for that type of work and instructions by the material manufacturer. The unit price includes all joining and sealing material.

3.29.6.8 Purchase and installation of standpipe made of cast iron

Purchase, transport and installation of standpipe made of ductile cast GGG 400. Type, nominal pressure and installation depth are determined by the design. The body must be protected with anti-corrosion and epoxy protection in line with standards DIN 30677 - part two and DIN 3476. Unit price includes all sealing material and absorbing layer of gravel. Calculation per piece of purchased and installed standpipe for all works and material.

3.29.6.9 Purchase and installation of underground hydrant made of cast iron

Purchase, transport and installation of underground hydrant made of ductile cast GGG 400. Type, nominal pressure and installation depth are determined by the design. The body of the hydrant must be protected with anti-corrosion and epoxy protection in line with standards DIN 30677 - part two and DIN 3476. Unit price includes oval cap "Hidrant", all sealing material and absorbing layer of gravel.

Calculation per piece of purchased and installed hydrant for all works and material.

3.29.6.10 Purchase, delivery and installation of pipeline for temporary water supply

Purchase, delivery and installation for temporary water supply of house connections during reconstruction of the main pipeline.

Temporary pipeline is made of polyethylene (PEHD, NP 10 bar, Ø 63/2") and it's laid right next to the trench on the existing terrain. It includes construction of HAKU amor clip (ND/2") on both sides (2 pc) and EK valve (2"/ 2") on ends of the pipeline with brass transition clamps (Ø 63/2").

After disassembly of the temporary pipeline, install plugs (2") at the points of EK valves. The position includes excavation as well (revealing the existing pipes) at points of connection and sealing of the existing pipes.

3.29.6.11 Purchase, transport and installation of temporary house connection

Purchase, delivery and installation of pipes and fittings and armature for connecting the house connections to a temporary pipeline. The position includes excavation as well (revealing) of the house connection at the point of connection to the existing pipe.

The position envisages installation of HAKU ambor clip Ø 63/ND, reduction 1", brass transition clamp and PEHD pipe - NP 10 bar - Ø ND (mm) average length l = 10 m.

3.29.6.12 Purchase, delivery and installation of replacement of the entire house connection to the watermeter - diameter to 2"

Purchase, transport and installation of pipes, fittings, armature, connection and sealing material for replacement of entire house connection from main line to regulation line.

The material includes collar for house connection of adequate type ND (main pipe) / nd (connection) with EK valve (ground installation with epoxy protection), diameter like connection with built-in telescopic set and cap, accompanying sleeve, nipple, reduction, two brass transition clamps (nd) and ball valve diameter of connection (in line with design specification).

Position description must contain diameter of the main pipe, diameter of house connection and average length of the connection.

3.29.6.12.1 Purchase, transport and installation of replacement house connection

Purchase, transport and installation of pipes, fittings, armature, connection and sealing material for replacement of entire house connection from main line to regulation line (with T-piece, multi-joint or PE flange adaptor, valve with epoxy protection with built-in set and street cap which are included in the bill for the main route).

House connection material includes pipe of adequate diameter, accompanying sleeve, nipple, reduction, two brass transition clamps (nd) and ball valve diameter of connection (in line with design specification).

Position description must contain diameter of the main pipe, diameter of house connection and average length of the connection.

3.29.7 Concrete works

3.29.7.1 Construction of new shafts-chamber locks out of reinforced concrete cc30

Construction of newly designed shafts-chamber locks out of reinforced concrete CC 30. Works include:

- excavation and planning of excess soil, planning of trench bottom and making of bedding of gravel 10 cm thick, strutting of the trench;
- making of leveling layer of concrete, min class CC 15, thickness 10 cm, cutting, bending and installation of reinforcement, making of formwork with stiffening for walls and pads;
- mixing and installation of concrete, class CC 30, making of support blocks for pipeline in the shaft, out of concrete CC 30;
- purchase, transport and installation of cast iron ladder for shaft SRPS M.J6.285:1971;
- purchase, transport and installation of shaft covers, adequate type, for load in line with design;

- internal walls of the shaft-chamber lock shall be protected by adequate coating of additive-penetrant which enables water-tightness of the object. Additive-penetrant should be certified by the manufacturer and applicable for water tanks;
- water pumping during work execution at discharge shafts.

Position description must include internal dimensions of the shaft, wall thickness, thickness of top and bottom slab, amount of reinforcement and type of cover.

3.29.7.1.1 Extension and reconstruction of shafts-chamber locks made of reinforced concrete

Extension and reconstruction of newly designed shafts-chamber locks out of reinforced concrete CC 30. Works include:

- disassembly of shaft cover;
- demolition of shaft parts (top slab and wall);
- excavation and planning of excess soil;
- planning of trench bottom and making of bedding out of gravel, thickness 10 cm, strutting of the trench;
- making of leveling layer of concrete, min class CC 15, thickness 10 cm, cutting, bending and installation of reinforcement, making of formwork with stiffening for walls and pads, connecting the reinforcement with the existing;
- mixing and installation of concrete, class CC 30;
- making of support blocks for pipeline in the shaft, out of concrete CC 30;
- purchase, transport and installation of cast iron ladder for shaft SRPS M.J6.285:1971;
- installation of existing shaft cover;
- internal walls of the shaft-chamber lock shall be protected by adequate coating of additive-penetrant which enables water-tightness of the object. Additive-penetrant should be certified by the manufacturer and applicable for water tanks;
- water pumping during work execution at discharge shafts.

Position description must include internal dimensions of the shaft, wall thickness, thickness of top and bottom slab, amount of reinforcement and type of cover.

3.29.7.2 Construction of anchor blocks out of compacted concrete cc 20

Construction of anchor blocks out of compacted concrete, class CC 20, dimensions in line with design. Unit price includes: purchase of material, placing and removal of formworks, mixing and installation of concrete.

3.29.7.3 Construction of concrete slabs out of compacted concrete cc 20

Construction of concrete slabs around the standpipes and round cap for the covers out of compacted concrete CC20, dimensions in line with the design. Unit price includes: purchase of material, placing and removal of formworks, mixing and installation of concrete.

3.29.8 Other works

3.29.8.1 Pressure testing of the pipeline

Perform pressure testing of the pipeline to the designed trial pressure. Prior to final backfill, the pipeline is pressure tested by sections, in line with manufacturer's instructions for the selected pipes.

3.29.8.2 Flushing, disinfection of the pipeline and bacteriological examination of water

Prior to commissioning the water supply, it is necessary to perform flushing, disinfection and additional flushing, as well as bacteriological examination of water by an authorized institution. An adequate record with positive certificate supplied should be made on performed pipeline flushing, disinfection and water analysis, in line with regulations for this type of work.

3.29.8.3 Securing the construction site during the work execution

Securing the construction site during the work execution is done by placing columns and protective tape.

3.29.8.4 Installation of pipeline marking

Purchase and install marks for marking the pipeline route. Install in such way that position of the water supply route can be determined with certainty. Shape and dimensions displayed in the detail.

3.29.8.5 Excavation of the existing traffic surfaces

Excavate the existing traffic structure at points where the pipeline route passes. Mechanical excavation, with adequate tools, flat edge cutting in order to avoid crushing and breaking of the final layer of road (asphalt, concrete, stone cubes, etc.) Excavation width is wider than trench width by 20 cm on each side. All expenses that arise from wrong excavation shall be borne by the Contractor. Excavated material shall be loaded in trucks and taken to a city landfill or per order by the Supervisor.

3.29.8.6 Restoring the traffic surfaces into technically correct condition

It is necessary to restore the excavated public area in technically correct condition after backfilling and compacting the trench up to prescribed density on the sand bed level as well as acceptance by the Supervisory organ. At the point where pipeline passes through the road body, construct a new road structure, thickness and composition in line with the road and designed traffic load. The water supply construction contractor is obliged to submit certificates on density of crushed stone layer to the Supervisor prior to constructing the road surface. If the achieved density meets the standards for construction of adequate road, the construction can begin. Structure layers shall be done in line with adequate regulations and with required testing.

3.29.8.7 Excavation of existing road vehicle access, bus stops and sidewalks made of concrete, asphalt, behaton or crushed stone

Excavation of existing road vehicle access, bus stops and sidewalks made of concrete, asphalt, behaton or crushed stone at points of passing of water supply route and house connections. Unit price includes excavation of the existing surface with loading and transport of debris to the landfill.

3.29.8.8 Restoring existing vehicle access, bus stops and sidewalks made of concrete, asphalt, behaton or crushed stone into original state

Excavation of existing road vehicle access, bus stops and sidewalks made of concrete, asphalt, behaton or crushed stone into original state. The position includes preparation of bedding, making of formwork, purchase and installation of gravel or crushed stone for tampon layer which must have required density, and purchase and installation of concrete CC20, asphalt or behaton on the tampon layer.

3.29.8.9 Demolition of curbs

Demolition of concrete, stone and other curbs and concrete base at sections above the trench. Demolished curbs and concrete debris shall be loaded in vehicles and transported to a landfill designated by the Supervisory organ.

3.29.8.10 Installation of curbs

Purchase, transport and installation of curbs on a CC20 concrete base, all in line with existing model, i.e. regulations for this type of work.

3.29.8.11 Construction of temporary road structure made of crushed stone

Construction of temporary road structure made of crushed stone $d = 20$ cm over backfilled and compacted trench. The position includes purchase, transport and installation of crushed stone in a layer 20 cm thick. The position includes temporary leveling and adding crushed stone.

Calculation of executed works per m^2 of constructed temporary road structure.

3.29.8.12 Installation of steel pads over the backfilled trench for heavy traffic

Placing and installation of steel pads over the backfilled trench, in traffic zone, for smooth running of heavy traffic during work execution. Pads are removed just before restoring the road structure into its original state. The position includes transport, installation, removal and transport of steel pads.

3.29.8.13 Placing of temporary pedestrian crossing

At points of intersection of water supply route and existing streets, place temporary wooden pedestrian crossings with fence to enable smooth access to residential buildings for pedestrians and access from side streets. The pedestrian crossing must be constructed of quality wood and safe for temporary use. Unit price includes construction of crossing with a fence and removal when there is no need for it.

Calculation per piece of placed pedestrian crossing for all works and material.

3.29.8.14 Installation of traffic signs

Install appropriate traffic signs along the trench route while the work is in progress. Traffic sign installation is done according to the separate design for technical regulation of traffic.

3.29.8.15 Maintenance of traffic signs

Maintenance of the installed traffic signs, displacement according to dynamics of work progress and possible additional purchase of missing traffic signs, determined by the design for technical regulation of traffic.

3.29.8.16 Pumping of silty and waste water by a mud pump

Pumping the silty and waste water by a mud pump from the working pit or shaft. The position includes transport and lowering the pump, installation of suction and pressure pipelines, power supply, pumping the silty and waste water, and disassembly of the mentioned equipment upon completion of works.

3.29.8.17 Lowering the groundwater level by waterpoint

Lowering of groundwater level is done only in case the ground water level is higher than the level of trench bottom. Lowering of water level is done during execution of following works: trench excavation, planning of trench bottom, installation works, strutting of trench sides, construction of shafts and backfilling of the trench above the ground water level.

Lowering the groundwater level is done by waterpoints stuck on both sides of the trench.

3.29.8.18 Lowering the groundwater level

Lowering the groundwater and waste water level, to the level of the excavation bottom, method adequate for work execution technology, all in line with regulations for that type of works and real situation on the terrain. The price includes works, material and equipment required for work

execution, including power distribution, generator and similar, and disassembly of the equipment after completion of works.

3.29.8.19 Relocation and apportioning of water supply, sewerage, power, telephone, gas and heat installations

Relocation shall be done all in line with a design details or instructions by the installation's owner and supervisory organ, and regulations applicable for that type of installations.

Calculation of executed works is done per invoices issued by the installation's owner, upon relocation.

3.29.8.20 Protection of existing installations in a trench

Protection of installations in an open trench which intersect with water supply pipeline. During execution of works, it is necessary to protect the installations which intersect with the designed water supply. After uncovering the installations, hang them on shaft carrier placed above the trench. Uncovering, method of securing and supervision shall be done in presence and with approval of the owner of subject installation.

3.29.8.21 Disassembly of the existing pipeline

After excavation of the trench to the level of existing pipeline bedding, disassemble the pipes, fittings and armature, clean them of dirt, load into vehicles and transport to a landfill designated by the Supervisory organ, unload on the landfill, categorize by type, make an inventory list and handover to the Supervisory organ through a construction log.

Average transport distance (ATD) for calculation is 10 km.

3.29.8.21.1 *Disassembly of existing cast iron fittings*

Make an inventory list and hand it over to JKP Vodovod i kanalizacija upon disassembly of existing cast iron fittings. Hand over the inventory list signed by JKP Vodovod i kanalizacija to the Supervisory organ.

3.29.8.22 Demolition of existing chamber locks

Demolish the existing chamber locks, dimensions listed in the design. The chamber locks are made of reinforced concrete, wall and slab thickness cca 20 cm. Tampon where the chamber lock is founded is most often made of concrete about 10 cm thick.

Load the demolished material in vehicles and take to a landfill designated by the Supervisory organ. Backfill the pit where the chamber lock was demolished with sand and soil from the trench excavation and plan it in level of the surrounding terrain. The position description must contain internal dimensions of the chamber lock.

Calculation per piece of demolished existing chamber lock.

3.29.8.23 Connection of new pipeline to the existing pipeline

Connect the newly designed pipeline to the existing pipeline. Include following works in position price:

- manual (additional) excavation of work pit;
- cutting the existing pipeline;
- discharging the water with pumping the excess sludge by a mud pump;

- connection of the new water supply.

3.29.8.23.1 *Blocking the existing network for connecting the new one*

Stopping the water flow and recommission is done only by JKP Vodovod i kanalizacija or exceptionally the Contractor with approval by JKP Vodovod i kanalizacija.

3.29.8.24 Purchase and installation of protective steel pipes

Purchase, transport and install protective steel pipes, type, diameter and thickness according to design specification. Shape and measures of the pipes in line with EN 10219-2. Service pipe relies on a slider in line with addendum to the design. Protect the steel pipe on external and internal side by protection marked A1. Protective steel pipe is placed in executed trench on a sand bed.

3.29.8.25 Purchase and ramming of protective steel pipe

Purchase, transport and ram the protective steel pipe under the road or object, diameter, thickness and type all in line with design. Shape and measures of the pipes in line with EN 10219-2. Protect the steel pipe on external and internal side by protection marked A1.

The position includes following required works: excavation of the trench and strutting according to ramming plan with a construction for ramming pit, delivery, lowering into trench and installation of horizontal hydraulic press and works on pipe ramming, delivery and placing the generator for press operation and connection to the press, delivery and operation of pipe welding device.

3.29.8.26 Making of as-built design of the object

Upon completion of works on construction of water supply, the Contractor is obliged to make an as-built design.

3.29.8.27 Technical inspection of the object

Technical inspection of the object will be done by an authorized institution.

Calculation is per invoice issued by the authorized institution.

3.30 ENVIRONMENTAL

1. The Contractor shall comply with the national requirements those of the Local Authority in relation to environmental protection and take all necessary steps to minimise any intrusion the construction operations may have on the local community.
2. The Contractor shall take all necessary precautions to prevent danger, nuisance or inconvenience to the owners, tenants or occupiers of adjacent properties and to the public generally and shall at all times keep roads, streets, private entrances, verges, paths, footways, drains and sewers in the area of the works in a safe, clean and passable state. All waste or surplus materials shall be cleared away by the Contractor without delay. If in the opinion of the Overseeing Organisation the Contractor fails to take reasonable measures to comply with these requirements, the Overseeing Organisation may, after notification in writing, make alternative arrangements to have the appropriate work carried out and charge the cost to the Contractor.
3. The Contractor shall take all reasonable measures, which shall include the provision and use of adequate water spraying equipment, to minimise dust nuisance. The Contractor must comply with any requirements the Local Authority may impose in relation to dust control during the execution of the Works.

3.30.1 Description of the quality of seedlings and saplings

3.30.1.1 General conditions for quality of seedlings

The seedlings must be in good condition, without weed, without diseases and pests.

Saplings need to be without any physical injuries along the trunk, the terminal shoot and branches.

The root system of saplings must be properly developed and must be appropriate for the age, properties of soil and the size of the plant, that is, it must match the part of the tree above the ground. The root turf must be compact, intervened with root branches and protected with jute fabric. The size of the turf must suit the kind and size of the sapling, as well as to the properties of substrate. The height and width of the crown, the way of branching has to match the sapling's age and habitat.

There are some conditions related to the potted seedlings, for example the pot size must be in accordance with the plant size. The container "Co" is a container with volume of 2 litres and more. The pot "P" is a dish with less than 2 litres volume, and it is marked with the radius of the pot in centimetres, unlike the container which is marked with litres. The root system of seedlings in containers/pots must intersect the substrate at such extent that it does not disperse while the seedling is taken out ..

On the other hand, the root system must not pervade in the container/pot at such extent that there is little or no substrate at all, that is, the root must not be spiralised, The seedlings have to have the certificate of psychopathological and entomological quality by an official institution.

3.30.1.2 Tall broadleaf trees saplings

The sapling has to have a specific habitus determined by the species. The bulk without branches must be minimum 1,5 - 1,8 m tall (height from the root to the crown). The tree must be straight, with no mechanical damage, with a properly formed crown. The crown does not have shoots exceeding the terminal ones and there are no dry branches.

The crown needs to be formed in accordance with the girth of the tree. The tree girth must be equal, which makes the tree stable and resistant at the place it is planted.

Girth of the sapling up 1 m height	Height (cm)	Minimum root turf size (cm)	Packaging	School-number of replanting
10/12	250-350	40	Jute or container	II

3.30.1.3 Short and medium broadleaf trees saplings

The sapling has to have a specific habitus determined by the species . Total height of the sapling needs to be between 1.5 m to 2.0 m. The crown needs to be formed in accordance with the species, variety and girth of the tree, it cannot have dry branches or the ones exceeding terminal shoots. The root system needs to be well developed with numerous secondary and tertiary roots, with a compact turf of appropriate size that is necessary for easy transport and grafting of saplings, which in turn enables their successful growth.

The sapling girth at 1 m height(cm)	height (cm)	Minimum size of turf (cm)	Packaging	Class-planting number
8/10	150-200	30	Jute or container.	II

3.30.1.4 Grass seeds

The contents of grass seeds are determined by the following factors :

- The purpose of grass areas;
- The kind of substrate and the base with the substrate ;
- Climate conditions of the site designed ;
- The level of required maintenance in future;
- The way of irrigation.

Purpose of grass areas on the designed site is primarily realisation of visual and environmental function. There will not be irrigation system which would make maintenance easier. Maintenance should not be too demanding providing that good planning results in a exceptional landscape with relatively simple works.

The required grass seeds for the designed site needs to be:

- resistant to grass diseases and efficient against erosion
- able to regenerate after extreme weather conditions

The contents of grass mixture designed for this site have been used in order to regenerate grass vegetation in the surrounding areas :

- 1 *Festuca pybpa*(40%)
- 2 *Agropyrum repens* (15%)
- 3 *Festuca arundinacea* (25%)
- 4 *Poa pratensis* (5%)
- 5 *Lolium perene* (5%)
- 6 *Lotus corniculatus* (5%)
- 7 *Trifolium repens* (5%)

The seed certificate is required.

3.31 ELECTRICAL WORKS

3.31.1 Electro energetic installations

3.31.1.1 Classification of external effects

The application of the standard SRPS HD 60364-5-51 includes the selection of equipment and its installation. It provides common rules for compliance with safety measures for the purpose of achieving safety, requirements for proper functioning according to the intended use of installations and requirements that correspond to the anticipated external influences.

The choice of equipment to external influences is necessary not only for the proper functioning, but also in order to ensure the reliability of protection measures in order to achieve safety in accordance with the rules of IEC 60364 in principle. The protection measures achieved by the construction of the equipment are valid only in the given conditions of external influences, if the appropriate tests of the equipment specification are made under these external impact conditions.

Table 1: Characteristics required for equipment in the function of the class of external influences

CODE	DESCRIPTION	EXTERNAL EFFECT	REQUIRED CHARACTERISTICS FOR SELECTION AND EQUIPMENT SETTING
The influence of the environment			
AC1	Elevation	≤ 2000 m	Normal
AD1	The presence of water	Negligible	The likelihood of water presence is negligible IEC 60721-3-4
AE1	The presence of foreign solid bodies or particles	Negligible	The amount or nature of dust or foreign bodies is not significant IEC 60721-3-3, IEC 60721-3-4, IEC 60529
AF1	Presence of corrosive substances or pollutants	Negligible	The quantity or nature of corrosive substances or contaminants is not significant IEC 60721-3-3, IEC 60721-3-4
AG2	Mechanical impact	Negligible	Normal
AH2	Vibrations	Negligible	Normal
AK1	The presence of flora and / or the development of mold	Negligible	Normal
AL1	Presence of fauna	Negligible	Normal
AM1	Conduction or radiation	Negligible	Normal
AN1	Solar radiation	Negligible	Normal

AQ1	Atmospheric discharge	Negligible	<25 days a year
AR1	Air movement	Normal	speed <1m/s
		Use	
BA4	Personality capability	Trained	People advised or monitored by experts in a certain way to avoid the dangers that electricity can cause (staff working and maintaining)
BC2	Touch people with the potential of the country	Bad touch	Permitted use of appliances and equipment of all classes
BD1	Conditions for emergency evacuation	Low density of population, good evacuation conditions	Normal
BE1	Nature of processed or stored materials	No significant risks	Normal
		Construction of the building	
CA1	Materials of construction	Незапаливи	Normal
CB1	Building project	Negligible risks	Normal

The term "normal" appearing in the third column of the table means that the equipment must satisfy the requirements of the corresponding standards according to which it was made.

3.31.1.2 Power supply by electric energy

The preliminary design of electricity installations foresees the connection to the electricity network that is in compliance with the Conditions for connection to the distribution system of electricity issued by Distribution doo Beograd, Ogranak Užice, D.09.15-311465 / 2-16 (broad consumption-group connection) and D .09.15-311465 / 1-16 (Low Voltage Consumption).

In both solutions it is defined that it is necessary to define the position of the future MBTS "CARINARNICA" 10 / 0,4kV, construction 1000, electro installation 1h630kVA, in the first phase with an energy transformer installed power of 250kVA.

Measuring distribution cabinets, transformer substations and terminals are not the subject of this project. The position of the future TS is given.

Locational conditions define the strengths and fuses in the measuring cubicles, and based on the given strengths and currents, the conceptual solution defines the types of cables and their cross-sections, which are given in the table (for monitoring the table, use the issued Location Terms of the competent electricity distribution). Cable selection is verified in section 4.6. Numerical documentation, Bills, Budget tables.

Table 2: Defined cross sections and types of cables according to the approved installed power for individual objects of the border crossing complex Kotroman

Number of objects	Name	Installed power Pinst(kW)/I(A)	Cable (mm ²)
1	Customs Bureau	83/125	PP00-A 4x120
1	PD	53/80	PP00-A 4x95
-	Reserve	11,04/16	PP00 5x6

Cable lines are laid in the ground, type of divorce D.

The power supply lines are given in the graphic documentation.

Conditions to satisfy an object in order to build a connection:

Object purpose: Border crossing

Voltage to which the object is connected: 0,4 kV

Power factor: above 0.95

Protection against indirect overload and overvoltage contact protection: Protect against indirect contact voltage in electrical installations on the complex at the complex using the TN-C-S protection system.

Conditions for installing the installation in an object behind the connection: Protective devices on the switchboard installation panel must be carried out in accordance with the applicable technical regulations.

The choice of power cables is based on permanently permitted load current, voltage drop, short circuit and conditions of allowed loop resistance, i.e. fulfilling conditions from SRPS HD 60364-41.

Within the complex of the border crossing Kotroman, alternative power is provided via a diesel electric generator, which is placed next to the substation. Characteristics of the predicted aggregate QAS-125 "ATLAS COPCO" or equivalent. The power reserve is envisaged so that in the event of a power failure in the TS, all the load is taken over by the aggregate. The conceptual solution also defines the position of the aggregate, as well as its cable connection to the future substation with the cable PP00-A 4x240mm². Cable cross section is selected in section 4.6. Numerical documentation, Bills, Budget tables.

3.31.1.3 Resources and table

In the graphic documentation, a block diagram of the power supply facilities of the Kotroman border crossing is provided.

In the facilities of the Customs Administration, MIA, Warehouses and Inspections, installation of distribution boxes is foreseen. In these cabinets, the installation of a compact switch at the input, a FID switch to consumers in the wet nozzle and automatic fuses type B power 6A for voltage presence signaling, 10A for lighting, 16A for sockets, and corresponding amperage for the air conditioner chambers are designed. Distribution cabinet GRO-UC is supplied with a distribution cabinet RO-MAG and a wet nozzle RT-WC. From the same cabinet, outdoor lighting, roofing

lighting, and distribution boards KK1-KK6 are supplied. Everything as given in the block diagram of power supply.

In facility No.5, distribution boards, overhead labels N-12C, are installed for mounting up to 12 automatic fuses, dimensions 287h236h112. Zero terminals and grounding are an integral part of the distribution board, manufactured by Tehnoplast or appropriate.

The arrangement of the cabinets is given in the graphic documentation.

All distribution cabinets are designed to protect the IP 20 minimum and are designed for indoor installation.

Make cabinets with doors in one part, and in accordance with size. All doors are fitted with the same cylinder lock and corresponding key to lock in.

Corresponding elements according to the accompanying distribution schemes are incorporated into the distribution cubicles. All elements are clearly marked with nameplates. The cabinets are equipped with a single-pole scheme which is attached from the inside. In the visible place on the outside, the protection system is marked: TN- (C-S).

3.31.1.4 Ventilation and climatization

The complex is designed for air conditioning of all spaces and is processed in the project of mechanical installations. The installed power of the air conditioning unit is taken into account when assessing the consumption of the complex. In Table 3, which follows, the forces of the air conditioning and ventilation devices are defined by the facilities. Power cords for these devices are defined in chapter 4.6. Numerical documentation, Bills, Budget tables.

Table 3. Power of HVAC system for objects with defined power cables

Number of objects	Name / system	Installed power $P_{inst}(kW)$	Cable (mm ²)
1	Customs Administration / VRV	15	PP00 5x6
1	PD/VRV	15	PP00 5x6
4,13,14,15,16	Combined cabins / inverter	1,2	PP00 3x2,5
16a	Vagara house / inverter	1,2	PP00 3x2,5
9.	Sanitary knot	0,5	PP00 3x2,5

3.31.1.5 Manner of cable management

There are no special conditions for the distribution of electrical installations, except when passing the installation through fire walls and bulkheads. At the points of passage of electrical conductors through the fire barriers, they are closed with a fire-resistant mass, and the conductors on one side and the other side, one meter long, are protected by a fireproof coating. For materials for filling in cable entry points and for fire protection cable protection materials, the scout will submit for inspection the appropriate certificate.

Protection of the breakdown of electrical distribution through constructional fire-resistant elements must possess certificates issued on the basis of test protocols for testing by accredited laboratories, in accordance with the provisions of Article 16 of the Rules on Technical Norms for Low Voltage Electrical Installations ("Official Gazette of SFRY" No.53 and 54/88 and 28/95).

3.31.1.6 Installation of electrical connectors

Installation of terminals is performed with cables of type PP00-y 3x2,5mm² or 5h2,5mm². Cables are placed in a PNK rack, or in installation channels. Connectors are modular, type Aling or corresponding, overhead, type 3M, 4M or 7M. The sockets are as follows:

7M - two socket outlets (one cable PP00 3x1,5mm²), two RJ45 cet6 (two UTP Cat6 cables), one euro socket (same cable PP00 3x1,5mm²). Total power 1500W.

4M - two socket outlets (one cable PP00 3x1.5mm²). Total power 1000W

3M - one socket outlet (one cable PP00 3x1.5mm²), one RJ45 cet6 (one cable UTP Cat6). Total power 500W.

These are labels for the number of modules. Shuko socket takes 2 modules. The RJ45 socket occupies one module. In the graphic documentation, the schedule of modular outlets is given in accordance with the layout of furniture, work places and technological needs of the Investor.

On the canopy 2, the Kotroman garage crossing, traffic signalization is foreseen. The necessary signal and power cables are designed for these devices. They are placed on PNK racks. The type of cables is PP00 3x1,5mm² or 5h1,5mm², for power and UTP Cat6 for communication. Communication cables end up in the REK cabinet in the part of the Customs Administration.

3.31.1.7 Electrical lighting installation

At the boundary crossing complex, external, internal, necessary and panic lighting will be designed

When choosing a type of light source, the need for rational energy consumption will be taken into account, as well as the required level of illumination given by the technological process.

The choice of luminaire type influenced:

- application site
- conditions for how to install and operate installations
- aesthetic requirements of the space

3.31.1.7.1 Exterior lighting:

For the illumination of access roads and parking, the following lamps are designed:

- AMPERA MIDI 64LEDs @ 700mA / NW / 5117 / 139W - 30 pieces

The attached photometry and projected luminaires are attached. It is projected to place the lamps on pillars of height of 10m, directly to the pillar or T carrier (2 saints per pillar), in the areas of hiking trails and pedestrian islands, along the edge of the carriageway and parking, as it is definitely in the graphic documentation. The luminaires are positioned under a slope of 00 to 100, which is also defined in the disposition of the luminaires in the graphic documentation. Power supply of outdoor lighting is designed to be cable, PP00 5x6mm² cable.

For the illumination of the canopies 2, 8, 8a, 8b and 11 (the part that covers the building is excluded) the following lampshade was designed:

- GL2 Compact 5 96LEDs @ 700mA / NW / 5098 / Symmetrical / 213W

The attached photometry and projected luminaires are attached. It is projected that the light shafts 2 are placed on the beams of the construction of the canopy, to the projected height of about 7,7m. In this way the illumination of the space under the roof of over 200lx is provided. It is projected that the light shafts 8, 8a, 8b and 11 are placed on the beams of the roof structure. Lighting installation is planned to be performed with cables of type PP00, 3x1,5mm² or 5x1,5mm². The installation will be run on PNK racks or in installation channels.

3.31.1.7.2 Internal lighting:

The following lamps are designed for interior illumination of objects:

- - S1 ARCO DLM 2, BUCK, 33W, 4000lm, 4000K, CRI80 (TOTAL 61 pcs)
- - S2 ASTRA DO, BUCK, 17W, 2000lm, 4000K, CRI80 (TOTAL 55 KOMADA)
- - S3 ORIEN CDP 2, BUCK, 38W, 3500lm, 4000K, CRI80 (TOTAL 9 KOMADA)
- - S4 CENT, BUCK, 11W, 800lm, 4000K, CRI90, 60 (TOTAL 36 AQUA)
- - S5 TANGRAM HB2 O, BUCK, 74W, 8500lm, 4000K, CRI70 (MAGACIN) (TOTAL 9 pcs)

The attached photometry and projected luminaires are attached. It is projected that the lights are placed in a suspended ceiling or directly on the ceiling, which all depends on the architecture of the objects. Installation of lighting is planned to be performed on cables of type PP00, 3x1,5mm² or 5x1,5mm². The installation will be conducted on PNK racks, installation channels on walls or in plaster walls.

3.31.1.7.3 Necessary lighting:

Within the boundary of the border crossing Kotroman, an aggregate is envisaged that covers the entire consumption of the Customs Administration and the Ministry of Interior. The idea is to use aggregates to provide a full backup for all consumers, so that all the lighting that is mounted becomes and is necessary.

3.31.1.7.4 Panic lighting

For PANIK lighting, there are 1x8W lamps. PANIK lamps with the inscription "OUTPUT" are placed above all the exit doors. All panic lamps have a working autonomy of at least 1 hour and should provide a minimum illumination of 1lx on the evacuation routes.

- P1 WITH NATPISOM EXIT (TOTAL 13 PIECES)
- P2 WITH A STRING TO DOLLS OR GOES (TOTAL 3 PIECES)
- P3 WITH A STRING TO LEFT OR RIGHT (TOTAL 4 PIECES)

The layout of PANIK lamps is given in the graphic documentation.

3.31.1.8 Lightning installation and improvement of potential

The installation of a classical lightning rod in the form of "FARADEJ CAVE" is foreseen for the facilities of the border crossing complex Kotroman. This system is based on the installation of a fundamental grounding device, to which all the objects and all the larger metal masses of the complex are connected.

The object is not higher than 30m, and no additional lightning conductor ring is required.

When assessing the level of protection of the lightning protection installation, a budget will be applied for determining the level of protection in accordance with the Standards and Regulations.

Such a technical solution is envisaged which enables safe and safe operation, while meeting the basic criteria for installation quality. By analyzing the size of the object, the current situation and the surrounding environment, it has been concluded that the application of "FARADE CAVE" is the most optimal solution.

3.31.1.8.1 Testing and maintenance of lightning installations

Testing or verification of the lightning rod installation is performed as a first inspection in progress, or after the execution of the facility.

For parts of the installation which will not be accessible when the facility is completed the lightning test installation is carried out during construction. Upon completion of the works, it must be verified that the lightning installation has been carried out according to the project, the regulations on technical norms for the protection of objects from atmospheric discharge ("Official Gazette of FR Y" No. 11/96) and standards for lightning installations, on which a record is drawn up.

The external lightning installation is checked by testing the continuity of the receiving system, the ground conductors and grounding systems and their connections, as well as testing the resistance of the lightning conductor's lightning rod installation. These tests are performed in accordance with the regulation for low voltage electrical installations.

The internal lightning installation is checked by testing the potential equalization system in accordance with the regulations and standards for low voltage electrical installations, measuring the safe distance of the open loops in the lightning installation, if any, and checking the existence of the device for overvoltage protection according to the project and according to the regulations and Yugoslav standards for electrical low voltage installations. After the first review, it is necessary to perform periodic examinations or additional checks.

3.31.1.8.2 Lightning Verification Verification Procedures

The first inspection of the lightning-rod installation is related to the start of the construction of the building, as the laying of the base grounding is, as a rule, performed before the first layer of the so-called "thin concrete" foundation is formed, or it is formed from reinforcing reinforced concrete reinforcement. Since these elements will no longer be available after the concreting, they should be reviewed before concreting and this report is compiled.

The first inspection should be completed by the end of the lightning installation.

It is necessary to recall the necessity that the report on the first lightning inspector's inspection becomes an integral part of the technical documentation of the lightning rod installation, in order to be able to compare the results of measurements of the grounding resistance of the grounders with the results of the first inspection during periodic or additional reviews.

3.31.1.8.3 Periodic and additional lightning inspections

Periodic reviews, i.e. their periodicity is not strictly determined by Supervisor/JUS. Therefore, depending on the protection level, it is necessary to prescribe the Supervisor in the project documentation. The orientation for determining periodicity provides the proposal given in the following table:

Table 3: Determination of the periodicity of the lightning test

Level of protection	Periodicity	
	Checking the whole lightning rod and grounding	Visual inspection ** critical parts of lightning rods
I*	2 year	1 year
II*	4 year	2 year
III, IV	6 year	3 year

* Periodicity of the inspection of objects I and II of the level of protection in which the elements of the lightning installation are natural elements of the cladding, clamp - tin roof, drain pipes - reinforced concrete poles and grounding - basic, should be 6 years. The ground impedance for these objects is measured from the potential equalization bus.

** It occurs on objects that are in aggressive atmosphere and soil.

Critical parts of lightning rod installations are:

- parts of grips and drains exposed to mechanical stresses and chemical influences
- fuses of surge protective devices
- surge arresters
- connections for equalizing the potential produced by cables or pipes.

Additional lightning installations should be tested after each direct lightning strike.

3.31.1.8.4 Measurements

During electrical measurements on the lightning installations of the facility, it must be ensured that during the measurement the people in the facility and around it are not threatened.

The connection between the grips and the conductive conductors and the quality of the connections in equalizing the potential in the parts of the building or the connections with the grounders of adjacent objects, if need be performed, are checked by the instrument for checking the continuity of the protective conductor. Measurement can also be carried out using the U-I method, where it is desirable that the measurement is not carried out by the mains voltage, due to the danger of the occurrence of dangerous contact voltage, but with reduced voltage (4-24V) through the galvanic separation transformer, or even better one-way voltage.

The continuity of the conductor to equalize the potential is good if resistance is in the circuit. This condition should be satisfied at the level of each of the equipotential bars or the entire equipotential bonding system.

Measurement of the grounding resistance of the grounding device is performed by an instrument for measuring the resistance of an alternating current of frequency up to 150Hz or U-I method. When measuring, it is necessary to move the auxiliary probe from the object to a distance from: where D is the linear equivalent of the surface of the earth's earthing object.

Measurement current in the U-I method should be large enough to ignore the impact of interference on the measured voltages. When measuring in urban environments, it is necessary to separate the earthing from the bus to equalize the potential.

In order to neutralize the influence of wavering currents during measurement, the polarity of the voltage should be changed.

3.31.1.8.5 Maintenance of lightning installations

During the operation of the facility, the lightning conductor must be maintained in a proper manner in order to maintain its efficiency in terms of the level of protection.

The maintenance of the lightning protection installation should be organized in such a way that it is realized on the basis of annual inspection of the facility by the owner or user of the facility. An overview must be carried out after a direct lightning strike into the building. These checks should be oriented to verify the physical preservation of the elements of the installation and its protection against corrosion, in particular at the points of entry of the groundwater into the ground, then controlling the joints of the grips and the conductive conductors. For this object, the interventions on the lightning conductor should be kept in the maintenance book. By this procedure and by keeping the lightning rod installed, it ensures its proper functioning, ie the protection of people and goods to which these installations are intended. All maintenance data, in particular the specification of the repair and proof of the basic parameters of the lightning rod installation, as well as the project must be kept.

The complete installation must be carried out in accordance with the applicable Technical Regulations.

3.31.1.9 Technical conditions for strength installation

These technical conditions must comply with the applicable technical regulations for the performance of electrical energy installations in buildings and commercial buildings. These technical conditions provide a supplement to the regulations and explanations for the proper execution of electrical installations on the facilities. As such they are an integral part of the project and it is mandatory that the contractor adheres to them.

The contractor must comply with the following instructions:

- Construction works on the building must be at this stage to allow a normal start and smooth running of electrical installations.
- All work safety regulations must be met when performing works.
- The electrical installation must be carried out according to the attached design and technical description in the project. Anything that is not specifically emphasized in the project or technical description must be carried out in accordance with existing regulations and standards.
- All materials and equipment to be used for the installation must be of adequate quality and must comply with existing regulations and standards.
- Before laying the lines, the contractor is obliged to mark on the wall and ceiling and to indicate places for boxes, switches, sockets, etc.
- The conductors can be continued and bonded only in distribution boxes and they must all be carried out in accordance with the regulations.
- In order to allow the conductor to be connected at the entrance of the switch box, output armatures, connectors, distribution boxes, it is necessary to install conductors in the length of 10 cm.
- Before installing the connectors, switches and other equipment, it is imperative to check the correctness of the same.

- When inspecting the electrical installation, the insulation resistance of the conductor to earth at a voltage of 220V must be at least 220,000 Ω , and the isolation resistance between the conductors 380,000 Ω .
- All fuses must be rated at 500 V.
- It is forbidden to bind or bend the fuse (cartridge) of the fuse.
- All lines are allowed only to be laid vertically and horizontally.
- For horizontal laying, the lines must be 0.3 m away from the ceiling and at least 2 m above the floor.
- PVC insulated conductors must be laid directly on the mortar and under the mortar in rooms that are dry, without kitchen and chemical vapors, dust or explosion hazard.
- The ducts laid directly into the mortar must be covered with a layer of mortar of at least 6 mm thick over the whole length.
- Stacking multiple lines in bundles is not allowed.
- The conductors in the bathroom must not have a mantle.
- It is forbidden to guide leads running through the bathroom to consumers in other rooms.
- The connection of the lines is done exclusively with terminals and coupling couplings. Avoid breaking and continuing the lines.
- The parallel piping of plumbing and sewage pipes should be carried out with a minimum distance of 3 cm and a cross-section with a space of at least 3 cm.
- The conductor of the low current must be laid in special tubes and channels, ie, completely separate from power lines.
- Crossing of power lines and telephone installation lines should be avoided. If this is impossible, the crossing must be performed at an angle of 90° and a minimum distance of 10 mm apart.
- For parallel conductors of high current, telephone and signaling installations, the following points must be observed:
 - Power lines must be 30 cm away from the ceiling.
 - Signaling lines are placed 10 cm above the power lines.
 - Place the telephone installation plates 10 cm above the signal lines or 20 cm above the high-power lines.
- Razv. Boxes on the upper lines, one after the other, should be placed at an angle of 45°.
- All installations. the switches are at 1.50 m above the floor, and the connectors are 0.40 m from the floor.
- The electrical installation of the facility ends at the low voltage discharge fuse in the substation, which is located in the immediate vicinity.

3.31.1.10 Technical conditions for protection against applications

- The protection against over-voltage contact is made by the TN-C-S protection system (see the attached drawing)
- The TN-C-S system has a neutral (N) and protective (PE) conductor through the entire installation system.
- All metallic parts of the appliance and devices, which are not live under normal operation, which could get under voltage during failure, are connected to the protective (PE) conductor.
- The protective conductor (PE) in the installation is marked in yellow-green.
- The neutral conductor (N) in the installation is highlighted in a light blue color.
- The connectors in the installation must have special contacts (pens) to which the PE conductor is attached.
- Light switches are single-pole and interrupted only by a phase conductor.
- It is not allowed to interrupt the neutral (N) conductor in the installation system.
- Grounding PE and N conductors is common.

- After a common ground, the PEN conductor can be connected to the system, which combines the function of PE and N conductors.
- The following protection devices can be used in the TN-C-S system:
 - overcurrent protection device - fuses
 - Differential current protection device - "FID" switch

3.31.1.11 Technical conditions for lightning installations

- Lightning conductors must be designed so that atmospheric emptying can be carried to the ground without harmful consequences.
- The lightning conductor must be such that when the atmospheric shock discharge is carried out there is no jump. It should be borne in mind that during lightning strikes, people and objects in the immediate vicinity of the drainage are always endangered.
- The clips should be placed on those sides, that is, the parts of the building where there is the greatest likelihood of a lightning strike, and the roof lines or drains shall be laid so that the enclosed cage with as much drainage is created around the protective object.
- In a facility whose lines are highly exposed to corrosion due to gases and other components in the air, it is necessary to protect the lines in particular by coating or in any other equivalent way.
- Only ground lines of mass material (usually galvanized steel) can be laid in the ground. Aluminum lines must not be laid in the ground.
- Galvanized steel is used for line support. In copper lines, a coil of lead or some other material or bronze support should be inserted between the support and the copper water.
- To protect against corrosion, it is allowed to coat the lines laid in the ground.
- On the roofs of steel and reinforced concrete skeletal buildings, normal roof lines shall be laid, which are at least every 20 m away from the steel parts of the roof structure.
- Metallic wraps less than 0.5 mm should not be used as grips.
- Water-catchers on wooden structures must be raised, preferably 150mm above the roof, and on concrete flat roofs can be laid directly on the roof.
- The clamp on sloping roofs consists of one water on each ridge of the roof and drains on the edge of the gates, stretching to the roof (gutter).
- Plug-in pliers shall be placed on top support not more than 1.50 m away and at a maximum of 1.00 m at the ridge support.
- The clips on roofs with straw, cane or shingles should be placed above the wooden ridge of the roof, so that the roof surface will be raised at least 0.50 m.
- Drains must establish the shortest possible connection with the ground, preferably vertically, without changing direction. The drains must be as short as possible, and should be moved primarily near the edges of the building. Drains must be located as far away from windows, doors, electrical installations and those metal masses that are not connected to the lightning rod installation.
- For buildings with a surface area between 20 and 50m², besides the main drainage, there is also one auxiliary drain.
- Each building with a surface area greater than 50m² should have at least two main drains.
- If the building is wider than 12 m, at least 4 water is needed.
- If the building is longer than 20 m, one more drain on both sides should be added for each started of 20 m, if the building is more than 12 m wide, that is, only on one side and this is unchanged if the building is up to 12 m wide.
- The main drainage can be: Metal masses of the building that form a good conductive unit (metal roof, gutter, carriers, reinforcement) and have an adequate cross-section.
- In order to prevent skipping and large electrodynamic forces, knees with a radius of less than 200 mm must not be run and the change in the direction of the water must not be greater than 90.

- The drains can also be placed directly under the tile if they are adequately protected against corrosion, e.g. coating, polyvinyl halide or other similar methods. In doing so, the joints must be accessible and not be covered with a tile.
- The main drains are not allowed into the gutters.
- The main drains as well as the auxiliary drains connected to the ground should have an accessory connection joint at a height of about 2 m above the ground.
- The position of the lines on the deck must be such that it allows easy inspection.
- The position of the line on the deck must be such that it does not prevent slipping of snow.
- Do not lay the pipes on metal roofs, if the sheet is not thicker than 0.5 mm.
- The impact of the lightning conductor is characterized by the impact resistance of the propagation of R1, and not the resistance of R2.
- For a specific resistance of earth less than 250 ohms, the impact resistance R1 of the grounding device may not exceed 20 if these regulations do not give any other values for certain cases.
- If the specific earth resistance is greater than 250 μm , the amount of impact resistance R1 must not be much higher than 8% of the measured specific resistance in ohm.
- Metal chimneys, ventilation ducts and other metal masses on the roof must be connected at one or more points to the lightning rod installation.
- The guides of cranes (lifts) reaching the top of the building (the last floor) should be connected to the upper and lower ends by the shortest way to the lightning installation.
- Steel structures of the structure and reinforcement of reinforced concrete structures should be grounded at least in two places.
- Since trees near the protected object influence the lightning action, if the wood is more than one object and if it is at least 10 m away, the lightning rod must have one drain placed on the object as close to the tree.
- The protection against over-voltage contact is made by the TN-C-S protection system (see the attached drawing)
- The TN-C-S system has a neutral (N) and protective (PE) conductor through the entire installation system of the facility.

3.31.2 Telecommunication and signalling installations

3.31.2.1 Classification of external effects

The application of the standard SRPS HD 60364-5-51 includes the selection of equipment and its installation. It provides common rules for compliance with safety measures for the purpose of achieving safety, requirements for proper functioning according to the intended use of installations and requirements that correspond to the anticipated external influences.

The choice of equipment to external influences is necessary not only for the proper functioning, but also in order to ensure the reliability of protection measures in order to achieve safety in accordance with the rules of IEC 60364 in principle. The protection measures achieved by the construction of the equipment are valid only in the given conditions of external influences, if the appropriate tests of the equipment specification are made under these external impact conditions.

Characteristics required for equipment in the function of the class of external influences

CODE	DESCRIPTION	EXTERNAL EFFECT	REQUIRED CHARACTERISTICS FOR SELECTION AND EQUIPMENT SETTING
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The influence of the environment

AC1	Elevation	≤ 2000 m	Normal
AD1	The presence of water	Negligible	The likelihood of water presence is negligible IEC 60721-3-4
AE1	The presence of foreign solid bodies or particles	Negligible	The amount or nature of dust or foreign bodies is not significant IEC 60721-3-3, IEC 60721-3-4, IEC 60529
AF1	Presence of corrosive substances or pollutants	Negligible	The quantity or nature of corrosive substances or contaminants is not significant IEC 60721-3-3, IEC 60721-3-4
AG2	Mechanical impact	Negligible	Normal
AH2	Vibrations	Negligible	Normal
AK1	The presence of flora and / or the development of mold	Negligible	Normal
AL1	Presence of fauna	Negligible	Normal
AM1	Conduction or radiation	Negligible	Normal
AN1	Solar radiation	Negligible	Normal
AQ1	Atmospheric discharge	Negligible	<25 days a year
AR1	Getting around air	Normal	speed <1m / s
Use			
BA4	Personality capability	Trained	People advised or monitored by experts in a certain way to avoid the dangers that electricity can cause (staff working and maintaining
BC2	Touch people with the potential of the country	Bad touch	Permitted use of appliances and equipment of all classes

BD1	Conditions for emergency evacuation	Low density of population, good evacuation conditions	Normal
BE1	Nature of processed or stored materials	No significant risks	Normal
Construction of the building			
CA1	Materials of construction	Non-flammable	Normal
CB1	Building project	Negligible risks	Normal

The term "normal" that appears in the third column of the table means that the equipment must satisfy the requirements of the corresponding standards against which it is made.

3.31.2.2 Telephone and computer installation

The preliminary design of signaling and telecommunication installations foresees a connection to a telecommunication network that complies with the Technical Conditions for connection of the facility to the TK network issued by Telekom Srbija, 171-451435 / 2-2016.

On the above plot there is the optical cable Mokra Gora-Kotroman and the subscriber cable TK 10 through which the existing telephones operate in the facilities of the border crossing Kotroman.

To connect the Kotroman border crossing point to the telecommunication network, it is planned to construct two leading TK windows measuring 1h1h1m with a light lid. The first window is foreseen in front of the building of the Customs Administration and MUP (building No.1), and the other at the inspection facility (facility No.7). A gap of 0.8m is provided between the windows, with two PVC pipes fi110mm laid out. From the boundary of the detailed regulation plan (direction towards Uzice) to the TK window no. 2, a depth of 0.8m is provided with two PVC pipes fi 110mm. From the newly constructed TK window No.1 to the building of the Ministry of Interior and the Customs Administration, there is a ditch with two PE pipes fi40mm, which end in the delivery cabinet. Through the pipes from the TK window to the ITO cabinet, the TK DSL (30) 59GM cable is of the appropriate length and capacity (20h2h0,4). In the delivery cabinet, KRONE divisive regulators are provided on which the drive cable ends. The second tube is designed for later wiring of the optical cable. ITO cabinet is installed in the ground floor of the building. The ITO cabinet will be grounded. The internal installation is intended to be performed with UTP cat6 type cables. The inside of the installation facility will be installed in the installation pipes. In the ITO cabinet, KRONE regulators are installed on which the installation cables are completed.

The computer network is also running with UTP Cat6 cables. The concentration of these cables is in the REK cabinet.

3.31.2.3 Automatic fire fighting

All parts of the Kotroman border crossing complex that may get dirty from the occurrence of fire will be covered by the automatic fire alarm system. The automatic fire alarm system consists of optical detectors, thermal detectors, manual fire detectors, installations, sirens and power stations. The switchboard is positioned where the duty staff will be present for 24 hours. One switchboard is designed. The entire automatic fire alarm system is designed to be addressable.

Pursuant to Article 42 of the Fire Protection Act (Official Gazette of RS No. 111/09): "In the design and construction of high residential buildings and public facilities (hotels, department stores, cinemas, theaters, libraries, children's institutions, schools and higher education institutions, health facilities, sports halls, concert halls, stadiums, etc.), as well as in facilities where art works are preserved, installation of devices is required which enable timely detection and fire reporting.

In facilities where technological processes take place, they process, use, and store the flammable, explosive and other hazardous substances, in high buildings (except residential buildings), in archival and documentation buildings of special value, in the objects in which they are performed stores over 3500 m², in facilities for exhibitions of over 1000 m², museums, cinemas, theaters, airport buildings of more than 1000 m², in addition to the devices referred to in paragraph 1 of this Article, installation of devices which enable timely g SENJI fire (fixed fire extinguishing systems). "

At the request of the investor, a preliminary design of a stable fire alarm system was made.

3.31.2.3.1 Product compliance

Pursuant to the Law on Technical Requirements for Products and Conformity Assessment (Official Gazette of RS No. 36/2009) all installed equipment must possess the appropriate certificate of conformity: declaration of conformity, test report, certificate, certificate of control. The project envisages the installation of equipment that is in compliance with applicable regulations. Equipment for a stable fire detection system must comply with: SRPS EN54 The electrical distribution must be in accordance with: SRPS HD 60364-1: 2012. Protective coating of cables at break through the boundaries of the fire sector must be in accordance with: СРПС ИСО 834 SRPS U.J1.042: 2000 - Technical requirements

3.31.2.3.2 Elements of the automatic fire alarm system

The projected fire alarm system consists of:

- addressable fire alarm centers B7-SCP520
- addressable automatic and manual fire detectors
- line aspiration detector
- addressable modules
- alarm sirens with and without flash
- cable installation.

Fire alarm system B7-SCP520 with integrated control and control keypad should be installed in a room with permanent attendance of staff, room no. 3 within the building part 1 of MIA. For the primary type of detector the optical smoke detector was selected because it reacts in the initial phase of the fire.

This type of detector is foreseen in all areas, except in those where in the first stages of fire development an elevated temperature is expected where thermal detectors are provided. У близини улаза/излаза из објекта, на комуникацијама поставити ручне јављаче пожара. Warning of employees about the occurrence of fire in the facility will be performed by sound signals via alarm sirens with and without flash placed on the objects.

3.31.2.3.3 Alarm plan

An automatic fire alarm system requires an elaborated alarm plan whereby the procedures of

employees must be established, trained to handle the fire alarm center, which is present at the headquarters 24 hours.

The alarm plan must be in accordance with the General User Act, or the Fire Protection Plan.

In the immediate vicinity of the fire alarm, a schematic diagram of the alert plan is set out, with a brief instruction on the procedures to be performed in a particular situation.

In addition to the alarm procedures, in connection with the operation of the fire alarm system, the alert plan must include procedures related to:

- warning other people and their evacuation
- by turning on the face of the fire extinguisher
by exciting the closest professional fire brigade
- by alarming a person with special duties in relation to fire protection.

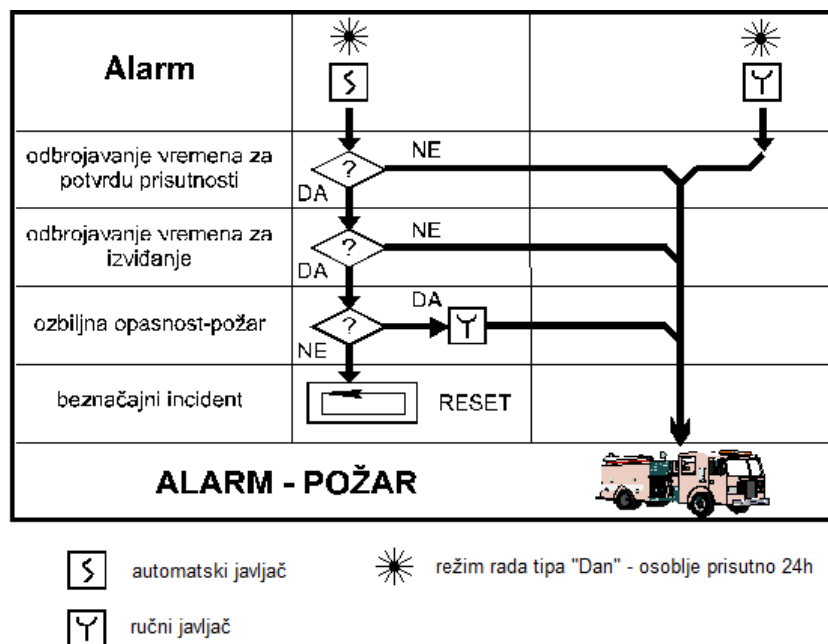


Figure 1. Graphical display of alarm organization

3.31.2.3.4 Organization of alarm "DAN" (staff present at the 24 h center)

The facility is staffed for 24 hours, which can react to the alarm system of the fire alarm system, in simpler cases, to extinguish the fire without the need to alert the fire brigade. For this reason, two time delays are defined in the fire alarm system:

1. time of attendance confirmation (acceptance of alarm)
2. Reconnaissance time (alarm checks)

In the event of a fire in the protected area, the nearest automatic fire alarm will occur. The activation of the automatic fire alarm causes ALARM I (first-degree alarm) on the control panel and starts the countdown time of the presence confirmation. Within this time, it is necessary to confirm (accept) alarm information at the headquarters. After accepting the alarm (which means that the staff is aware that there is a fire and the location of the fire is located), the counting time of the reconnaissance (alarm checks) starts. During that time, the person who accepted the alarm goes to the place of fire and depending on the fire situation:

1. extinguishes the fire and, upon return, "resets" the central station
2. Activates the closest hand fire alarm.

The activation of the manual fire alarm causes ALARM II (second level alarm). immediately activates alarm sirens and executive functions (information on a fire signaled by a manual alarm is not checked). If the alarm signal is not received before the expiration of the presence time, or if the person who accepted the alarm does not return and does not "reset" the station before the scanning period expires, the control panel switches to the ALARM II state and performs all of the above actions in relation to the second alarm .

3.31.2.3.5 Facial treatment in case of fire

We distinguish two causes of fire alarm:

1. signaling the fire via an automatic fire
2. signaling the fire through a manual fire alarm

The fire alarm is signaled by an automatic fire alarm

In case of an alarm of the fire alarm system caused by the activation of the automatic fire alarm, the procedure of persons qualified for the operation of the central control panel is as follows:

1. Alarm reception on the control panel (control panel control panel)
2. identification of the location of the fire according to the data at the switchboard (the address and description of the location of the activated caller is displayed),
3. going to the place of fire and situation analysis,
4. The decision on the size of the fire:

Small size fire

1. fire extinguishing with fire extinguishersгашење пожара приручним средствима за гашење
2. return to the switchboard and return to the central control station (reset switch)

big fire:

3. Activating the nearest manual fire alarm, after which the alarm devices (sirens, flashlights) and executive functions
4. telephone call of the fire brigade
5. after stopping the danger (after extinguishing the fire), returning the power station to normal condition

Fire alarm signaled by a manual alarm

In case of an alarm of the fire alarm system caused by a manual detector, the procedure of persons trained to operate the central station is the following:

1. identification of the location of the fire according to the data at the switchboard (the address and location of the activated caller is displayed),
2. going to the place of fire and situation analysis,
3. decision after the established situation.

real fire

4. telephone call of the fire brigade,
5. fire extinguishing with hand tools,
6. return to the central station and return control to normal.

a randomly activated manual caller

7. Return to the switchboard and return the control panel to the normal state.

Note:

Alarm organization is only part of the Fire Protection Plan.

As part of the Fire Protection Plan, it is necessary to set up a schematic diagram of an alarm system in the immediate vicinity of the switchboard with a brief description of the procedures in the event of a fire accident.

In addition, in the immediate vicinity of the switchboard, the Operating Instructions and the Control Book (Inspection and Testing).

3.31.2.3.6 Fire alarm

It is envisaged to install an automatic fire alarm system with an addressable single-loop microprocessor controller, type SecuriFire B7-SCP520 or similar.

On the control panel, addressable automatic and manual fire detectors and various input / output modules are connected over the loop. The switchboard provides power supply and continuous monitoring of signaling - signal lines, signaling the processing of signal lines or the occurrence of faults on them, sending alarm signals to acoustic sources, as well as the management and certain interventions in a two-stage alarm system. It also provides signals necessary for connecting the fire alarm system to other systems (central control functions).

The switchboard is powered by a voltage of 220V, 50Hz from the distribution cabinet from a special circuit. The switchboard contains a 24V, 2.5A power supply, 2x12V, 12Ah battery backups for a minimum 72 hours of power backup and 30 minutes in alarm mode in the event of a power outage.

The control unit is designed for wall mounting and contains electronic components and a power supply unit with batteries. Complete system management is done via an integrated control and control keyboard, with a 5.7" TFT display and a SecurityWheel to navigate through the menus. All system states are displayed in a text format on the display. It is possible to choose a print in 4 languages, one of which is Serbian. Changing the language is possible during the operation of the control panel. There are 3 function keys and 7 LEDs for displaying priority states on the console.

The center has the ability to select the sensitivity and criteria of the fire detectors (smoke, temperature / temperature growth rate or combined) by the software. The switchboard has programmable relay outputs for switching on alarm devices, switching off valves, electrical energy, PP gate or the like in the event of a fire.

Technical characteristics of the control panel:

- Power supply: 230 VAC (50Hz)
- Operating voltage: 10 to 30VDC
- Working temperature: -5 до +50 oC
- Degree of protection: IP 30
- Dimensions WxHxD: 340x300x80 mm

The center meets standard EN 54-2 and has VdS attestation.

3.31.2.3.7 Firefighter

Automatic detectors

Considering the purpose of the facility, the possible causes of fire outbreaks, the speed of fire development and the conditions in the premises, for the automatic detection of a fire occurrence, install the following type of detectors:

a combined multi-criterion optical smoke and temperature sensor with a base, type MCD573X / USB501 or similar, to be programmed to operate as an optical smoke detector or as a thermal fire alarm.

An optical smoke detector was adopted for the basic type of an alarm system of the automatic fire signaling system, since it detects the appearance of a fire at an early stage of its development.

The density of the setting of the alarm was determined based on the analysis, and taking into account the following parameters:

- principle of control over premises,
- geometry of rooms
- disruptive conditions
- data from equipment manufacturers and others.

In the rooms that are protected and whose height does not exceed 6m, the maximum surface area of the smoke detector is 60m². Accordingly, the maximum distance between the two detectors is $1.2 \times \sqrt{60} = 9\text{m}$, and the maximum distance from the wall of the wall is 4.5m.

In protected areas, whose height is from 6 - 8 m, the maximum surface area of the smoke detector is 80m². Accordingly, the maximum distance between the two detectors is $1.2 \times \sqrt{80} = 10.6\text{m}$, and the maximum distance of the radiator from the wall is 5.3m.

In the passages and corridors that are 3m in length, the spacing between the radius does not exceed 15m.

In the passages and corridors that are 3m in length, the spacing between the radius does not exceed 15m.

Smoke detection is based on the Tyndall effect, while the NTC sensing principle is used for the detection of heat. The construction of the smoke detection chamber is such that it allows the unobstructed smoke to enter the chamber, which together with the setting of the sensitivity level increases the resistance to false alarms.

The sender is more criterionally, since the sensitivity of the detector when it works as a smoke detector is temperature-dependent according to the so-called. "CUBUS leveling", ie. When the temperature increases, the sensitivity of the detector also increases. When the temperature in the protected area decreases, the sensitivity decreases. In doing so, the sensitivity remains within the scope defined by EN 54-7. This feature is important, since in the event of a fire, smoke to the top of the room slows down due to the increase in temperature.

Sensor sensitivity when operating as a temperature sensor can be selected between classes A1, A2, B, and all according to EN 54-5.

The wearer has a loop insulator installed which, in the event of a short circuit or line interruption, ensures smooth operation of the caller. The sender is mounted in a standard base for mounting on the ceiling or on a suspended ceiling.

The sender can generate the following messages to the fire alarm centre:

- Fire alarm: smoke or temperature
- Smoke predalarm: PA 1 to 50%, PA 2 to 75% alarm threshold
- Pollution: Levels 1 and 2
- Temperature predalarm
- Audit alarm of smoke and heat

Error message: worsening, optical error (dullness), power failure, NTC short circuit, EEPROM memory error.

Technical characteristics:

- Operating voltage: 16 to 30VDC

- Working current: 250 µA
- Alarm current: 5 mA
- Operating temperature: -25 to +60 °C
- Degree of protection (complete with base): IP 44
- Relative humidity (no condensation, temp ≤ 34 °C): 10 to 95% rel /X
- Dimensions Øxh (complete with socket): 112x60 mm
- The sender must have a VdS attestation and satisfies EH 54-5 и EH 54-7.

The programmer program to work as optical or thermal.

Manual fire detectors

An addressable manual fire alarm serves to manually activate the alarm in the event of fire, without the time of checking and thus play a role in the fire protection for direct alarm. It is installed at a height of 1.5m from the floor.

A handheld speaker consists of a housing for the wall mount with a protective plastic lid, a front-facing glass microscreen, terminals and an addressable module, type MCP545X-1 N 82X or similar for internal mounting and MCP545X-4 N 82X or similar for external mounting.

Addressable module has built-in loop isolator which in the case of short circuit or line breaker allows smooth operation of the signal.

In case of an alarm, it is necessary to lift the protective plastic cover and press the front glass. In this way, an electrical contact is established that transmits an electrical signal to the fire alarm control panel via an addressable module.

The front glass is coated with plastic foil and can not be damaged during straw. The electrical contact can only be unlocked after removing the broken front glass.

To check the functioning of the system, a special tool is used, so it is not necessary to disassemble the alarm or break the front glass.

The sender must meet the EN54-11 and EN54-17 standard and have a VdS certificate.

Technical characteristics:

	MCP 545X-1 N	MCP 545X-4 N
Working voltage:	7 to 31 VDC	7 to 31 VDC
Working current:	120 µA	120 µA
Alarm current:	20 mA	20 mA
Degree of protection:	IP24	IP67
Ambient temperature:	-10 to +55 °C	-10 to +55 °C
Dimensions WxHxD:	89x93x61.5 mm	97.5x93x73 mm
Weight:	160 g	240 g

Addressable modules

Addressable relay module BX-REL4 Securitron or similar, contains four volt-free relay contacts 230 V / 2 A. Each relay provides COM, NO and NC data. Each input can be programmed with PC software. Relay outputs can be switched to a fail-safe position in case of power loss.

Technical characteristics:

- Operating voltage: 12 to 30 VDC
- Working current: 510 µA
- Relay output: 230B/2A (max 60W)
- Ambient temperature: -20 do +60 oC
- Dimensions WxHxD 100x67x20 mm
- Parallel indicators

Connection of parallel indicators of the fracture projection is foreseen for all the detectors that are placed in the space of the lowered ceiling, the double floor or in the rooms that are permanently locked or inaccessible. Indicators are displayed in a prominent position.

The projected type of indicator is RAL 720H Securitron or similar.

Technical characteristics:

- Operating voltage: 5 to 30 VDC
- Damp protection: IP 42
- Working current: 1 mA
- Ambient temperature: -20 do+60 oC
- Dimensions WxHxD: 85x85x30 mm
- Weight: 53 g
- Alarm elements

Informing staff in fire-fighting facilities will be done by means of sound and light signals emitted via alarm sirens with and without flash-mounted objects. Two types of alarm devices are planned, as well:

siren for indoor mounting type Sonos Klaxon 450 (PSS-0003) or similar and siren with flash for external mounting type Sonos Klaxon 501 (PSS-0013) or similar.

Technical characteristics:

	Sonos 450	Sonos 501
Working voltage:	9 to 60 VDC	9 to 60 VDC
Working current of the siren:	4-45 mA	4-45 mA
Flash working current:	-	5 mA
Degree of protection:	IP21	IP65
Ambient temperature:	-25 to +70 oC	-25 to +70 oC
Dimensions Øxh complete with base:	100 x 81 mm	97.5 x 104 mm

Alarm sirens and flashing sirens should have a VdS attestation and meet the EN 54-3 standard.

Alarm sirens and flashing sirens are placed at a height of 2.2-2.5m from the upper floor layer and are

fed directly from the fire alarm or from a separate power supply unit.

Phone alarm

An alarm telephone with three input zones, type T-VOX or the like, serves to send three independent alarm voicemails or unique messages to 3 groups with 4 programmed telephone numbers. The module is installed in the fire alarm system..

Technical characteristics:

- Operating voltage: 10.5 to 15 Vdc
- Consumption: 25 mA (with programmer) / 90 mA max. (during the active state)
- Operating temperature: 0 to +50 oC
- Voice message duration: 1x40 sec (2x30 sec, or 3x20sec)
- Dimensions WxDxH: 104x83x32 mm

Fire alarm installation

Connecting all automatic and manual fire detectors, parallel indicators and modules to each other and with the controller is provided with a cable type JH (St) H 2x2x0.8 mm, and connection of alarm sirens and executive functions with cable type JE-H (St) H FE180 / E30 2x2x0 .8 mm.

The power supply of the switchboard is provided with a cable type NhXH 3x1.5mm² which goes from a special circuitry, from the closest electrical distribution cabinet in the building.

Install the fire warning set through:

- halogen-free PVC channels,
- halogen-free flexible hose,
- halogen-free smooth PVC pipes beneath the layer of mortar
- non-combustible clamps,
- existing cable racks and existing cable channels.

The connection between the distribution cabinets of the fire warning is provided with a cable type TK59 3x4x0.8mm. Cable is installed through existing cable channels between objects.

Executive functions of the fire alarm control panel

In the event of a fire, by any automatic or manual alarm in the facility, the controller operates in accordance with the enclosed alarm schedule, i.e. via relay output provides:

- switching on alarm sirens with and without flash on objects,
- forwarding a voice message to the programmed phone numbers.

3.31.2.4 Technical description of video control system

The video surveillance system consists of:

- IP camera for outdoor installation, 31 pieces
- IP camera for plate recognition, 8 pieces
- network video server, where video storage is stored, 2 pieces
- client workstations, with software for monitoring and management of video surveillance system,
- active and passive network equipment (part of the structural-cable system with active network equipment).
- electrical installation.

A system for automatic identification of registration plates in each traffic lane is foreseen. incoming

and outgoing traffic, as well as vehicle inspection areas and interior cabins.

The external cameras are compact cameras with heater and thermostat in the body of the camera (Bullet), in IP66 degree of protection, which gives these cameras a high resistance to external influences. The cameras are highly sensitive and give a high quality picture in color mode up to 0.05lx and 0.1lx (at 50IPE), and also contain infrared (IC) diodes that allow them to deliver high quality images even in full darkness. Although the external, predetermined cameras have low power consumption and can be powered by a standard PoE switch (802.3af). The cameras are full HD resolutions (1920 x 1080 pixels), which is enough resolution for detecting person movements and identifying people in controlled areas.

The system also includes cameras for identifying license plates that also have dullness in the dark, Full HD resolution (1920 x 1080 pixels) and IC diodes. Specific for these cameras is the speed of taking images to process 60fps, so that the image is always taken best to process the image of the table. Also, these cameras contain a 10-22mm lens so you can zoom in on a part of the area where the front of the vehicle with the registration plate is expected to appear.

Mounted at a height of 1.5m.

The digital recording device is a computer server with a video surveillance software placed in a rack. For servicing the camera system and working with a client computer, two servers are required.

All camera images are digitally archived on servers, on hard disks in H.264 compression (optimum compression in terms of image quality / flow ratio).

Milestone Hprotect Professional + is installed on servers, which manages the recording of images on hard drives. This software version lets you connect an unlimited number of cameras to an unlimited number of servers in the system, and software licenses are made by the camera. This software also supports the central configuration of the system from a single server if there are multiple video storage servers in the system, "EDGE storage" the ability to record video material locally in the camera when the video server is terminated, and after the connection has been established to transfer to the memory network video server.

Milestone Software is an open source platform software and supports over 300 camera manufacturers and ONVIF protocols.

Motion detection is aimed at targeted shooting of images from a camera to a hard disk (only if there is a corresponding change in the image). In this way, the memory space reserved for storing recorded video material is significantly saved.

Within the network video server, the intended hard drives are provided for professional video surveillance systems for long and continuous operation, which are organized in the RAID5 configuration to ensure that when a hard drive fails, all recorded video material can be saved and reconstructed after its replacement

On client computers, workstations, software is provided for the HProtect Smart Client software, which allows you to view live images, preview of previously recorded material, backup to DVD, USB. The client connects to the server via a local network or an external network. Clients are authorized by the user name and password on the basis of which they have a certain level of authorization to access the system. Milestone Hprotect Professional + Software does not have software restrictions in the form of a number of client computers that connect to a network video surveillance server (the only limitation is harder computers).

All camera images are digitally archived on recorders. Recording video material from the camera to the hard disk server is performed only if there is a change in the scene that the camera monitors

(motion detection motion detection). Also, when the memory space with video material is filled up, the oldest recorded material is copied, so the recorders have been archived for the last 30 days of video material.

If there are major changes in the scene that the camera monitors, an alarm condition occurs, which ensures protection to overlap and rotate the camera.

The system envisages one client workstation with the software for managing the video surveillance system, and, if necessary, additional workstations can be added.

The planned workstation in the Control Center room is a high-performance computer that can display simultaneously a large number of cameras on two 55 "-based" 55-inch "monitors and a 24-inch monitor that serves to view recorded video material, backups and system settings.

On client computers, image control with live camera or from previously recorded material is performed. The software can also perform "backup" of recorded video material on various media (USB, DVD ...) and in different formats (AVI ...).

A client computer connects to a network video server via a local network or an external network. Within the client software it is possible to watch "live" simultaneously or view the recorded video material with the camera.

The transfer of video material between network video servers and client workstations is encrypted to ensure maximum significance.

Cable installation is foreseen by 6TP SFTP cables. The foreseen cables are "Halogen free" type. The maximum length of the cable between the camera and the furnace panels in the cabinets with the video surveillance system switches, as well as between the furnace panels in different racks, does not exceed 90m. For routes longer than 90m, it is envisaged to install an optical cable with 4 multimode fibers 50/125 µm, with media converters at both ends.

All cameras are powered by switches via PoE (Power over Ethernet), so the image and power are transferred via the same cable. For cameras that are intended to be connected via optics, a 220 / 12V power supply with a PoE injector is provided at the camera location.

For the video surveillance system in the rack, an additional UPS 3kW, single-phase, 8-minute operation autonomy is also provided. The rectangle is connected to the aggregate supply.

3.31.2.5 Technical conditions

3.31.2.5.1 General technical conditions

- All works should be carried out according to the project, existing regulations and instructions.
- The materials and equipment used to make installations must comply with existing standards and standards.
- The Contractor shall be responsible for the completeness, accuracy and quality of the works performed.
- Prior to commencement of works, the contractor is obliged to get acquainted with the project and instructions of the equipment manufacturer. All remarks should be submitted to the supervisory authority in due time.
- For minor deviations from the project, the written consent of the supervisory body of the investor is sufficient, and for the significant deviation and approval of the Supervisor.
- When making electrical installations, the contractor must take into account already performed works and existing installations.

- The Contractor is obliged, upon completion of the works, to carry out commission examinations and examinations of the implemented installations and make necessary corrections before the technical acceptance and takeover of the works by the user.
- The warranty period for all works carried out is one year from the date of the commission's receipt. Within this period, the Contractor is obliged to eliminate at his own expense all defects due to poor production or poor quality material.
- Prior to the commencement of the works, the contractor is obliged to check the project and if it finds a certain disagreement with the actual condition of the object, he is entitled to request changes, additions and notifications through the investor.
- If the contractor considers that the installation of fire protection works would function better and rationally with some changes or additions to the project, such changes or amendments with special explanations, analyzes and other documentation could be submitted to the investor. However, the contractor is not authorized to make any changes or amendments without the consent of the investor or Supervisor.
- Unforeseen works or an increase in the amount of materials and works must be previously approved by the investor. In extremely urgent cases, subsequent approval may be required even during the execution of these works.
- All waste and garbage remaining after these works are carried out, the contractor is obliged to export from the facility to the place determined by the Supervisor.
- All damage to the building caused by the performance of the projected fire protection installations is performed by the contractor, who is obliged to repair it and bring the object to its original state.
- For any necessary tests during the performance, as well as the final tests at the test drive, the contractor is obliged to make available the appropriate necessary instruments as well as qualified personnel.
- All mutual obligations of investors and contractors shall be regulated by contract.
- The guarantee of the proper functioning of the fire protection installations and the quality of the contracted material will be regulated by the contract, but with the guarantee period not shorter than two years, counting from the date of technical reception.
- The contractor is obliged to keep a construction log in which he will write the performed works and the consumption of the material on a daily basis. This journal must be directed by the investor's supervisory authority.
- If the need for changes and additions to the project of the works envisaged during the execution, they must be stated in the construction log. No changes may be made here without the consent of the responsible Supervisor.
- The investor's supervisory body is obliged to regularly control and verify the construction log and, together with the contractor, responds that the fire protection installations are carried out according to the project.
- Upon completion of the assembly, the contractor is obliged to submit to the investor, in the final calculation, three samples of the plans of the works actually performed, the details of the description and the scheme of the installed equipment, as well as the detailed instructions for handling and maintenance of the entire installation in the proper condition.
- These general contractual terms are an integral part of the project elaborate and are in all cases mandatory for the installation of fire protection installations.

3.31.2.5.2 Technical conditions for electrical installations

- These technical conditions are an integral part of the project elaborate and as such are obligatory for the contractor. Anything that is not foreseen by the description as well as the project itself, and necessary for the proper operation of the installation, the contractor is obliged to report it to the supervisory authority on time.

- The entire installation must be carried out according to the plans, the description of works from the budget as well as the existing regulations and standards applicable in the FRJ for certain types of works.
- The material for the contractor must be of good quality and in accordance with existing standards. Upon the issuance of materials to the construction site, the supervisory authority is obliged to inspect it and state its status in the construction log.
- In addition to the material and all work, it must be performed well, with expert work force, and all that is later found to be incorrect, the contractor is obliged to remove at his own expense without the right to compensation.
- Prior to the commencement of works, the contractor is obliged to mark the places for the phone and computer, speaker, fire alarm, antenna output connections, anti-theft signaling elements, video cameras, as well as cable rails and all lines for all installations.
- Pipes and distribution boxes have to be made of insulated material, and when laying them, care must be taken to ensure that the walls do not collapse, as well as when laying the cables.
- The pipes must be so arranged that there is no place between the two distribution boxes where condensed water could possibly be collected. When horizontally laying the pipes between the two boxes, they must make a gentle bow with a hook up and down the ends of the pipe toward the distribution boxes.
- In parallel laying of energy, telecommunication and signal lines on the walls, the power lines are the lowest, and at min. 20 cm from them are telecommunication lines.
- Crossing of telecommunication lines with power lines should be avoided. at right angles, the distance between these lines must be 10 and where it is not possible to install an insulation insert of 3 mm thickness.
- The wiring and extension of the conductors shall be carried out exclusively in distribution boxes of sufficient dimensions to accommodate transparent conductor connections. The minimum internal diameter of the distribution boxes shall be 70 mm. Connections must be reeled and isolated. Each type of installation must have special distribution boxes.
- Conduits for all types of installation shall be made of copper, characterized by the type of insulation of the cross-section or diameter as per plans, schemes and estimates.
- When pulling and laying cables, make sure that they are not broken. At the direction of change of direction, a slight curvature must be made whose radius must not be less than 15 times the external diameter of the cables.
- The passage from the cable to the pipe conductors must be carried out in the cable cabinets.
- 14. The cabinets must be made of decapitated sheet metal with door locks and key. The telephone distributor must be grounded. The grounding resistance of the ground must be less than 10 ohms.
- 15. If during the execution of works for any reason the need for minor deviations from the project is indicated, a written consent of the supervisory authority must be obtained for each deviation. Major deviations may only be made after the approval of the commission that approved the project.
- 16. The warranty period for all works is two years from the date of technical acceptance. During all the warranty period, the contractor is obliged to eliminate all defects and defects that result from poor manufacturing or poor quality of the installed material at their own expense without the right to compensation. For failures caused by improper handling, the performer is not responsible.
- All waste and garbage caused by the installation shall be taken from the site to the place specified by the investor.
- An investor's consent must be obtained for unforeseen works or an increase in the volume of work.

- Upon completion of all works, all installations must be tested according to existing regulations. The results obtained must be within the limits prescribed by the regulations.
- If the installation finds a faulty performer during the examination, it is obliged to bring it into proper condition at its own expense.
- Installation of the installer from the contractor can only be performed after the completion of all the works and the testing of the correctness of the installations.

3.31.2.5.3 Technical conditions for the execution of electrical installation for fire signal

- For el. fire alarm installations use the cables foreseen by this project or the like that can completely replace the intended ones.
- Cables should be laid using clips or cable installation channels.
- Connect and disconnect the signal cable only at the base of the receiver or in the cabinets for cable concentration.
- The distance between the fire alarm installations and the electrical energy installations of the voltage of 0.4kV must be at least 0.1m, and when crossing 1cm. If this condition can be met when crossing this condition, insulation material with a minimum thickness of 3mm must be inserted between the aforementioned cables.
- Within a single signal line, the conductors must be operated without interruption. At the ends of the conductors leave 30cm of free conductor to connect the base.
- Before commissioning the installation, the contractor is obliged to check the resistance of the cable insulation.

3.31.2.5.4 Special technical conditions for installation of fire fight

- The contractor is obliged to perform all works on installation of equipment, laying of cables as well as connecting cables in diversions. Cables entering the central device should be left unconnected to the central, because these connections, as well as the testing of the entire fire alarm system, are performed by the only equipment supplier, and this is one of the warranty conditions.
- Set the automatic fire alarm according to the graphic documentation, whereby, when determining the position of the same, account should be taken of the largest intermittent intermittent distances between the distances, the distance from the wall, the surface of the overlap depending on the fire risk and, on the other hand, the obstacles in the form of parts of the technological equipment. If, however, the mounting shows the overlapping of the position of the detector with part of the equipment, it is necessary to move the fire alarm to a minimum distance of 0.5 m from the equipment part, in the horizontal and vertical direction.
- The mounting of the base of the automatic fingerprint is performed supersensibly. Attachment must be carefully carried out for the control and service of the catcher inserts, which will be removed and re-mounted in several ways during operation. The mounted caller on the underside must be easily accessible for service and control, at least 50 cm of free space.
- Applicants should be linked in accordance with the binding schemes given in the graphic documentation.
- On each caller, it must be marked where it belongs and its serial number in that zone.
- The optical LED indicator on the alarm should be visible from the input side of the room in which it is located.
- Manual fire detectors are placed at the exit. Mounted at a height of 1.2 to 1.5 m in an accessible and noticeable place. Intrusion cables up to 2 m in height must be mechanically shielded. When installing a handheld speaker near the door, the caller should be placed on the opposite side from the one on which the door is fixed.

- Mount the electrical alarm siren on the wall using anchors and screws at the height defined by the project.
- The installation of the alarm system must be formed independently of other low-voltage or high-voltage installations.
- Each zone has a special plus and minus and no common minus can be used. All callers are connected in parallel on one line. Attention should be paid to the correct polarity.
- Prior to the commencement of the works, the contractor should mark the project on the basis of the project, as well as the location of the caller, the cabinet, etc..
- Adjusting the cables is done at the foot of the fire detector.
- Horizontal laying of cables shall be carried out at a height of at least 2 m. Cable laying is prohibited.
- When laying cables parallel to the pipes of other installations, provide a gap between lines and pipes of at least 5 cm.
- When paralleling the high-power cables and TT cables with signal cables, ensure that the signal lines are in the middle and that the minimum distance between the signal lines and the power and / or TT cables is 10 cm.
- Make cables so that the wall is damaged as little as possible.
- During the breakdown of concrete structures, engage a construction expert.
- When wiring the wiring lines, leave a sufficient 30-cm reserve for connecting and adjusting the conductors from each fire alarm.
- When bending the cables, observe the prescribed radius of 15 D.
- The distance between the clips during the horizontal laying of the cable must not be greater than 30 cm, and when the vertical laying is 40 cm.
- Each cable entry must be well sealed and in this regard, the appropriate dimensions for the cable used should be used. The spare devices must be closed with insulating screw plugs.
- The cable is stretched with the roller, and the first is the longest cable.
- Before installing, each cable must be tested. After completing the work, it is necessary to examine the complete installation.

3.31.2.5.5 Maintenance of the system for fire signal

- The user of the system must ensure that around each automatic fire alarm, there is a free space of at least 750 mm in diameter and that the handhelds are continuously visible and accessible.
- The user of the system performs visual control of the most vital parts on a daily basis.
- The maintenance of the system should be carried out exclusively by an authorized company. This maintenance is regular, periodic and detailed.
- Regular maintenance means checking the system at intervals not longer than two months.
- Periodic inspection is mandatory once a year and includes functional control of a stable system and a detailed overview of all components.
- 6. If any defects are found to be defective and deviate in operation, the repair of a stable system must be carried out.
- A detailed overview of all components must be made every five years. Measurement of resistance of insulation and grounding is mandatory, where the used voltages of measuring instruments must not damage components connected to water and cables.
- The user of the alarm system must have a control book (with stamped and numbered sheets) in which the authorized person brings in time and scores all events, controls and reviews. The book contains all alarms with date, time, alarm group, alarms, as well as the reasons for the alarm, as well as detected irregularities in the functioning of the system.

3.32 HVAC INSTALLATION

3.32.1 TECHNICAL CONDITIONS FOR REFRIGERATION OF COOLANT INSTALLATIONS WITH FREON (VRV)

These technical conditions include the conditions of delivery and installation for cooling installations where a refrigerant is used as a refrigerant.

The cooling installation must be carried out according to this project, and the works can be carried out only by a company that has professionally qualified staff for performing freon installations.

The cooling equipment used must include certificates that enable delivery and assembly in the countries of the European Union.

Freon installation, both for liquid and steam phase, must be performed exclusively from copper pipes and copper fittings.

Copper tubes used should be made according to DIN1786 (5.80). The production of these pipes is with a narrow tolerance for connecting with capillary soldering so-called. by hard soldering using electrodes with silver content with the mandatory presence of an inert gas when soldering the tubes in this case of nitrogen to be extruded through the pipe during soldering with a pressure of about 0.05-0.1 bar.

Persons welding copper pipes and fittings must be appropriately trained and should provide appropriate certificates.

When welding, the ends of pipes and fittings must be cleaned very well from grease, dirt and oxidation deposits. Only new pipes and fittings (non-oxidised) are permitted. In the welding process, use only oxygen and acetylene (disugas). The distribution of the pipes must be adequately fixed.

Electrodes used for welding must contain a guaranteed silver composition.

Refrigerant discharge pipes (freons) must be insulated with steam-jet insulation. The insulation joints should be adhesive with special adhesive and additionally provided with self-adhesive tape. The insulation used for the insulation of copper pipes of cooling systems must have appropriate attestations. Isolation should be self-inflicted.

The internal cooling units must be carefully mounted. Care should be taken of the prescribed slopes for proper drainage of condensate.

Indoor units should be properly secured. Internal carriers should withstand a minimum load of 100 kg. Only suitable fire resistant steel impellers can be used.

When finishing the installation, the Freon test should be tested for strength and leakproofness. The test pressure for strength should be 28 bar for 2 h. The leakproofness test shall be carried out at a pressure of 18 bar for a period of 4 hours. During testing, use glycerol manometers with an accuracy of 1.6. The test medium should be compressed air, nitrogen or other inert gas. During the test, pressure drops must not occur, and the joints must be additionally controlled with the appropriate foam. After testing, the installation should be slowly dissolved by the gradual release

of the test medium. Then the vacuuming of the installation is carried out with the appropriate vacuum pump. The installation must be kept under vacuum for a minimum of 24 hours.

Filling (upgrading) of the freon installation can be done with the prior vacuuming of the installation. As a rule, the addition of freon is done exclusively with the permanent control of the amount of replenishment using electronic scales.

For cooling installations operating in the air condition, the pressure in the Freon installation in suction (steam) water should be (depending on the type of freon) such that it corresponds to the evaporating temperature from $t = +1$ to $+5$ °C.

3.32.2 DRAINAGE PIPES

Condensate drainage pipes should be made of copper or plastic (PVC). When installing condensate lines, it is important to ensure that the fall is ensured along the entire route. The condensate line must not be connected to the sewage system (except in extreme cases but with the obligatory installation of the "dry" siphon). If the condensate line is connected to the drainage system, it should be carried out via a siphon (dry siphon). Condensate drainage pipes should be insulated. On the condensate network, adequate ventilation must be provided.

3.32.3 TESTING AN PUTTING INTO OPERATION

With the successful completion of the assembly work, the HVAC installation is put into operation. For trial work, all the system functions specified in the equipment manufacturer's instructions must be controlled.

Included in the unit prices:

Introduction to the project and facility, internal transport, installation of scaffolding, all testing, regulating and precommissioning with training performed by the Investor's staff, putting up signage, site clearance, quality taking-over with handing of certificates, diagrams and written instructions for operation and maintenance.

4 PARTICULAR SPECIFICATION

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Section 4.2	PS - Traffic	Book 2
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Section 4.7	PS - Telecommunication & signal installation	Books 5.1 & 5.2
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Section 4.9	PS - Traffic signalization and equipment	Book 8
Section 4.10	PS - Landscaping	Book 9

Brand Names

Where a brand name of a product is specified in this Technical Specification, in drawings and in the Bills of Quantities, a product with equivalent qualification can be used. In this context the term “appropriate” in this section, drawings and the Bills of Quantities has the same meaning as “equivalent”.

4.1 ARCHITECTURAL AND CONSTRUCTION

4.1.1 GENERAL REQUIREMENTS

All points of the bill of quantities and work estimate mean execution of each position of works in an unconditionally professional manner, precisely and in high quality, all in line with approved drawings, technical description and descriptions in the Bill of quantities, technical requirements, static calculation, details and later details by the Supervisor, applicable technical regulations and instructions by the supervisor and the Supervisor if not otherwise conditioned by the position. All works must be executed in line with the design and in line with applicable norms and rules of profession.

In all construction and finishing works, the use of appropriate labor and quality materials is required, which must correspond to the applicable technical regulations SRPS standards and descriptions of work positions. The Contractor must previously submit a certificate for each material to be installed to the supervisory organ. In case of dispute regarding quality, samples will be submitted to the Institute for testing of materials, whose findings are valid for both Investor and Contractor. Contractor is obliged to remove from the construction site all materials for which the Investor's representative finds not to be in line with contracted bill of quantities or prescribed quality. Execution of construction and finishing works requires adequate professional, skilled labor, as envisaged in Ordinary construction norms for several positions.

Contractor must keep the object and the entire construction site tidy and clean, and upon completion of work, prior to handing over of the object, Contractor must fill in all pits and holes from scaffolding, compact and level them out, in order to prevent later subsidences.

Contractor is obliged to keep the construction site tidy on daily basis, provide a mobile trash bin, and periodically transport the debris to the city landfill and clean the dust of the roads around the construction site every day.

Aside from all temporary objects necessary to Contractor for work execution and site organization, Contractor is obliged to provide a room for supervisory's organ office. Contractor will keep this room tidy during construction of the object as well as provide light, heating, cleaning and necessary office inventory.

Scaffolding and formwork is required for all works in the bill of quantities so the Contractor is obliged to obtain and construct them, they shall not be paid for separately since they are already calculated in the offered work price. If the scaffolding is calculated separately, the position will be precisely defined by the bill of quantities.

Contractor is obliged to study the PTD and conditions for work execution. Construction site organization costs and costs of internal transport will not be separately calculated and should be calculated in unit prices for positions of construction and finishing works.

Execution of all construction and finishing works requires adequate professional, skilled labor, as envisaged in Ordinary construction norms for several positions.

Until the object is handed over to the Investor, the Contractor is absolutely responsible for everything on it and in case of any damage or failure, he is obligated to bring it to its proper state at his expense.

The Contractor is obliged to name a highly skilled and experienced expert to the construction site during the construction who will be responsible for the professional control and the exact execution of all obligations of the Contractor.

All necessary openings and grooves in the walls and ceilings for installations and various devices shall be made by the Contractor exactly to the details and disposition plans, and after placing the pipes, grooves shall be wallowed and muddled. This is not paid separately, but it is included in the price of related structures, masonry and plastering.

All obligations in these general descriptions are accepted by the Contractor as an integral part of the Contract concluded with the Investor and undertakes to receive them without any limitations and execute without objection and reclamation.

4.1.1.1 Ground works

Ground works must be professionally executed right before the construction start, at high quality, all in line with applicable technical requirements and standards, i.e. all in line with the design.

Prior to excavation, the Contractor is obliged to mark the object in the field, and survey the existing height level of the entire terrain in all directions with the Investor's representative. These levels shall be recorded in the construction log and calculation for soil excavation will be done based on them.

Ground works will be done all in line with the design and geo-mechanical study. The prices includes all work operations, material use, auxiliary tools and scaffolding prescribed by "Norms and standards for construction works - Building construction GN 300" as well as other costs.

Excavation shall be done with all necessary measures for securing sides of the excavation by soil trimming or strutting. Possible strutting or shoring is included in excavation price, any damage that the Contractor causes by unprofessional or bad work execution, not strutting the endangered parts, or for any reason caused by him, is obliged to bear the expenses of re-arrangement. All excavations must be cleaned of all foreign and dispersed materials, leveled out and flattened.

In case of additional digging, all deep excavated surfaces should be filled with concrete CC10 or restore the terrain in proper way and in collaboration with a geomechanist. Contractor bears these costs.

When calculating amounts of really executed works all excavations and transport shall be calculated per m3 of autochthon soil and all backfills per m3 of compacted material.

If during excavation works unexpected objects are found - parts of buildings, archaeological and other finds, Contractor is obliged to act upon supervisory organ's order. All works that arise from previously mentioned will be considered additional and shall be separately calculated and paid.

Material from the excavation shall be used for necessary backfill by the foundation, under the floors and similar, provided that it is suitable for creating the backfill. Such material shall be placed next to the edges of the excavation or transported to a temporary landfill and later used for backfilling. Excess material from the excavation shall be transported to a permanent landfill.

Backfilling next to foundation walls shall be done immediately and without further delay in order to avoid unnecessary flooding of the excavation by water.

Calculation of the excavation shall be done based on profiles recorder before and after the excavation, and in line with excavation lines displayed in drawings.

Construction of foundation and similar must not start before supervisory organ inspects and accepts excavations and records necessary calculation data into the construction log and states the quality of excavation. Drainage of groundwater shall be considered additional work and shall be calculated and paid separately.

Compression testing will be done in line with SRPS U.B1.046 (slab method), by dynamic module (Light drop tester) or through degree of compactability. Record the testing in a Certificate on achieved compression by an authorized institution. Due to composition of the terrain in the given conditions, we do not recommend continuation of works until the testing of compression is done

4.1.1.2 Concrete and reinforced concrete works

All concrete and reinforced concrete works must be executed all in line with "Regulation on technical standards for concrete and reinforced concrete", Off. Gazette SFRJ 23/2/1987. As well as "Regulation on technical standards for construction of buildings in seismic areas" Off. Gazette SFRJ no. 31/81; 49/82; and 29/83; 52/90.

Concrete works must be executed in line with approved drawings, construction elements, static calculation and technical description, in high quality and professionally, by proper professional and skilled labor and under expert supervision. Concrete works are executed per structural design and concrete design. Designed concrete class must be maintained. Making and installation of concrete shall be done mechanically by immersion vibrators. Concrete shall be installed through funnels at pouring depths larger than 1 m. Include use of smooth formwork in price. Concrete design is created before start of concrete works and it must contain all addendums prescribed by regulations.

Content and making of concrete, method of installation and curing of concrete shall be done all in line with applicable regulations and predefined recipe confirmed by sampling by the authoritative institution.

Supervisory organ shall accept the formwork in terms of dimensions, axis and height levels; scaffolding and formwork must be constructed and executed in such way to take over the loads and impacts that occur during construction works, without harmful subsidence and deformations and ensure accuracy envisaged by the structural design; and accept the reinforcement in terms of number, layout and diameter of installed rods, if the reinforcement was soiled by concrete, cement mortar or similar shall be cleaned before concreting. Contractor is responsible for formwork safety against deforming and collapse. Concreting shall be done only after the supervisory organ states no remarks in the construction log.

Designed concrete class is CC 30.

If the Contractor shall use different additives, it is necessary to test their compatibility previously.

Water that meets requirements determined by the prescribed standard shall be used for mixing concrete. Amount of used water must be in line with prescribed ratio of water to cement in the mix itself, sufficient but not larger than necessary to produce dense concrete, appropriate for work, that can be easily poured and compacted around the reinforcement and in the angles, with no segregation or water loss on the surface.

Organization, equipment and designs for execution of concrete works on the site must be harmonized with structural design and concrete design.

Protection of freshly concreted constructions as well as protection of concrete against frost or high temperatures is included in the concrete design; special attention must be paid to curing concreted elements in order to achieve appropriate - required quality.

Concrete curing after installation is really important, until the concrete achieves 2/3 of the concrete class, not less than 7 days. Covers for preventing excessive drying of concrete or additives for this purpose should be designed.

Removal of scaffolding and formwork is done in line with regulations but not without the approval by the supervisory organ. The price includes leaving of grooves for water, sewage, heating, etc.

Prices include all work operations, purchase of material, external and internal transport, installation, protection measures, all horizontal and vertical transfers, necessary skilled labor, necessary formwork and other works necessary for quality execution of works. Calculation of concrete works is done per unit noted at each work position.

Reinforcement is calculated by a separate item in reinforcement works.

Quality of installed concrete is proved by appropriate Reports on testing the sample strength taken in the concrete factory and on the site, for each concrete lot, evaluation of concrete quality is done in line with regulations. Safety and durability of the structure are proved based on the final mark of concrete quality in the structure.

4.1.1.3 Reinforcement works

Reinforcement works will be done all in line with the designed solution, static calculation and in line with applicable technical regulations and standards (SRPS EN 10080) for concrete and reinforcement; prices include all works and use of materials and auxiliary tools.

Construct the reinforcement out of steel, quality as designed in static calculation, all in line with applicable regulations. Clean the reinforcement of rust and dirt, straighten, cut, bend and install according to details.

Unit price includes placing bar chairs/spacers made of steel, plastic or concrete for achieving designed protection layers and proper positioning of reinforcement in the structure. All divider steel and stirrups will be firmly bound to the main reinforcement so no changes of reinforcement position occurs during concreting of the structure.

Acceptance of installed reinforcement in terms of number and diameter of installed rods will be done by the supervisory organ, stating the condition and issuing license for concreting by the construction log. Contractor is responsible for attesting and quality of installed reinforcement.

Really installed amount of reinforcement of all quality is calculated per kilogram regardless of the complexity and diameter of reinforcement rods.

When transporting and storing the steel, there should be no mechanical damage, breakage at the place of welding and dirt that can reduce adhesion, as well as loss of marks and reduction of cross-sections due to corrosion.

Quality of installed reinforcement is proved by proper certificates issued by authorized institutes.

4.1.1.4 Steel structure

For steel structure works positions, include purchase and cleaning of materials in price, construction of steel structure in line with design documentation, test installation, transport, installation and entire RS and fire protection of the support steel structure, all in line with technical requirements and regulations for production, transport, installation, anti-corrosion and fire protection of steel structure.

Elements- structure shall be cleaned of corrosion and dust- sandblasted, and prior to applying anti-corrosion coat, inspect all joints and test joining the structure in the workshop. Apply first, base coating in the workshop after the testing, and apply the second coat after installation.

If the steel structure assemblies are done in the workshop, they should be inspected and recorded by the Supervisor.

Parts of the structure should be separated from each other by battens made of soft wood or rubber strips during transport.

Upon completion of all transport and installation works of steel structure, inspect in detail and record all points where the protection is damaged, clean those points and re-apply protection coats on those parts. Only afterwards can fire protection dye be applied.

Unless otherwise specified in the design, the thickness of the weld is $a = 0.7$ from the minimum wall thickness of the material over the entire scope of the contact, and at least 3.0mm.

"Contractor is obliged to prove the quality of steel and anti-corrosion protection with attestations obtained by an authorized institute. Anticorrosion protection is done for corrosivity category C3 (medium durability range) according to ISO 12944-2002. Fire protection is done by coatings optimized for 30 and 90 minutes fire resistance. Fire protection coatings are patented by some manufacturers, thickness, number of coats and their content are determined and guaranteed by their manufacturer by certificates issued by recognized materials testing institutes. Fire protection contractor is obliged to follow instructions and requirements from the fire protection manufacturer.

Final color in tone as selected by the Investor."

All anchor plates shall be timely supplied by the steel structure contractor so they can be installed together with the reinforcement prior to concreting of reinforced concrete structure. Installation of anchor plates shall be done by concrete works contractor.

Each position of the bill includes purchase of materials prescribed by standard SRPS C.VO.500 of rolled profiles and sheets, external and internal transport, workshop production and installation on the object, the required scaffolds and all vertical and horizontal transport, and all in line by the detail for steel structures, static calculations, and technical description with the consent of the supervisory organ during design and installation.

Welding works in the workshop and during installation can be done only by welders certified for that type of work, under continuous professional supervision.

For structure that need fire protection, a expanding fire protection coating is applied in layers (layer thickness depends on required fire resistance) after applying basic anti corrosion coating, all in line

with manufacturer's instructions. A finishing coat in two layers and in tone selected by the Investor is applied to a completely dried fire protection coating.

All works shall be done in line with static calculation, workshop drawings and technical regulations for steel structures. Steel: S235 JRG2.

Test all measures on the object.

4.1.1.5 Roofing Works

All roofing works must be precisely and professionally done. The contractor must fully comply with the installation of layers, materials and conditions given in the extended description for roofing works.

Include purchase, horizontal and vertical transport, installation of basic and auxiliary materials, all bonding means and cleaning upon completion of works as well as transport of debris in price.

Roof assembly must meet heat transfer coefficient of $U_{max}=0,15 \text{ W/m}^2\text{K}$.

4.1.1.6 Metalworks

Works shall be executed all in line with Technical requirements for metalworks execution. Metalworks must be done professionally and in high quality, all in line with Technical requirements for carpentry works execution, steel and Al structures, technical description, drawing details and Supervisor's instructions. Installation of all elements on the construction site shall be done professionally, while the installation of elements of special workmanship is done according to manufacturer's instructions.

Include purchase of materials, delivery, installations, all transport and transfers on the site in the price.

Workshop drawings are made by the contractor and certified by the Supervisor.

All metalworks shall be done in line with the design, proper diagram and structure detail by the Supervisor. Each position of metalworks should be equipped with required number of anchors for connecting and fixing to structure elements.

All metal parts should be cleaned of rust and dirt and double coated with anticorrosion mean prior to installation.

Include glazing, required fitting and possible covering of joints with decorative battens in corresponding items in metalworks.

Contractor is obliged to provide proofs of quality for metalwork - certificates, warranties.

All in line with the diagram and details.

Check all measures on the spot/ site.

4.1.1.7 Steel sheet works

All sheet metal works must be precisely and professionally done all in line with Technical requirements for sheet metal works, with proper skilled labor, with full application of modern tools and machines intended for this type of works.

All used materials, bonding and connection means, protection means, must be of prescribed quality in line with SRPS standard for this type of work, i.e. they must hold certificates. All profiles, drips and other must be constructed in line with Supervisor's details. Sheet must be protected (galvanized, plasticized, painted) as required by technical documentation. Executed works must have a correct geometric shape along its length and surface, in the same positions.

Sheet metal works shall be done all in line with technical documentation and certified details with mandatory application of modern methods for connecting-extending sheet.

All sheet works must be precisely and professionally done - they must completely meet the designed purpose. At points where sheet is in direct contact with other materials (concrete, clay and similar), it must be protected by: coatings, roof paper and similar. Sheet supports in direct contact with sheet must be made of same kind of material.

Calculation is done per unit noted at each work position. Unit price includes execution of the entire work position, purchase of basic and joining materials, external and internal transport, construction and installation, protection measures, all horizontal and vertical transfers, required scaffold, required protection at joints with other materials. The prices includes all work operations, material use, auxiliary tools and scaffolding prescribed by "Norms and standards for construction works - Building construction GN 771".

Prior to execution, check the measures on the spot.

4.1.1.8 Masonry works

Masonry works shall be executed all in line with the design and applicable standards and regulations, with proper skilled labor, and with the full application of modern machinery intended for this type of work.

Prices include all work operations, purchase and consumption of materials, external and internal transport of materials, installation, protection measures, all horizontal and vertical transfers, auxiliary tools, necessary scaffolding, necessary formwork and other works necessary for quality execution of works. Calculation is done per unit noted at each work position.

Brick products – all used materials, elements and bonding means must be of prescribed quality, i.e. hold certificates.

When constructing horizontal and vertical ring beams for stiffening walls, it is necessary to achieve prescribed bonding for masonry walls.

Necessary scaffolding is included in unit prices, except facade pipe scaffolding which is calculated separately.

All in line with the diagram, details and requirements by Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

The applicable labor and material consumption norm is prescribed by "Norms and standards for construction works - Building construction GN 301

4.1.1.9 Insulation works

Insulation material must be first class and must meet the prescribed standards, properly stacked and protected. Hydro-insulation shall be harmonized in all with applicable technical regulation for hydro-insulation.

Defective materials (damaged, stuck together or of not proper, prescribed quality) must not be stored or kept at the construction site, nor can they be installed.

All insulation works must be done professionally and in high quality, all in line with SRPS standards. Materials for making hydro, sound or thermal insulation must have thermal, acoustic, mechanical properties i.e. they must be certified. Prior to the insulation works, the correctness of the performed construction, finishing and other works that could affect the quality of the insulation must be tested.

Bases for installation must be flat, solid and dry as well as cleaned of dust. Preparation of base (cleaning and polishing) are included in unit price. All installations and all previous works must be finished and tested prior to insulating. Hydro-insulation joints are allowed only in extraordinary cases, when there are objective reasons. All penetrations must be insulated and processed; hydro-insulation next to walls and other vertical surfaces should be lifted at least 20 cm.

Insulation layers must not be placed on a concrete base if the process of bonding and curing of concrete hasn't finalized.

Insulation works must be done in such way that certain parts and layers of insulation, as well as entire completed position, must entirely meet their purpose, high quality requirement, safety and durability.

If the works are executed at temperatures higher or lower than prescribed, protect used basic and joining materials.

Calculation is done per unit noted at each work position. Unit price includes making of the entire work position, purchase of basic, joining and protection materials, external and internal transport, construction, protection measures, all horizontal and vertical transfers, required scaffold, cleaning and other activities required for high quality execution of works.

The applicable labor and material consumption norm is prescribed by "Norms and standards for construction works - Building construction GN 561"

All in line with Regulations on energy efficiency of buildings and Law on planning and construction

4.1.1.10 Aluminum Carpentry

All carpentry works shall be done by proper professional labor, by applying modern tools and machines intended for this type of works.

All used materials, bonding and protection means must be of prescribed quality, i.e. they must hold certificates.

Works must be done in high quality, all in line with applicable regulations, standards and technical documentation.

During work execution, i.e. until the handover of the object, the Contractor is obliged to take all required measures to prevent damage to these works.

Calculation is done per unit noted at each work position. Unit price includes execution of the entire work position, purchase of basic, joining and protection materials, external and internal transport, construction, protection measures, all horizontal and vertical transfers, required scaffold, cleaning and other activities required for high quality execution of works.

Dimensions of doors and windows, processing and equipping all in line with the design, details, specification and instructions by the Supervisor.

Connections and joints of the elements should be done all in line with attached diagrams, in line with SRPS standards and manufacturer's technology, with the approval by the Supervisor and supervisory organ. All joints must be immaculately executed with proper and precise cutting.

All elements that require special construction (fire resistance, sealing and similar) must be entrusted to specialized organizations for this type of elements.

NOTE: All measures shall be inspected on the spot.

Contractor is obliged to provide proofs of quality for carpentry- certificates, warranties.

All in line with diagram, details from the design and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

4.1.1.11 Flooring works

Works must be executed professionally, in high quality and precisely and all in line with technical requirements for flooring works in SRPS G.E5.021. If there are no standards for certain materials, the manufacturer is obliged to confirm following by a quality certificate: dimensions, dimensional stability, resistance to light, non-flammability, slipperiness, electric conductivity and uniformity of surfaces. Cover for floor covering must be high quality and adapted for the appropriate type of floor coverings. Cover must be executed in such way to meet all quality requirements by regulations. Air temperature during flooring must not be less than +10 °C.

4.1.1.12 Tiling works

Tiling works shall be executed all in line with the design and applicable standards, with proper skilled labour, and with the full application of modern tools and machinery intended for this type of work. The prices includes all work operations, material use, auxiliary tools and scaffolding prescribed by "Norms and standards for construction works -

All used materials, connection and bonding means, protection means must be of prescribed quality, i.e. they must hold certificates. Works must be done in high quality, all in line with applicable regulations, standards and technical documentation. Class, purpose and quality of tiles are determined by technical documentation. Colour and method of installation are determined by the Supervisor. All external edges of the walls shall be protected by AL strips and internal angles must be protected by acrylic silicone.

All non visible installations should be laid and tested before installation of tiles. For laying the tiles in adhesive, the base must be clean, solid, flat with regular and sharp edges. Upon completion of works, tiled surfaces shall be cleaned and washed. If the works are executed at temperatures higher or lower than prescribed, protect used basic and joining materials. Protection measures do not affect the contracted price of works. During work execution, contractor is obliged to take all required measures to avoid damage to the floors.

Calculation is done per unit noted at each work position. Unit price includes making of the entire work position, purchase of basic, joining and protection materials, external and internal transport, construction, protection measures, all horizontal and vertical transfers, required scaffold, cleaning and other activities required for high quality execution of works.

Note: Anti-slip tiles I class, min. R12, V4, is laid in following rooms: communications, stairways and sanitary rooms.

4.1.1.13 Dry installation – plasterwork

Plasterwork must be done in line with material manufacturer. The contractor must fully comply with the installation of layers, materials and conditions given in the description by the manufacturer.

The price includes purchase, horizontal and vertical transport, installation of basic and auxiliary materials, all bonding means and cleaning upon completion of works as well as transport of debris. The price includes required scaffold for installation as well.

The positions prices include drilling i.e. cutting of an aperture for installations, lights and doors. The price doesn't include placing metal profiles for fastening partitions-due to heights, reinforcement in the walls required for mounting sanitary facilities, and reinforcement in the wall for installing FO doors.

All completed surfaces must be entirely flat, vertical, or horizontal where required. Angles must have sharp edges and executed exactly as designed. In walls longer than 15m design expansion joints at each cca. 15m.

4.1.1.14 Painting works

Painting works must be done all in line with the design and rules of profession, with proper skilled labor.

All required material, connection, bonding and protection means must be of fine and stable quality all in line with standards, i.e. they must hold certificates.

There must be no stains and brush marks on the painted surfaces.

Color tone must be absolutely uniform, color and tone deviations are unacceptable. For temperatures higher or lower than prescribed, take measures to protect the material.

Painted surfaces must not wipe or peel.

Surface for paint works must be solid, clean, dry and entirely flat. Before application of the finish layer, the base should be prepared in accordance with the applicable regulations, which prescribe the construction standards or according to the instructions of the construction material manufacturer.

Smoothing material must be suitable for several types of base (mortar, concrete, gypsum, etc.).

Cover coatings must completely cover the base, for surfaces where the base is not specifically prepared, smooth the minor unevenness. Used materials must adhere well, they must be resistant according to their application, harmless to health, not aggressively affect materials in contact, and processed surfaces must have sharp touch edges.

The prices includes all work operations, material use and auxiliary tools prescribed by "Norms and standards for construction works - Building construction GN 531".

4.1.1.15 Facade works

Contractor for thermal panel sandwich facades and other facade / sandwich facades covers is obliged to include in price the making of MD study (main design) and submit it for review to the Supervisor, prior to installation of panels, because the method of fixing depends on the manufacturer, and therefore the length of cover elements and possible additional steel substructure.

Contractor is obliged to permanently maintain and clean the site, and transport the debris to the site landfill.

Note:

- Calculation of facade surfaces without deducting apertures.
- "The contractor is obliged, during price formation, to examine the entire facade and calculate in unit price all waste of materials, all cutting and in that way concludes the necessary quantities for purchase.
- Calculation shall be done per really constructed facade without deduction of apertures less than 3m². For apertures that are > 3 m², excess over 3m² is deducted."

4.1.1.16 Equipping the object

It is required/ is necessary to take detailed measures on the spot and prepare work execution according to them. The equipment bought off the shelf will be submitted to the author of the solution for review.

Works must be executed with maximum precision and pedancy.

Designed equipment for the ambient is from the scope of prefabricated panel materials, melamine faced chipboards. Color and texture as selected by the Supervisor.

Include purchase, loading, delivery to the point of installation, unloading, installation, with supply of warranties for delivered furniture and equipment.

4.1.2 PRELIMINARY WORKS

4.1.2.1 Method of Measurement

Item 3 "Dismantling of existing objects" , additional note:

Note: dismantling includes existing canopy, object for accommodation of MIA and CA employees, cabin under the canopy, object of tourist organization of Mokra Gora nature park. Other objects are not included in this bill.

Item 3.1 includes:

Careful dismantling of the existing canopy made of steel profiles and sheets with previous dismantling of lights with respective installation and dismantling of signalization. Dismantling of suspended ceiling, attic flash, gutter horizontals and verticals. Record of dismantled elements shall be handed over to the Investor and transported to a place designated by the Investor up to 5 km away, and the debris taken to a landfill up to 10 km away.

canopy dimensions 31,60*16,72

Calculation all complete.

Item 3.2 includes:

Careful disassembly of the existing object for accommodation of MIA and CA employees. Object is a prefabricated barrack. Record of dismantled elements shall be handed over to the Investor and transported to a place designated by the Investor up to 5 km away, and the debris taken to a landfill up to 10 km away.

object dimensions 25,10*7,90 m

Calculation all complete.

Item 3.3 includes:

Careful disassembly of the existing object - Tourist organization (Mokra Gora nature park). The object is a wooden house. Record of dismantled elements shall be handed over to the Investor and transported to a place designated by the Investor up to 5 km away, and the debris taken to a landfill up to 10 km away.

object dimensions 5,00*4,00 m

Calculation all complete.

Item 3.4 includes:

Disassembly of the existing object - combined cabin. Object is a prefabricated house. Dismantled elements shall be transported to a place designated by the Investor up to 5 km away, and the debris taken to a landfill up to 10 km away.

object dimensions 6*2.20 m

Calculation, all per piece.

Item 3.5 includes:

Disassembly - demolition of the existing RC support wall with transport of debris to a landfill up to 10 km away.

Wall length cca 100 m.

Calculation all complete.

Item 4 "Preparation of the terrain" includes:

Item 4.1 includes:

Cleaning of the terrain. Cutting of the existing low-growing vegetation and shrubs with cleaning of terrain prior to work commencement, with loading into a truck and transport to the city landfill. Calculation per m² of cleaned terrain.

Item 4.2 includes:

Mechanical removal of humus layer in bulk excavation thickness cca. 0.30 m (in line with geo-mechanical study) with direct loading into a transport vehicle, transport and unloading of soil on a landfill up to 10 km away. Calculation all per m³ of excavated material in autochthon state.

Item 5 "Construction site sign" includes:

Purchase of material, making and installation of construction site sign, with information on object that is constructed, all in line with main design and regulation on construction site signs (dimensions, text, point of installation, and similar)

Item 6 "Visibility panel" includes:

Purchase of material, making and installation of construction site sign, with information on object that is constructed, all in line with main design and regulation on construction site signs (dimensions, text, point of installation, and similar)

Item 7 "Rental of container for meetings" includes :

Purchase, transport and mounting or rental container for meetings, container dimensions cca 6,00/2,40, on a previously prepared base. Containers are equipped with office equipment and tools (table and min. 12 chairs) as well as air conditioning.

Item 8 "Rental of containers for Supervisor's office" includes :

Purchase, transport and mounting or rental container for offices, container dimensions cca 6,00/2,40, on a previously prepared base. Containers are equipped with office equipment and tools (table and min. 12 chairs) as well as air conditioning.

Item 9 "Rental of sanitary cabins" includes :

Purchase, transport and mounting of rental toilets for period of work execution or cancellation by the Investor.

The price includes transport of toilets to the destination and mounting.

Toilet rental should include service which includes washing and disinfection, toilet paper, the insertion of organic products and discharge, two services during a week.

Calculation includes loading, transport and unloading as well as loading and transport of the toilet.

Item 10 "Plateau between containers" includes :

Purchase of materials, delivery, construction of plateau between the containers and pavement around the container d=8 cm, out of behaton cubes on a previously prepared base.

Calculation per m².

Item 11 "Access roads" includes :

Purchase of materials, delivery and construction of access road on the entrance into the construction site 5.00 m wide, with backfilling and compacting crushed stone and all ground works.

Calculation per m².

Item 12 "Rental for potable water tank" includes :

Rental of potable water tank 9 m³ with a driver. The price includes transport in both directions where maximum distance from point of refueling in both directions is 50 km.

Calculation all complete flat rate for period of 120 days.

Item 13 "Power connection." includes :

Purchase of materials, delivery and making of power connection by a PP00 5x25 mm² with all required ground works.

Calculation per m.

Item 14 "Power distribution cabinet." includes :

Purchase of materials, delivery and installation of power distribution cabinet.

Calculation per piece of completely installed.

Item 15 "Construction site lighting." includes :

Purchase of materials, delivery and installation of site lighting on wooden columns - reflectors (column at each 20 m).

Calculation per piece of completely installed.

Item 16 "Laying the electro route." includes :

Purchase of material, delivery and installation of electric cable route PP00 4x16 mm² for lighting.

Calculation per m.

4.1.3 MINISTRY OF INTERIOR AND CUSTOMS ADMINISTRATION (OBJECT 1)

4.1.3.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m².

Item 2 includes:

Combined excavation in a previously backfilled terrain for the foundation structure, below the foundation slab of the object, all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to Ms = 10 - 15 Mpa.

Item 3 includes:

Purchase, transport, backfilling and compacting of sand under the foundation slab of the object on the previously prepared base, in layers, total layer thickness of sand 30 cm. Sand is compacted up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Item 3a includes:

Purchase, transport, backfilling and compacting of sand around the concreted foundations of the object in layers, total width of sand layer cca 30 cm (30 cm lower than the level of the newly designed terrain around the object). Sand is compacted in layers up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Note: belt around the object 1.20 m wide is designed for backfilling, while the remaining backfill is included in the traffic design.

- a) backfill around the foundation up to the level of backfilled terrain
- b) backfill around the object (30 cm lower than the level of the newly designed terrain)

Item 4 includes:

Purchase, transport, backfilling and compacting of a crushed stone aggregate layer under the floor slab of the object and under the foundation beams, total thickness of the layer d=30 cm (fraction 0-31.5 mm) with compacting up to Ms=30 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

- a) under the foundation beams
- b) under the floor slab of the object

4.1.3.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of material, transport and construction of screed CC 15, thickness $d=5$ cm, under the floor slab of the object and under the foundation beams. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m^2 .

- a) under the foundation beams
- b) under the floor slab of the object

Item 2 includes:

Purchase of material, transport and construction of RC foundation beams of reverse T section, footing width 80 cm and thickness 35 cm, and rib of cross section 30/65 cm, out of concrete CC30 in required formwork, all in line with Concrete design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Footing shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m^3 .

Item 3 includes:

Purchase of material, transport and making of RC floor slab of the object, thickness $d=20$ cm, out of concrete CC30, in required formwork, all in line with Concrete design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Slab shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m^3 .

NOTE: prior to construction of the foundation slab, place PVC pipes for leading in the installations into the object, all in line with the design.

Item 4 includes:

Purchase of material, transport and construction of full reinforced concrete mezzanine ceiling out of concrete CC 30, thickness $d=20$ cm. Parget the upper surface, all in line with the design and static calculation.

Calculation per m^3 of installed concrete with formwork and support - height up to 4.00 m.

Item 4a includes:

Purchase of material, transport and construction of full reinforced concrete roof slab out of concrete CC 30, thickness $d=20$ cm. Parget the upper surface, all in line with the design and static calculation.

Calculation per m^3 of installed concrete with formwork and support - height up to 3.50 m.

Item 5 includes:

Purchase of materials, transport and construction of RC elements of the structure, pillars with square section 30/30 cm, out of reinforced concrete CC30, all in line with design and static calculation. Construct the pillars in smooth formwork. Clean the excess concrete, process and level out the joints after removing the formwork.

Calculation per m3 of installed concrete with use of applicable formwork and required scaffold.

Note: (five pillars) are within the object and are support for roof structure of the canopy at the same time.

Item 6 includes:

Purchase of material, transport and concreting RC walls, designed thickness $d=20$ cm, out of reinforced concrete CC 30 in double formwork. Install mechanically mixed pumped concrete with prescribed compaction by immersion vibrators with a thin needle and funnel for concreting on high walls.

Calculation per m3 of installed concrete with use of applicable formwork.

Item 7 includes:

Purchase of material, transport and making of crank RC pad of stairway branch and landings with stairs - POS ST-1, pad made of reinforced concrete CC30, thickness $d=15$ cm, all in line with design, structure calculation and details. Include necessary formwork (8m²/m³ of concrete) and supports in unit price. Remove the excess on joints, clean and flatten after removing the formwork.

Calculation all complete per m3 of installed concrete with formwork and supports.

- stairway footing
- crank pad with landings
- steps

Item 8 includes:

Purchase of material, transport and construction of rim parapet beams, dimensions 20/23 cm, out of reinforced concrete CC30 in required formwork; beams are constructed after placing steel columns of the structure on the RC slab of the object. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m3.

- parapet beams dim. 0.15/0.20 m
- parapet beams dim. 0.15/0.50 m

Item 9 includes:

Purchase of material, transport and making of RC slab above the jamb in the wall for placing the fan convector in room no. 6, which enables continuation of building the partition wall up to the required height. Slab thickness $d=15$ cm, out of reinforced concrete CC30, all in line with the design and static calculation. Include required formwork with supports in price, support height 1m

Calculation per m3.

Item 10 includes:

Purchase of material, transport and making of RC framework with a slab for making wooden bed in the room for retaining passengers. Wall thickness of the frame and the slab is $d=10$ cm, out of reinforced concrete CC 30, reinforced by mesh armature (armature calculated in a separate position, in reinforcement works). During reinforcement of frame walls, it is necessary to connect the

armature of the walls with anchors left during concreting of the floor slab, all in line with design and static calculation. Include necessary formwork in price.

Include in unit price purchase and installation of steel nut Ø 10 mm at the designed point in the frame, 70 cm high (15 cm from the frame edge and 15 cm from the upper edge of wooden piles), and filling the frame with soil as well.

Calculation all complete per m³.

4.1.3.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement for foundation beams, parapet beams, floor slab, mezzanine ceiling, roof slab, pillars and other positions from concrete works all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m³ of concrete)

MA 500/560

B500B

4.1.3.4 IV Masonry works Method of Measurement

Item 1 includes:

Purchase of material, delivery and construction of external wall of the object in brick, wall in room no. 6 on the ground floor of the object (retention room for passengers), wall thickness d= 12 cm. Building in lime cement mortar 1:2:6, make a RC ring beam within the wall at the level of lintel, ring beam dim. 12x15 cm, reinforced by 4 f 8 mm and stirrups f 6 mm at distance of 20 cm. (C3 1.3)

Calculation per m² with deducted apertures and with ring beam. Include required scaffold in the unit price.

Item 2 includes:

Purchase of material, delivery and construction of internal-partition walls by bricks, wall thickness d = 12 cm. Build in lime cement mortar 1:2:6, total height of the wall is 3.52 m, with reinforced concrete ring beam 12x15 cm, reinforced with 4 f 8 mm and stirrups f 6 mm at distance of 20 cm. RC ring beam is constructed at the level of lintel and is connected to ring beams of external walls, i.e. RC walls and RC pillar (IW 1.4, IW 1.5)

Calculation per m² with deducted apertures and with ring beam. Include required scaffold in the unit price.

Note: in room no. 6 a niche is built for placing fan coil.

Item 3 includes:

Purchase of materials, delivery and construction of internal installation wall for installing flush cistern, by brick, wall thickness $d = 7$ cm. Build in lime cement mortar 1:2:6. Total height of the wall is 3.52 m, connect the wall with masonry bond to walls 12 cm thick, i.e. by piercing in anchors in every third row for connecting to RC pillar.

Calculation per m2. Include required scaffold in the unit price.

Item 4 includes:

Purchase of material, delivery and construction of internal wall by brick, wall thickness $d=7$ cm, build in lime cement mortar 1:2:6. Wall closes the niche for fan convector and it forms on the RC slab above the niche (room no. 6 on the ground floor of the object for retaining passengers). Connect the wall by masonry bond with wall 12 cm thick. Calculation, all complete per m2.

Include required scaffold in the unit price.

Item 5 includes:

Purchase of material, transport and plastering of brick walls in rooms on the ground floor of the object, in lime cement mortar 1:3:9. Plastering in two layers, with coarse and fine pargeting. Clean all concrete surfaces within the wall and spray with grout.

Calculation per m2, including required scaffold in the unit price.

rooms no. 4,5,6,7 and 2.

Item 5/1 includes:

Purchase of material, transport and plastering of concrete walls and pillars in rooms in the object, in lime cement mortar 1:3:9. Plastering in two layers, with coarse and fine pargeting. Clean all concrete surfaces and spray with grout.

Calculation per m2, including required scaffold in the unit price.

a) ground floor

(plastering height 3.30; 10 cm above the suspended ceiling)

room no. 3, 4, 5, 14

RC walls of the stairway area

room no. 14, 17, 18, 19, 20

b) first floor

(plastering height 3.15; 10 cm above the suspended ceiling)

room no. 1

RC walls of the stairway area

room no. 3, 6, 7, 8, 9, 10, 12, 15, 17, 18

Item 6 includes:

Purchase of material, transport and plastering of concrete surfaces (ceiling) of the stairway in lime cement mortar. Plastering in two layers, with coarse and fine pargeting. Clean the ceiling surface, dampen it and spray with grout.

Calculation per m², including required scaffold in the unit price.

Item 7 includes:

Purchase of materials, transport and construction of reinforced cement screed, thickness d=4.5 cm on floors, on which PVC floor covers are placed; the price includes purchase and installation of electro welded wire mesh, with making of prescribed laps.

Include construction of floating position in the price, 1 cm of Styrofoam at the expansion of wall and cement screed as well as PVC foil for protection of thermal insulation.

Calculation all per m² of floor surface, with fine pargeting of the top surface.

a) ground floor

rooms no. 3, 4, 5,6,7, 14, 17,18,19,20

b) first floor

rooms no. 3, 7, 8, 9, 10, 11, 12, 16, 17, 18.

Item 7/1 includes:

Purchase of materials and construction of reinforced cement screed, thickness d=4 cm on floors of the object, on which granite covers are placed as final cover; the price includes purchase and installation of electro welded wire mesh, with making of prescribed laps.

Include construction of floating position in the price, 1 cm of Styrofoam at the expansion of wall and cement screed as well as PVC foil for protection of thermal insulation.

Calculation all per m² of floor surface, with fine pargeting of the top surface.

granite floor ceramics

a) ground floor

rooms no. 1, 2, 8, 9, 10, 11, 12,13, 15, 16, 21.

b) first floor

rooms no. 1, 2, 4, 5, 6, 13, 14, 15.

4.1.3.5 V Steel structure Method of Measurement

Item 1 includes:

Purchase of material, workshop construction, delivery, all transports and installation of the substructure for object façade, facade is partially a sinus steel sheet with thermal insulation 15 cm

and C block, and partially a thermal insulation panel (calculated in facade works). The facade rests on vertical RC structure (RC pillars and walls) and steel substructure, all in line with design detail.

Include in price anti corrosion base coating, expanding fire protection coating in layers (layer thickness depends on required fire resistance) - all in line with manufacturer's instructions, and final coating in two layers in tone selected by the Investor, with attest on required fire resistance supplied.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation all complete per kg of finished, installed steel substructure (fire resistance **30 min**):

NOTE: item 1 includes the amount of steel for installation of ladders as well.

For calculation (7 kg/m²):

Item 2 includes:

Purchase of material, construction, transport and installation of steel substructure, facade flashing in axis A by steel box profiles [] 70x70x4, substructure shall be constructed all in line with design detail.

Include anti-corrosion primer, two coats, and final coating in two layers in tone selected by the Investor.

Calculation all per kg of completed, installed steel substructure.

For calculation (15 kg/m²):

4.1.3.6 VI Insulation works Method of Measurement

Item 1 includes:

Purchase of materials, transport and hydro-insulation of reinforced concrete structure of the object - floor slab and foundation beams by hydro-insulating coats, polymer-cement materials ISOMAT, Greece or equivalent.

AQUAMAT-ELASTIC coat is an elastic, two-component cement hydro-insulation coat, applied in three layers on a clean and well-soaked surface, applied by a brush and each layer is applied once the previous has entirely dried. Freshly coated surface is protected against high temperatures, rain, frost and mechanical damage. Preparation of the base and installation all in line with manufacturer's instructions, with additional reinforcement using polyester fabric (TREVIRA) where required, on the edges of parapet beam, at the joint of floor slab and parapet beam and similar, DW 50 cm, imprinted in a fresh coat of AQUAMAT-ELASTIC.

Alternative - HIDROSTOP ELASTIK made by KEMA, Slovenia or equivalent "SIKA" product or other manufacturer of equal properties.

Calculation per m² of entirely installed hydro-insulation.

next to parapet beams and foundation walls (facade TI panel)

next to parapet beams and foundation walls (facade sinus steel sheet)

Item 2 includes:

Purchase and installation of horizontal hydro-insulation of floors in sanitary rooms, out of insulation coating AQUAMAT-ELASTIC or equivalent, in two layers, over prepared cement screed base with additional reinforcement by polyester fabric (Trevira) where required, DW 30 cm (on floor and wall joints as well). Preparation of the base and installation per instructions and technology by material manufacturer. Include lifting the hydro-insulation on the joint between wall and floor and all laps in price.

Calculation per m² of entirely installed hydro-insulation.

a) ground floor

rooms no. 6,11,12 and 13.

b) first floor

room no. 4.

Item 3 includes:

Purchase of materials, delivery and installation of thermal insulation on the object floor, out of styrodur layer XPS, thickness d=15 cm. Thermal insulation is installed over the hydro-insulation layer. Calculation per m² of installed thermal insulation.

Calculation per m².

Item 4 includes:

Purchase of materials, delivery and installation of thermal insulation on the mezzanine structure, out of styrodur layer XPS, thickness d=2 cm. Thermal insulation is installed over the RC slab. Calculation per m² of installed thermal insulation.

Calculation per m².

Item 5 includes:

Purchase of material, delivery and hydro insulation of mezzanine structure console (thermal insulation for the part with heating which is located above the part without heating). Thermal insulation of stone wool d = 15 cm. Thermal insulation is placed by using adhesive and anchors on the bottom side of mezzanine structure (console part). Calculation per m².

Include required scaffold in the unit price.

Item 6 includes:

Purchase of material, delivery and hydro insulation of the roof structure of the object (RC slab) out of stone wool, thickness d= 30 cm, which is the finishing layer of the roof as well. Thermal insulation is placed over the RC slab, over the vapor permeable foil, and a PVC foil with required overlaps is placed over the thermal insulation. Calculation per m² of placed thermal insulation with vapor permeable and PV foil.

Calculation per m².

4.1.3.7 VII Aluminum Carpentry Method of Measurement

Item 1 includes:

Purchase, delivery and installation of single leaf entrance door with fanlight and fixed part, made of improved anodized aluminum profiles with a heat bridge, paint and finishing selected by the Investor.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

Glass heat transfer coefficient $U_w=1,1$ [W/m²xK].

Install rubber sealings on the leaves and brushes on the lower part.

Fitting, cylinder, handrail (pos. 9 and pos. 10) or a handle (pos. 12) with a door closing mechanism. Bolt for fixing on the leaf, occasionally opened. Color and finish in line with selected sample.

Calculation, all per piece.

- Pos. 9.
production measure 105+43/270 cm
- Pos. 10
production measure 105+49/270 cm
- Pos. 12
production measure 85/270 cm

Item 2 includes:

Purchase, delivery and installation of single leaf internal door (wind shield) with fanlight and fixed part, made of improved anodized aluminum profiles, paint and finishing selected by the Investor.

All in line with the diagram and details and general description as position VII/1 of the bill.

- Pos. 11
production measure 105+54/270 cm

Item 3 includes:

Purchase, delivery and installation of double-leaf window, made of improved anodized aluminum profiles with a thermo-breaking, color and finish as selected by the Investor, equipped with standard fitting, tilt and turn mechanism.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

$U_{wmax}=1,1$ [W/(m²K)].

Calculation, all per piece.

Drip cap made of aluminum sheet, in tone selected by the Supervisor, included in unit price.

- Pos. 1 : production measure 85/180cm
- Pos. 3 : production measure 85/120cm

Note pos. 3: window handle shall be mounted "down" towards the window sill.

Item 4 includes:

Purchase, delivery and installation of single-leaf window, made of improved anodized aluminum profiles with a thermo-breaking, color and finish as selected by the Supervisor, equipped with standard fitting, tilt and turn mechanism.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

Include purchase, delivery and installation of window handle in price.

All in line with the diagram and details and general description as position VII/2 of the bill.

Calculation, all per piece.

Drip cap made of aluminum sheet, in tone selected by the Supervisor, included in unit price.

- Pos. 2
production measure 85/85 cm

Item 5 includes:

Purchase, delivery and installation of triple-leaf window (1+2 fixed), made of improved anodized aluminum profiles with a heat bridge, color and finish as selected by the Supervisor, equipped with standard fitting, tilt and turn mechanism.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

All in line with the diagram and details and general description as position VII/2 of the bill.

Calculation, all per piece.

Drip cap made of aluminum sheet, in tone selected by the Supervisor, included in unit price.

- Pos. 4
production measure 85/240 cm
leaf that opens dim. 85/144 cm
- Pos. 5
production measure 170/180 cm
leaf that opens dim. 85/144 cm

Item 6 includes:

Purchase, delivery and installation of eight-leaf window (2+6 fixed), made of improved anodized aluminum profiles with a thermo-breaking, color and finish as selected by the Supervisor, equipped with standard fitting, tilt and turn mechanism.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

All in line with the diagram and details and general description as position VII/2 of the bill.

Calculation, all per piece.

Drip cap made of aluminum sheet, in tone selected by the Supervisor, included in unit price.

- Pos. 6

production measure 260/240 cm

leaf that opens 2* dim. 85/144 cm

Item 7 includes:

Purchase, delivery and installation of facade portal with two fixed leaves, made of improved anodized aluminum profiles with thermo-break, color and final processing selected by the Supervisor.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

All in line with the diagram and details and general description as position VII/2 of the bill.

darkened part of the glass

Calculation, all per piece.

Drip cap made of aluminum sheet, in tone selected by the Supervisor, included in unit price.

- Pos. 7

production measure 115/180 cm

Item 8 includes:

Purchase, delivery and installation of facade portal (twelve-leaf, 2 sliding and 10 fixed leaves), made of improved anodized aluminum profiles with a thermo-breaking, color and finish as selected by the Investor, fitting for sliding mechanisms.

Glassed by reflective low-emission dual-layer 4 + 12 + 4 mm glass, filled with helium, all in line with the scheme, details of the project and requirements: Regulations on energy efficiency of buildings, Law on planning and construction and Energy efficiency study.

All in line with the diagram and details and general description as position VII/2 of the bill.

darkened part of the glass

Calculation, all per piece.

Counter is calculated separately in pos. XIV/5. Various works.

- Pos. 8
production measure 444/180 cm - counter
counter 2* dim. 85/71 cm

Item 9 includes:

Purchase, delivery and installation of single leaf door, with a frame made of anodized aluminum profiles, leaf made of veneered MDF selected by the Investor, lock fitting, cylinder, handle - standard.

Construct the door all in line with carpentry diagram and details from the design.

Include all flashing around the door

Calculation per pc.

- Pos. 1 - carpentry
production measure 85/220 cm
- Pos. 2 - carpentry
production measure 95/220 cm
- Pos. 3 - carpentry
production measure 105/220 cm

Item 10 includes:

Purchase, making, delivery and installation of sanitary cabins made in el. aluminum profile framework, with compact panel filling d=8 mm. Raised from the floor by 15 cm, height up to 2.00 m from the floor level, all in line with carpentry diagram.

Cabin doors are equipped with hinges, handle and locking system.

Processing as selected by Investor.

Calculation per piece of finished, mounted partition. This position includes frontal wall with doors.

- Pos. P 1
part with the door 92/180 (1.66m²)
- Pos. P 2a
part with the door 143/180 cm (2.57m²)
- Pos. P 2b
part with the door 148.5/180 (2.67m²)

Item 11 includes:

Purchase, making, delivery and installation of partitions near urinals made of compact panels d=8 mm, with proper console supports, dim. 50/130cm. Raised from the floor by 40 cm, all in line with carpentry diagram.

Fitting for fixing the partition to the wall.

Calculation per piece of finished, mounted partition.

- Pos. P 3

4.1.3.8 VIII Metalworks Method of Measurement

Item 1 includes:

Purchase of material, making, transport and installation of single-leaf metal door with an aperture for supervising the retained person. The aperture (spy-hole) shall be done with a cover which is opened towards outside and is equipped with a girder for closing. Clean aperture dimensions are 15x15 cm.

Make the door out of ox profiles 40x40x2 mm, cover with flat steel sheet on both sides, thickness 2 mm, with a tervol filling between the sheets.

Equip the door with a cylinder lock and a handle (ball) on the external side instead of a handle. The lock must not be visible on the internal side.

Internal side must be flat (smooth) without any profiles, bumps, welds, sharp edges, etc. Pierce apertures in the lower part of the door Ø7 mm, in two rows, for ventilation, provided they are moved in relation to the outside and inside of the door.

Apply double red lead coating on the door and paint twice in tone selected by the Supervisor and investor.

Calculation per piece, all complete, installed.

- Pos. 13

production measure 105/220cm, all in line with metalworks diagram

Item 1a includes:

Purchase of material, making, transport and installation of single-leaf metal door on the weapons storage, room 5.

All in line with the diagram and details and general description as position VIII/1 of the bill.

Include a door locking mechanism in the price.

Calculation per piece, all complete, installed.

- Pos. 14

production measure 105/220cm, all in line with metalworks diagram

Item 2 includes:

Purchase and installation of single-leaf fire door, made of steel box profiles, covered with special steel sheet on both side, with expansion tape on all joints - which expands at temperature of 100°C by 200% and thus prevent penetration of heat, fire resistance of the door 30 min.

Dry installation by anchoring in GC walls on the steel substructure calculated in unit price.

Painted in fire resisting paint or FP plasticization, fire resistance 30 min.

Door is equipped with standard FP fitting and cylinder lock, handle and closing regulator. All in line with metalworks diagram.

Include a door locking mechanism in the price.

Calculation, all per installed piece.

- Pos. FP
production measure 85/220 cm

Item 3 includes:

Purchase of material, making, transport and installation of protective metal mask on the internal (external) side of the window. The mask must be smooth, without screws, bulges, welds, sharp edges, etc. The mask shall be made of steel sheet, thickness 5 mm with apertures Ø7 mm spaced 7 mm.

The mask is placed over the metal frame made of box profiles 25x25x4 mm, installed in the wall. Connection between the mask and the frame is made by screws with recessed head.

At the place of the window handle on ventus, leave an aperture max. size 3x3 cm, so the guard could open the window with a dismantling handle if needed. Apply anti-corrosion protection and paint twice in tone selected by the Supervisor and investor.

Calculation per piece, all complete, installed.

- Pos. M1, P1 (100cm)
production measure of the window for mounting metal mask is 85/85 cm, all in line with metalworks diagram.

Item 4 includes:

Purchase of material, making, transport and installation of protective metal mask for the fan-coil (fan convector). The mask shall be made of steel sheet, thickness 5 mm with apertures Ø7 mm spaced 7 mm.

The mask is placed over the metal frame made of box profiles 25x25x4 mm, installed in the wall. Connection between the mask and the frame is made by screws with recessed head.

Apply anti-corrosion protection and paint twice in tone selected by the Supervisor and investor. Internal side must be smooth without any screws, bumps, welds, sharp edges, etc.

Calculation per piece, all complete, installed.

- Pos. M2
production measure 93/120 cm, all in line with metalworks diagram

Item 5 includes:

Purchase of material, making, transport and installation of protective metal mask for the heater. The mask shall be made of steel sheet, thickness 5 mm with apertures Ø7 mm spaced 7 mm.

The mask is placed over the metal frame made of box profiles 25x25x4 mm, installed in the wall. Connection between the mask and the frame is made by screws with recessed head.

Apply anti-corrosion protection and paint twice in tone selected by the Supervisor and investor. Internal side must be smooth without any screws, bumps, welds, sharp edges, etc.

Calculation per piece, all complete, installed.

- Pos. M3
production measure 75/60 cm, all in line with metalworks diagram

Item 6 includes:

Purchase of material, making, transport and installation of metal mask for lights, placed above the lintel, where the electric light for room is placed and which is turned on the outside of the room. Install the mask-box in width of plastered wall.

Box dimensions are 105/40 cm, one side is fixed with perforations all in line with design diagrams, and the other side opens and a lamp is installed on it, which is part of the electro installation project.

The mask shall be made of steel sheet, thickness 5 mm with apertures Ø7 mm spaced 7 mm.

Equip the box with hinges and lock.

Calculation per piece, all complete, installed.

-production measure 105/40 cm, all in line with metalworks diagram

Item 7 includes:

Purchase of material, transport and making of stairway fence made of steel box profiles 40/40/3 mm, horizontal and vertical separation of steel flat bar 40/4 mm, 110 cm high. Installation in line with detail.

Calculate red lead coating and painting in RAL as selected by the Investor in price.

NOTE: contractor is obliged to give the construction details to Supervisor and investor for approval.

Calculation all complete per m of mounted fence.

- Pos. O1

Item 8 includes:

Purchase of material, making, transport and installation of galvanized metal fixed ladders with a cage for accessing the roof, all in line with metalworks diagram, details and instructions by the Supervisor, color selected by the Supervisor.

Calculation per piece, all complete, installed.

- Pos. P
- ladders, height 7.55 m / cage height 5.50 m

4.1.3.9 IX Flooring works Method of Measurement

Item 1 includes:

Purchase of materials, delivery and installation of PVC floor covers over the prepared cement screed, dry, clean and flat.

PVC floor covers are made of self-adhesive vinyl panels (LLT) reinforced with glass fibers for exceptional dimensional stability, thickness 4 mm, wear class T (according to EN 660-2), with Topclean XP protection, wearing layer thickness 0.7mm, fire resistance Bfl-s1 (according to EN 13501-1), weight up to 5900g/m², class 34-43 (EN 685), slip resistance R9 (DIN 51130), resistant to chair wheels (EN 425), not supporting development of mold and fungi.

Panels are placed on anti-slip adhesive, according to recommendation by the manufacturer of Henkel Thomsit T425 quality or equivalent.

Quality and type of floor cover in class of manufacturer Tarkett - Square Compact or equivalent.

Design, color and texture as selected by the Supervisor and investor.

Calculation per m².

- ground floor
room 3, 4, 5, 7, 14, 17, 18, 19, 20
- first floor
room 3, 7, 8, 9, 10, 11, 12, 16, 17, 18

Item 2 includes:

Purchase, delivery and installation of PVC plinth, height h=10 cm, in rooms with PVC flooring, installation all in line with manufacturer's instructions. Design, color and texture in line with floor covering. Calculation per m¹.

- ground floor
room 3, 4, 5, 6, 7, 14, 17, 18, 19, 20
- first floor
room 3, 6, 7, 8, 9, 10, 11, 12, 16, 17, 18

4.1.3.10 X Tiling works Method of Measurement

Item 1 includes:

Purchase of materials, delivery and installation of granite floor tiles, I class, dimensions 60x30cm (50x50cm) at the entrance part, hall, sanitary node, anteroom, locker rooms, kitchen and dining room, and archive.

Tiles shall be laid all in line with Supervisor's and investor's choice (type, composition, design, texture, color and similar). Laying shall be done over a cement screed base in proper adhesive with joint grouting. Prepare the base and lay them straight.

Envisage processing of joints between floor and wall tiles, joints at the sink and similar with appropriate silicone in the price. Also, include protection of floors made of granite ceramics until completion of all works in price.

Calculation per m².

- ground floor
room no. 1, 2, 6, 8, 9, 10, 11, 12, 13, 15, 16, 21
- first floor
room no. 2, 4, 5, 6, 13, 14, 15

Item 2 includes:

Purchase of materials, delivery and covering the walls with ceramic tiles, I class, in line with floor tiling, in the kitchen with dining room, up to height of 1.50 m and in appropriate adhesive. Tiles are laid on gypsum walls, all in line with material manufacturer's instructions, on a solid, clean, flat and dust-free surface. Tiles shall be laid all in line with Supervisor 's and investor's choice (type, composition, design, texture, color and similar). Calculation per m².

first floor, room 6.

Item 3 includes:

Purchase of materials, delivery and covering the walls with ceramic tiles, I class, in line with floor tiling, in the entire height of the wall and appropriate adhesive. Tiles are laid on gypsum walls, all in line with material manufacturer's instructions, on a solid, clean, flat and dust-free surface. Tiles shall be laid all in line with Supervisor 's and investor's choice (type, composition, design, texture, color and similar). Calculation per m².

- ground floor
room 11, 12
- first floor
room 4, 13, 15

Item 4 includes:

Purchase of material, delivery and covering the walls around the sanitary block for retention rooms, by glazed ceramic tiles, I class, in the entire height of the wall, in cement mortar, joint on joint, jointing in white cement. Tiles shall be laid all in line with Supervisor 's and investor's choice (type, composition, color and similar). Calculation per m².

- ground floor
room 6.

Item 5 includes:

Purchase of material, delivery and making of plinth on the perimeter of the rooms where granite floor tiles will be laid in appropriate adhesive, plinth heights is $h=10$ cm, and color, design and quality is in line with floor tiling. Grout the laid tiles and clean the plinth.

Calculation per m¹.

- ground floor
room 1, 2, 6, 8, 10, 13, 14, 15, 16, 21
- first floor
room 2, 5, 6, 14

Item 6 includes:

Purchase of materials, delivery and installation of standard AL strips on external edges of walls covered in ceramic tiles, all in line with manufacturer's instructions and Supervisor and investor's choice. Calculation per m¹.

Item 7 includes:

Purchase of material, delivery and installation of granite floor tiles, class I, dimensions 60x30 cm (50x50 cm) on the stairs.

Tiles shall be laid all in line with Supervisor 's and investor's choice (type, composition, design, texture, color and similar). Laying shall be done over a cement screed base in proper adhesive with joint grouting.

Prepare the base and lay them straight. Envisage processing of joints for floor and wall tiling - plinth, with proper silicone, in the price. Also, include protection of floors made of granite ceramics until completion of all works in price.

Include purchase and installation of standard Al strip for stair landings in the price.

Calculation per m².

- stairway
- landing
- face $x=18$ cm

Item 8 includes:

Purchase of material, delivery and making of stairway plinth out of granite tiles in appropriate adhesive, plinth heights is $h=10$ cm, and color, design and quality is in line with floor tiling. Grout the laid tiles and clean the plinth.

Calculation per m¹.

Item 9 includes:

Purchase of materials, delivery and installation of extension AL strips for covering the pass between two different types of floor (PVC floor and floor ceramics), all in line with manufacturer's instructions and Supervisor and investor's choice. Calculation per m1.

4.1.3.11 XI Dry installation – plasterwork Method of Measurement

A) WALLS

NOTES:

- in rooms with sanitary accessories, it is necessary to create reinforcement within the lining or partition wall at points of installation of sanitary devices, included in a separate position.
- floor height of the ground floor $h=3.33$ m (cover 3.00 m), first floor $h=3.46$ m (cover 3.00 m).

Item 1 includes:

Purchase, transport of materials and installation of "Knauf W626" or "appropriate" **wall lining**. External wall is with single metal substructure made of galvanized steel CW and UW profiles 100 mm. Wall lining is cladding type. Wall lining height max. 3.40 m (axial distance of CW profile 62.50 cm).

Total thickness of wall lining 125 mm, single layer coated on one side with standard construction gypsum panels GKB1 1x12.5 mm, type A13 or "appropriate", thickness 125 mm. Processing of joints by GK panel kit - smoothed joint.

Filling for joints: "Knauf Uniflot" or "appropriate" kit with use of bandage tape.

Calculation all per m2 of finished lined walls, including required scaffold, with no deduction of apertures < 3 m², with processing around apertures (for apertures that are > 3 m², excess over 3m² is deducted).

All in line with the design, details and manufacturer's instructions.

C3 1.1. - facade walls : ground floor

C3 1.5. - facade walls: first floor

Item 2 includes:

Purchase, transport of materials and installation of "Knauf W626" or "appropriate" **wall lining**. External wall is with single metal substructure made of galvanized steel CW and UW profiles 100 mm. Wall lining is cladding type. Wall lining height max. 3.40 m (axial distance of CW profile 62.50 cm).

Total thickness of wall lining 125 mm, single layer coated on one side with Knauf or ""appropriate"" impregnated-waterproof gypsum panels type H13 (GKBI), thickness 125 mm. Processing of joints of GK panels in Q2 quality - smoothed joint.

Note: Processing of joints all as in position 1 of the bill.

Calculation per m² of finished lined walls, including required scaffold, no deduction of apertures, with processing around apertures.

All in line with the design, details and manufacturer's instructions.

C3 1.2. - facade walls: ground floor, first floor

Item 3 includes:

Purchase, transport of materials and installation of "Knauf" or "appropriate" partition wall.

Total thickness 125mm, double layer coated on both sides "Knauf" or "appropriate" by standard construction gypsum panels type A (GKBI) thickness 25 mm. Insulation layer made of mineral wool "Knauf Insulation TI 140" or "appropriate", 75 mm.

Note: Processing of joints all as in position 1 of the bill.

Calculation per m² of finished walls, including required scaffold, no deduction of apertures, with processing around apertures.

All in line with the design, details and manufacturer's instructions.

Note: during construction of walls in rooms 2 and 21. on the ground floor, it is necessary to construct a niche for placing the electro cabinet, calculated in this position. Reinforcements are given separately, in device supports part.

IW 1.1. internal walls: ground floor, first floor

Item 4 includes:

Purchase, transport of materials and installation of "Knauf" or "appropriate" partition wall.

Total thickness 150mm, double layer coated on both sides "Knauf" or "appropriate" by standard construction gypsum panels type A (GKBI) thickness 25 mm. Insulation layer made of mineral wool "Knauf Insulation TI 140" or "appropriate", 100mm.

Note: Processing of joints all as in position 1 of the bill.

Calculation per m² of finished walls, including required scaffold, no deduction of apertures, with processing around apertures.

All in line with the design, details and manufacturer's instructions.

IW 1.7. internal walls: ground floor

Item 5 includes:

Purchase, transport of materials and installation of "Knauf" or "appropriate" partition wall.

Total thickness 125 mm, double-coated on both sides by "Knauf" or "appropriate". Wall is formed by mounting double impregnated-waterproof construction gypsum panel type A (GKBI H13 2x12,5mm) on both sides, towards the wet rooms. Insulation layer made of mineral wool "Knauf Insulation TI 140" or "appropriate", 75 mm.

Note: Processing of joints all as in position 1 of the bill.

Calculation per m² of finished walls, including required scaffold, no deduction of apertures, with processing around apertures.

All in line with the design, details and manufacturer's instructions.

IW 1.2. internal walls: ground floor, first floor

IW 1.3. internal walls: ground floor, first floor

Item 6 "Knauf fire resistant F90 or appropriate".includes:

Purchase, transport of materials and installation of "Knauf W112" (or equivalent) product) partition wall or equivalent. Partition wall is with single metal substructure made of galvanized steel CW and UW profiles 100 mm.

Total wall thickness is 125 mm, covered on both sides in two layers with Knauf hard fire-resistant impregnated gypsum panels, or "appropriate", thickness 2.5 cm. Insulation layer made of mineral wool "Knauf Insulation TI 140" or "appropriate". 7.5 cm. Processing of joints of GK panels in Q2 quality - smoothed joint. Fire resistance F90.

Calculation all complete per m² of finished walls, no deduction of apertures, including required scaffold.

IW 1.6. internal walls: ground floor, first floor

Item 7 "Knauf fire resistant F90 or appropriate" includes:

Purchase, transport and making of "Knauf" or "appropriate" wall **cover** or equivalent. Partition cover is with single metal substructure made of galvanized steel CW and UW profiles 75 mm.

Cover is made of double fire resistant gypsum panel GKF F13 2x12.5 mm Knauf with hard fire resistant impregnated gypsum panels or "appropriate", thickness 2.5 cm. Insulation layer made of stone wool "Knauf Insulation TI 140" or "appropriate". 15 cm in the facade wall structure. Processing of joints of GK panels in Q2 quality - smoothed joint. **Fire resistance F90.**

C3 1.10. - facade walls: ground floor, first floor

Brackets for mounting sanitary and other devices and equipment:

Item 8 "Brackets for sink" includes:

Bracket for sink with a rail support for the sink, rail with two mounting pedals for support of ESK valve connection and mounting clamp Ø 52 mm for fastening the drain for sub-structure raster 62.5 cm.

Delivery and installation complete with installation tools.

Calculation per pc.

Item 9 "Stiffening of the door aperture" includes:

Purchase, transport and installation of stiffening for door aperture and brackets for console sanitary devices by UA profiles - complete with profile angles (for headroom over 2.60 m).

Calculation per aperture up to 4 m high - UA profiles + profile angles

For door leaf weight up to 75 kg

Profile UA 75 mm double sided + profile angles (set of 4 pieces)

Calculation per pc.

- door
- double-leaf entrance door

Item 10 "Brackets for low-mounted heater" includes:

Brackets for heater with 3 rails, two rails for fastening the heater and one plate for two ECK valves, for substructure raster 62.5 cm. Delivery and installation complete with installation tools.

Calculation per piece for raster 62.5 cm.

Volume 10 l.

Item 11 includes:

Purchase of materials, delivery and construction of reinforcement out of galvanized profiles inside the wall structure, under the niche for placing the electro cabinet. Electro cabinet dimensions are 126/30 and 127/30 cm.

Total weight of a cabinet is about 100 kg.

Calculation all per piece of reinforcement for both cabinets.

Niches in rooms of entrance 2 and 21.

Item 12 includes:

Purchase, delivery and installation of ALU TOP revision aperture- standard construction with covered closing system, anodized, with installed lining made of DIAMANT panels d=12.5 mm or "appropriate".

Calculation per pc.

dimensions:

300x300 mm

B) CEILINGS

Item 13 includes:

Flat monolithic ceiling "Knauf KGBI 2x12,5mm" or "appropriate".

Purchase of materials, transport and construction of suspended ceilings out of monolithic gypsum panels, thickness d=2x12.5 mm with covered substructure made of galvanized steel profiles, hanged by lintels (30 cm) for roof structure. Suspended ceiling is at height of 3.00 m from the floor level. Include bandaging of joints in the price.

Join the ceiling with the wall by a countersunk clamp - "shadow joint". Edge of the clamp shall be processed-reinforced by Knauf or appropriate aluminum edge batten 25x13 mm.

Calculation all complete per m² including required scaffold.

- waterproof
- fire resistant

Item 14 includes:

Flat monolithic waterproof ceiling "Knauf D 112 - H13 2H12.5mm" in bathrooms or "appropriate".

Purchase of materials, delivery and construction of suspended monolithic gypsum ceilings waterproof, thickness $d=2 \times 12.5$ mm in sanitary blocks with covered substructure made of galvanized steel profiles. Include bandaging of panel joints in the price.

Note: Method of suspension, height of suspended ceiling, processing of joints, filling, finishing battens, all in line with description from previous position of dry installation works.

Calculation all complete per m^2 including required scaffold.

Item 15 includes:

Suspended fire ceiling - fire resistance F60.

Purchase of material, delivery and installation of fire resistant gypsum boards 15+18 mm.

Filling for joints: "Knauf Fireboard spachtel" or "appropriate" with use of bandage tape made of glass fibers.

Fire resistance 60 minutes.

Calculation per m^2 .

Item 16 includes:

Purchase, delivery and installation of ALU ECO revision aperture- standard construction with covered closing system, anodized, with installed lining made of Knauf H2 or "appropriate", gypsum panel $d=12.5$ mm.

Calculation per pc.

dimensions:

- 300x300mm
- 600x600mm

4.1.3.12 XII Painting works Method of Measurement

Item 1 includes:

Purchase of materials, delivery and final painting of internal wall and ceiling surfaces, by dispersion paint and smoothing with skim mass twice. Calculation per GN for painting works, per m^2 with scaffold.

ceiling area:

wall area:

- ground floor
room no. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
- first floor
room no. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

stairway

total without deducting apertures:

deduct apertures toward GN for that type of works

- ground floor
room no. 1, 2, 3, 8, 15, 16, 18, 19, 20, 21
- first floor
room no. 2, 6, 9, 10, 11, 17, 18

Item 2 includes:

Purchase of material, delivery and final painting of internal wall surfaces with light oil paint (green, blue, beige), height 2.0 m from the floor, including smoothing with skim mass twice. Calculation complete per m² with scaffold.

- ground floor
room 6.

4.1.3.13 XIII Facade works Method of Measurement

Item 1 includes:

Purchase of material, delivery, all horizontal and vertical transport on the site and installation i.e. construction of the object facade out of thermal insulation panels with mineral wool filling 15 cm thick, in color RAL 9002.

The position must meet heat transfer coefficient of $U_{max}=0,30 [W/(m^2K)]$.

Placing the panels horizontally, connection by hidden joints, all in line with instructions by the panel manufacturer, external surface of the sheet is flat, smooth, sheet thickness min. 0.63 mm.

Required fire resistance of the panels in line with Fire protection study 30 minutes.

This position includes all required works which enable proper and quality construction and installation.

Unit price includes washers, screws (stainless) for mounting panels on a steel substructure, with all auxiliary material and parts.

Calculate processing of angles-external, vertical and horizontal joints, flashing around windows and doors in unit price. All screws and connections with the substructure must be hidden.

Facade construction shall be done in line with design detail and instructions from the manufacturer.

Note: Secondary steel substructure of the panels and substructure for facade apertures is also included in unit price.

Steel substructure shall be protected against corrosion.

Calculation all per m² of finished facade without deduction of apertures that are < 3m², with processing of all joints (or apertures that are > 3 m², excess over 3m² is deducted).

Item 2 includes:

Purchase of materials, delivery, all horizontal and vertical transports on the construction site and installation i.e. making of sandwich facade of the objects out of following layers: C block 0.088 cm, stone wool $d=15$ cm, vapor permeable film, air layer $d=4$ cm and sinus steel sheet 18/76mm, thickness 0.63mm as final cover (type „ArcelorMittal Frequence V18/76) or equivalent, color RAL 7031 and RAL 9002.

The position must meet heat transfer coefficient of $U_{max}=0,30$ [W/(m²K)].

Required fire resistance of the panels in line with Fire protection study 30 minutes.

This position includes all required works which enable proper and quality construction and installation.

Unit price includes substructure made of galvanized profiles for final sheet, washers, screws (stainless) for mounting on a steel substructure, with all auxiliary material and parts.

Calculate processing of angles-external, vertical and horizontal joints, flashing around windows and doors in unit price. All screws and connections with the substructure must be hidden.

Facade construction shall be done in line with design detail and instructions from the manufacturer.

Note:Secondary steel substructure and substructure for facade apertures is also included in unit price.

Steel substructure shall be protected against corrosion.

Calculation all per m² of finished facade without deduction of apertures that are < 3m², with processing of all joints (or apertures that are > 3 m², excess over 3m² is deducted).

- ground floor
- first floor

Item 3 includes:

Purchase of materials, delivery, all horizontal and vertical transports on the construction site and installation i.e. making of sandwich facade of the objects out of following layers: C block 0.088 cm, stone wool $d=15$ cm, vapor permeable film, air layer $d=4$ cm and sinus steel sheet 18/76mm, thickness 0.63mm as final cover (type „ArcelorMittal Frequence V18/76) or equivalent, color RAL 1005.

The position must meet heat transfer coefficient of $U_{max}=0,30$ [W/(m²K)].

Required fire resistance of the panels in line with Fire protection study 30 minutes.

This position includes all required works which enable proper and quality construction and installation.

Unit price includes substructure made of galvanized profiles for final sheet, washers, screws (stainless) for mounting on a steel substructure, with all auxiliary material and parts.

Calculate processing of angles-external, vertical and horizontal joints, flashing around windows and doors in unit price. All screws and connections with the substructure must be hidden.

Facade construction shall be done in line with design detail and instructions from the manufacturer.

Note: Secondary steel substructure and substructure for facade apertures is also included in unit price.

Steel substructure shall be protected against corrosion.

Calculation all per m² of finished facade without deduction of apertures that are < 3m², with processing of all joints (or apertures that are > 3 m², excess over 3m² is deducted).

Item 3a includes:

Purchase of material and making of external vertical flashing for corners of the object, out of galvanized plasticized sheet d=0.63 mm. Total developed width is 220 mm, in color as facade sheet.

Calculation per m'

Item 3b includes:

Purchase of material and making of flashing for parapet on the facade, out of galvanized plasticized sheet d=0.63 mm. The flashing consists of two parts, bottom part with perforate sheet for entrance of air DW 200 mm and front face part DW 150 mm. Total developed width is 350 mm, in color as facade sheet.

Calculation per m'

Item 3v includes:

Purchase of material and making of flashing at the joint of the panel and sinus sheet, as well as on the joint between two sinus sheets of different color. Make the flashing out of galvanized plasticized steel sheet d=0.63 mm. Total developed width is 350 mm in color RAL 5009.

Calculation per m'.

Item 3g includes:

Purchase of material and making of suspended ceiling out of flat galvanized plasticized steel sheet, at level +3.07 in axis A. Sheet color RAL 5009.

Secondary steel substructure and galvanized substructure are also included in unit price.

Calculation per m'

Item 4 includes:

Installation of Z profile of the starting facade element on the joint between horizontal facade and parapet beam.

Include all basic and auxiliary material, transport and labor in price.

Calculation per m1.

Item 5 includes:

Flashing of facade surfaces around the windows and doors out of galvanized plasticized steel sheet d=0.63 mm, developed width cca 35 cm. Flashing all in line with detail and recommendation by the manufacturer of facade lining for flashing with concealed joint. Sheet color should be in line with facade lining color.

Include all basic and auxiliary material, transport, scaffold and labor in price.

Calculation per m1.

- flashing of window sill DW 25 cm.
- flashing of window DW 25 cm.
- flashing of door DW 25 cm.

Item 6 includes:

Flashing and covering of facade surfaces in axis A with sinus steel sheet 18/76 mm, on the upper side. Flashing all in line with detail and recommendation by the manufacturer of facade cover. Sheet color should be in line with facade lining color RAL 7031.

Include steel substructure, all base and auxiliary material, transport, scaffold and labor, standard elements for connecting horizontal and vertical surfaces in price.

Calculation per m2.

- level +4.05 from the pavement level
- level +8.16 from the pavement level

Item 7 includes:

Purchase and covering of plinth by panels made of extruded polystyrene XPS; ribbed surface structure d=5 cm. Installation is done by gluing with construction adhesive and anchoring by special dowels. Apply a coat of construction adhesive over the panels, imprint the glass mesh on the entire surface and apply final layer of construction adhesive.

Calculation per m² of covered surface.

Item 8 includes:

Processing of facade wall surfaces with plastic mortar with scratching, type Kulir or appropriate, selected by the Supervisor. Final painting in tone selected by the Supervisor is included in price.

Calculation per m² of processed surface and final paint.

Item 9 includes:

Purchase, delivery and installation of stone wool, in hard panel form, thickness d=7.5 cm and PE foil. Place the stone wool as thermal and sound insulation and fire protection for facade walls, in line with contractor's details. Calculation per m² of facade.

Item 10 includes:

Mounting and dismantling of facade pipe scaffold, height up to 6.60 m for facade installation works, cleaning and stacking after dismantling. Calculation complete per m² of vertical projection of scaffold.

Scaffold in executed all in line with applicable regulations and industrial hygiene (HTZ) measures, it must be stable, anchored to the object and properly grounded, with work platform and fences.

Scaffold is mounted for facade mounting.

4.1.3.14 XV Various works Method of Measurement

Item 1 includes:

Installation of benchmarks on the object for monitoring possible subsidence of the object, all in line with Supervisor's instructions. Calculation per piece, at point determined by the Supervisor, and recording of the object in periods also determined by the Supervisor.

Item 2 includes:

Final cleaning of the object upon completion of all works and handover to the client for use.

Calculation per net m².

Item 3 includes:

Purchase, delivery and installation in floor tiling, of mats in front of the entrance into the MIA and CA. Calculation per piece, mat dimensions 120/80 cm.

Item 4 includes:

Purchase, delivery and installation of internal window sills, width 20 cm, made of MDF painted by polyurethane in tone selected by the Supervisor, all in line with the design and details from the design.

Calculation per m1.

Item 5 includes:

Purchase of material, delivery and installation of external aluminum window sill. Sheet thickness d=5 mm, color in line with metalworks, width up to 30 cm. Calculation all per piece with required substructure (length 4.15+1.20=5.35 m).

counters position 8.

Item 6 includes:

Purchase of material, making, transport and installation of beech planks for making the wooden bed in the room for retaining passengers, on a previously made RC structure for the bed. Planks are d=8 cm thick, 12 cm wide, made of healthy wood without nodes, fine processed top surface (smooth), final processing colorless lacquer.

Mounting-screwing wooden planks on the RC pad with carriage bolts. Planks are mounted side by side.

Calculation all complete per piece of finished, made bed dim. 200/90 cm.

4.1.4 CANOPY (OBJECT 2)

A) RC Structure

4.1.4.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m².

Item 2 includes:

Combined excavation in a previously backfilled terrain for a foundation pit for spot footings of the canopy, all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to Ms = 10 - 15 Mpa.

NOTE: three remaining spot footings are within the RC retaining structure.

Item 3 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the spot footings, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is t=30 cm, degree of compactability on the final layer Ms = 50 Mpa.

Item 4 includes:

Purchase, transport, backfill and compacting of sand around concreted foundations of the object up to the level of backfilled terrain, in layers up to degree of density of Ms =25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Note: ground works don't include backfilling of concreted spot footings with sand up to the level of newly designed terrain. The entire backfilling is included in the traffic design.

4.1.4.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness t=5 cm under the RC spot footings. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m².

Item 2 includes:

Purchase of material, transport and concreting of RC spot footings for steel pillars of the canopy structure with reinforced concrete CC30, all in line with concrete design, include formwork and curing of the concrete in unit price. Foot dimensions 2.00x2.00 m, height h=40 cm, door dimensions 1.30x0.60 m, height cca 1.10m.

All in line with structural design and given details.

Calculation per m³.

Note: during concreting of the spot footings, it is necessary to install template pads on the point of installation of steel poles for the canopy, all in line with the design. Template pads are included in steel works position.

Note: concrete and RC works include construction of 7 spot footings for steel structure poles of the canopy, 3 (three) footings are within the RC retaining structure.

4.1.4.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the spot foundations, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m³ of concrete)

MA 500/560

B500B

B) Canopy

4.1.4.4 IV Steel structure Method of Measurement

Item 1 includes:

Purchase of material, workshop construction, delivery, all transports and installation of steel structure of the canopy.

Horizontal retaining structure consists of NEA 300 beams, which connect the tips of the pillars in longitudinal direction and main roof racks NEA 400, installed at a distance of 5.75 m, on which the IPE 220 rafters rest, over which the roof cover of the canopy is placed, included in the roofing works position. Horizontal structure of the canopy forms two gable roofs, with roof plane slopes of 12°, and 8°. Roof bracing for stiffening is designed in the roof structure, located in all end fields of the roof except above the object no. 1. Bracing elements will be made of L profiles 75x75x8.

Vertical retaining structure consists of 11 pillars. Pillars have a "V" shape, formed of prefabricated steel profiles, round tube section Ø 273, wall thickness 8 mm. Branches of the "V" pillar spread towards the girder and meet on the reinforced concrete foundation, all in line with static calculation and details for steel structure.

Elements- structure shall be cleaned of corrosion and dust- sandblasted, and prior to applying red lead coating, inspect all joints and test joining the structure in the workshop and degrease all the elements. Apply the anti-corrosion coating after inspection and first primer in the workshop and apply the second primer after installation. After installation, repair the coating in connection zones and finish the painting in tone selected by the Investor in two layers.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation all per kg of completed, installed and painted steel structure.

Item 2 includes:

Purchase of material, making, transport and installation of steel substructure for the suspended ceiling.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation all per kg of completed, installed and painted steel substructure.

For calculation (10 kg/m²).

Item 3 includes:

Purchase of materials, making, delivery and installation of steel anchor slabs dim. 400/950 mm, thickness d=15 mm with 2*4M 20 for installation of steel columns on the designed positions, all in line with the details and static calculation.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation, all per piece.

Item 3a includes:

Purchase of materials, making, delivery and installation of steel standard plates dim. 400/950/10 mm, which are concreted in RC spot footings.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation, all per piece.

Item 4 includes:

Purchase of materials, making, delivery and installation of steel anchor slabs dim. 300/300 mm, thickness d=12 mm with 4M 20 for installation of NEA 400 roof racks on the designed position - RC pillars within object no. 1, all in line with the details and static calculation.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation, all per piece.

Item 4a includes:

Purchase of materials, making, delivery and installation of steel standard plates dim. 300/300/5 mm, which are concreted in RC poles.

Include all connection and bonding materials as well as appurtenant works in the price.

Calculation, all per piece.

4.1.4.5 V Roofing Works Method of Measurement

Item 1 includes:

Purchase of material, delivery, all horizontal and vertical transports on the site and installation i.e. construction of the roof of the canopy object, out of sinus steel sheet 18/76 mm, all in line with

design details. Place the sheet over the rafters in the designed slope. Canopy roof consists of 4 inclined roof planes, i.e. two gable roofs, roof plane slopes are 12° (three planes) and 8° (one plane). Sinus sheet is plasticized RAL 7031.

This position includes all required works which enable proper and quality construction and installation.

Mandatory application of all prescribed instructions for installation by the manufacturer.

Calculation per m² of covered surface, including in unit price all connection materials, transports, required overlaps, basic and auxiliary material and required scaffold.

Note: Processing of connection of two roof planes, attic flashing and horizontal gutters are included in sheet metal work positions.

Within the roof plane of the canopy and above object no. 1 (above the ladders for accessing the roof), a skydome is designed, dim. 100x120 cm, included in metalworks position.

4.1.4.6 VI Metalworks Method of Measurement

Item 1 includes:

Purchase, delivery and installation of a skydome dim. 100/120 cm (dimensions of the opening on the roof).

Purchase, delivery and installation of appropriate skydomes.

Light transmission 50%.

Upstand is made of polyester. Frame is made of PVC, with co-extruded sealings, with a system with double sealing at the contact with the upstand.

Manual opening. Opening angle 165°.

Calculation per piece of installed skydome with all required material for installation and scaffold

4.1.4.7 VII Steel sheet works Method of Measurement

Item 1 includes:

Purchase of materials, construction and installation of horizontal lying gutters made of galvanized, plasticized sheet t=0.6 mm, DW up to 128 cm, with a pitch of 0.5% toward vertical gutters. Calculation per m.

Item 2 includes:

Purchase of materials, construction and installation of drainage gutter verticals-pipes made of plasticized sheet t=0.6 mm, circular section Ø 100 mm. Include joining the horizontal connection pipe from the roof and stainless steel clamp for fastening on the facade as well as final cast part in the price.

Calculation all per m1.

Ø 100

Item 3 includes:

Purchase of materials and making of attic flashing with sinus steel sheet, in line with suspended ceiling, variable developed width ranging from 45 cm to 120 cm. Calculation per m1.

Item 4 includes:

Purchase of material, making, transport and installation of flashing for roof plane connection of the canopy object, with sinus steel sheet in line with roof, DW 60 cm. Flashing shall be done all in line with design detail and instructions from the Supervisor. Include all required materials in the unit price.

Calculation per m1.

Item 5 includes:

Purchase of material, delivery and flashing of eave with sinus steel sheet 18/76 mm, RAL 7031. Include required substructure made of painted steel profiles and connection materials in the price, all in line with the design.

Calculation per m2 all complete.

- flat part of the eave l=1.0 m
- vertical h= up to 40 cm

Item 6 includes:

Purchase of material, delivery and construction of suspended ceiling out of sinus plasticized sheet RAL 1005. Include required lintels and substructure made of galvanized profiles in the price, all in line with the design.

Calculation per m2 of inclined projection, all complete.

- vertical part
- horizontal part
- deduct part of MOI and CA

Item 7 includes:

Purchase of material and construction of flashing around the exit door to the roof, with sinus steel sheet 18/76 mm, DW 60 cm. Calculation per m1.

Item 8 includes:

Purchase of material and construction of flashing around the exit door to the roof, on the bottom side, of material like for the suspended ceiling of the canopy.

Calculation per piece, all complete.

Item 9a includes:

Purchase of material and construction of ridge flashing from galvanized plastic steel sheet t = 0.63 mm. The total developed width is 250 mm in color of the roof sheet. Calculation per m'.

Item 9b includes:

Purchase of materials and construction of an attic flashing and the roof plate with galvanized plastic steel sheet t = 0.63 mm. The total developed width is 250 mm in color of the roof sheet. Calculation per m'.

Item 9v includes:

Purchase of materials and construction of an attic flashing and horizontal plane with galvanized plastic steel sheet t = 0.63 mm. The total developed width is 200 mm in the color of the roof sheet and the sheet of suspended ceiling. Calculation per m'.

Item 9g includes:

Purchase of materials and construction of an attic flashing and horizontal plane with galvanized plastic steel sheet $t = 0.63$ mm. The total developed width is 200 mm in the color of the roof sheet and the sheet of suspended ceiling. Calculation per m'.

Item 9d includes:

Purchase of materials and construction of external, vertical flashings of the object's corner's with galvanized, plastic, steel sheet $t = 0.63$ mm. The total developed width is 220 mm. Calculation per m'.

Item 10 includes:

Purchase of materials, delivery and installation of line snow fence type 330 made of galvanized painted steel sheet.

Snow fences are mounted above the support points of panels by "zigzag" system.

Calculation per m1.

4.1.4.8 VIII Various works Method of Measurement

Item 1 includes:

Installation of benchmarks on the object for monitoring possible subsidence of the object, all in line with Supervisor's instructions. Calculation per piece, at point determined by the Supervisor, and recording of the object in periods also determined by the Supervisor.

Item 2 includes:

Purchase of material, transport and forming of a through for the horizontal gutter over the steel roof structure.

Box profiles are placed over the steel racks at the area for gutters, all in line with given details, steel profiles are included in steel works position; OSB pad 1.5 cm is placed over the profiles so it forms a through.

Calculation all complete per m2 of installed OSB pad, or formed through for horizontal gutter.

4.1.5 TWO COMBINED CABINS no. 1 (MIA and CA) (OBJECT 4a + 4b)

4.1.5.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m²

Item 2 includes:

Combined excavation in a previously backfilled terrain for the foundation construction, all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to $M_s = 10 - 15 \text{ Mpa}$.

Item 3 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the floor slab of the object and foundation beams, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density of $M_s=30 \text{ Mpa}$. Include purchase, transport, spreading and compacting in price. Calculation per m³.

- a) under the floor slab of the objects - combined cabin
- b) under the foundation beams

Item 4 includes:

Purchase, transport, backfilling and compacting of sand on a previously prepared base - level of terrain backfill in layers, under the floor slab of the object (replacement of the soil). Sand is compacted in layers up to degree of compactability $M_s = 25 \text{ MPa}$. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is $t=0.30 \text{ m}$.

Item 4a includes:

Purchase, transport, backfilling and compacting of sand around the concrete foundations, up to the angle of the ground. The sand is charged in layers to the modulus of compaction $M_s = 25 \text{ MPa}$. Include purchase, transport, spreading and compacting in price. Calculation per m³.

4.1.5.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness $t=5 \text{ cm}$ under the foundation pad and foundation beams of the plateau for placing the combined cabin. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m².

Item 2 includes:

Purchase of material, transport and making of RC floor slab of the object, thickness $t=15$ cm, out of concrete CC30, in required formwork, all in line with Concrete design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Slab shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m^3 .

NOTE: prior to construction of the foundation slab, place PVC pipes for leading in the installations into the object, all in line with the design.

Item 3 includes:

Purchase of material, transport and construction of RC foundation beams, dimensions 25/105 cm, out of reinforced concrete CC 30 in required formwork. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m^3 .

4.1.5.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the floor pad of the plateau for placing the combined cabins and foundation beams all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/ m^3 of concrete)

MA 500/560

B500B

4.1.5.4 IV Various works Method of Measurement

Item 1 includes:

Purchase of material, construction, delivery and installation of a container - combined cabin no. 1 on a prepared RC pad. Container has minimal dimensions of 6,00x2,10m, min. ceiling height 2.60m, for accommodating MI and CA employees, all in line with the design.

The container structure is made of steel, covered in TI panels with mineral wool filling $U<0,30$. Roof cover is also a thermal insulation panel with a single pitch $U<0,15$. Founding of the object is on a foundation pad (calculated in concrete works). Cabin floor has thermal and hydro insulation, raised from the island level, finishing PVC floor cover.

The containers have aluminum carpentry: entrance door, sliding counter window and windows are glazed with safety glass (tempered or laminated).

Aside from the counter, all other windows have standard fittings, tilt and turn mechanism.

Provide energy requirements for new facilities, cabins, in accordance with the Regulations on energy efficiency of buildings and the Ordinance on the conditions, content and method of issuing certificates on the energy properties of buildings for building blocks of cabins, fewer than the largest allowed.

The container is equipped with (according to the electrical part of the project):

- electrical equipment
 - 7M (2 x shuko socket, 2xRJ45 cat 6, 1 x eypo socket) pcs 4
 - Switch pcs 2
 - Fluo lamp 2 x 36 W pcs 3
- equipment for heating, ventilation and cooling, according to the electrical and mechanical project

Calculation all completely mounted.

Note: Final color for panels, doors and windows is RAL 5009.

4.1.6 DISINFECTION BARRIER (OBJECT 9)

4.1.6.1 I Prefabricated disinfection barrie Method of Measurement

Item 1 includes:

Purchase, construction, delivery and installation of prefabricated disinfection barrier on state road category I A no. 4. Disinfection barrier is made of steel sheet d=10 mm, specially protected against corrosion by base and final coatings (twice) dimensions 6.00 x 3.00 m, with elevated edges in line with design details.

Disinfection barrier is equipped with disinfection mats and disinfection means.

Calculation per piece of completely installed disinfection barrier.

dim. 6.00 x 3.00 m

4.1.7 COMBINED CABIN no. 2. at the exit (MI and CA) (OBJECT 13)

4.1.7.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m²

Item 2 includes:

Combined excavation in a previously backfilled terrain for the foundation construction, all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to Ms = 10 - 15 Mpa.

Item 3 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the floor slab of the object and foundation beams, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density of Ms=30 Mpa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

- under the floor slab of the objects - combined cabin
- under the foundation beams

Item 4 includes:

Purchase, transport, backfilling and compacting of sand on a previously prepared base - level of terrain backfill in layers of 30 cm, under the floor slab of the object (replacement of the soil). Sand is compacted in layers up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is t=0.65 m.

4.1.7.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness t=5 cm under the foundation pad and foundation beams of the plateau for placing the combined cabin. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m².

Item 2 includes:

Purchase of material, transport and making of RC floor slab of the object, thickness t=15 cm, out of concrete CC30, in required formwork, all in line with Concrete design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Slab shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m³.

NOTE: prior to construction of the foundation slab, place PVC pipes for leading in the installations into the object, all in line with the design.

Item 3 includes:

Purchase of material, transport and construction of RC foundation beams, dimensions 25/105 cm, out of reinforced concrete CC 30 in required formwork. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m³.

4.1.7.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the floor pad of the plateau for placing the combined cabins and foundation beams all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m³ of concrete)

MA 500/560

B500B

4.1.7.4 V Various works Method of Measurement

Item 1 includes:

Purchase of material, construction, delivery and installation of a container - combined cabin on a prepared RC pad. Container has min. exterior dimensions of 3.50x1.35 m, min. ceiling height is 2.6 m, all in line with the design.

The container structure is made of steel, covered in TI panels with mineral wool filling, total thickness d=15 cm. Roof cover is also a thermal insulation panel with a single pitch, thickness d=15 cm. Founding of the object is on a foundation pad (calculated in concrete works). Cabin floor has thermal and hydro insulation, raised from the island level, finishing PVC floor cover.

The containers have aluminum carpentry: entrance door, sliding counter window and windows are glazed with safety glass (tempered or laminated). Pcs 2

Aside from the counter, all other windows have standard fittings, tilt and turn mechanism.

Provide energy requirements for new facilities, cabins, in accordance with the Regulations on energy efficiency of buildings and the Ordinance on the conditions, content and method of issuing certificates on the energy properties of buildings for building blocks of cabins, fewer than the largest allowed.

- electrical equipment
 - socket outlet, single pcs 1

- socket outlet, double pcs 2
- switch pcs 1
- Fluo-lamp 2 x 36 W pcs 2
- - equipment for heating, ventilation and cooling
- * E-convector 2 kW pcs 1

Calculation all completely mounted.

Note: Final color for panels, doors and windows is RAL 5009.

4.1.8 COMBINED CABIN no. 3. at the entrance (MI and CA) (OBJECT 14)

4.1.8.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m2

Item 2 includes:

Combined excavation in a previously backfilled terrain for the foundation construction all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to Ms = 10 - 15 Mpa.

Item 3 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the floor slab of the object and foundation beams, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density of Ms=30 Mpa. Include purchase, transport, spreading and compacting in price. Calculation per m3.

- under the floor slab of the objects - combined cabin
- under the foundation beams

Item 4 includes:

Purchase, transport, backfilling and compacting of sand on a previously prepared base in layers, below the floor slab of the building. The sand is charged in layers to the modulus of compaction Ms = 25 MPa. Cost includes procurement, transportation, clearing and piling. Calculation per m3.

Total thickness of the layer in a compact state t = 30 cm.

Item 4a includes:

Purchase, transport, backfilling and compacting of sand around the concrete foundations, up to the angle of the ground. The sand is charged in layers to the modulus of compaction Ms = 25 MPa. Cost includes procurement, transportation, clearing and piling. Calculation per m3.

4.1.8.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness $t=5$ cm under the foundation pad and foundation beams of the plateau for placing the combined cabin. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m^2 .

Item 2 includes:

Purchase of material, transport and making of RC floor slab of the object, thickness $t=15$ cm, out of concrete CC30, in required formwork, all in line with Concrete design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Slab shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m^3 .

NOTE: prior to construction of the foundation slab, place PVC pipes for leading in the installations into the object, all in line with the design.

Item 3 includes:

Purchase of material, transport and construction of RC foundation beams, dimensions 25/105 cm, out of reinforced concrete CC 30 in required formwork. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m^3 .

4.1.8.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the foundation pad, and foundation beams, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/ m^3 of concrete)

MA 500/560

B500B

4.1.8.4 IV Various works Method of Measurement

Item 1 includes:

Purchase of material, construction, delivery and installation of a container - combined cabin on a prepared RC pad. Container has min. external dimensions of 3.00x2.40 m, and min. ceiling height 2.6 m, all in line with the design.

The container structure is made of steel, covered in TI panels with mineral wool filling, total thickness $t=15$ cm. Roof cover is also a thermal insulation panel with a single pitch, thickness $t=15$ cm. Founding of the object is on a foundation pad (calculated in concrete works). Cabin floor has thermal and hydro insulation, raised from the island level, finishing PVC floor cover.

The containers have aluminum carpentry: entrance door, sliding counter window and windows are glazed with safety glass (tempered or laminated).

Aside from the counter, all other windows have standard fittings, tilt and turn mechanism.

Provide energy requirements for new facilities, cabins, in accordance with the Regulations on energy efficiency of buildings and the Ordinance on the conditions, content and method of issuing certificates on the energy properties of buildings for building blocks of cabins, fewer than the largest allowed.

The container is equipped with (according to the electrical part of the project):

- electrical equipment
 - socket outlet, single pcs 1
 - socket outlet, double pcs 2
 - switch pcs 1
 - Fluo-lamp 2 x 36 W pcs 2
- - equipment for heating, ventilation and cooling
 - * E-convector 2 kW pcs 1

Note: Final color for panels, doors and windows is RAL 5009.

Calculation all completely mounted.

4.1.9 CABIN no. 4. at the entrance from the truck terminal (MI) (OBJECT 15)

4.1.9.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m².

Item 2 includes:

Combined excavation in a previously backfilled terrain for a tampon layer below the foundation beams - foundation walls of the platform for placing the combined cabin, all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to $M_s = 10 - 15$ Mpa.

Item 3 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the floor slab of the platform and under the foundation walls, fraction 0-31.5 mm with compacting in layers from

20-30 cm up to achieving required density. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is d=30 cm, degree of compactability on the final layer Ms = 50 Mpa.

- under the floor slab
- (under the foundation beams)

Item 3/1 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the stairway, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is d=30 cm, degree of compactability on the final layer Ms = 50 Mpa.

Item 4 includes:

Purchase, transport, backfilling and compacting of sand on a previously prepared base - level of terrain backfill in layers of 30 cm, under the floor slab of the object (replacement of the soil). Sand is compacted in layers up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is d=1.25 m.

Item 5 includes:

Purchase, transport, backfilling and compacting of sand around the concreted object in layers of 30 cm, total width of sand layer cca 65 cm (30 cm lower than the level of the newly designed terrain around the object). Sand is compacted in layers up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Note: part around the object 1.20 m wide is designed for backfilling, while the remaining backfill is included in the traffic design.

4.1.9.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness d=5 cm under the RC foundation pad and foundation beams of the plateau for placing the combined cabin. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m².

- under the foundation beams
- under RC platform and stairway

Item 2 includes:

Purchase of material, transport and making of RC foundation beams of the platform object dim. 25/175 m, concrete CC30 in required formwork, all in line with Concrete design. Include purchase of

material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Foundation beams-walls shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m3.

Item 3 includes:

Purchase of material, transport and making of RC floor slab of the platform for combined cabin, thickness $d=20$ cm, out of concrete CC30, all in line with Concrete design. Slab shall be concreted over a layer of screed all in line with the design and static calculation.

NOTE: prior to construction of the foundation slab, place PVC pipes for leading in the installations into the object, all in line with the design.

Item 4 includes:

Purchase of material, transport and making of stairway for accessing the platform, stairway footing, crank pad, steps made of reinforced concrete CC30, all in line with the design, structural calculation and details. Include required formwork in the unit price. Remove the excess on joints, clean and flatten after removing the formwork.

Calculation all complete per m3 of installed concrete with formwork.

- stairway footing
- crank pad for the stairway
- steps

4.1.9.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the house foundation, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m3 of concrete)

MA 500/560

B500B

4.1.9.4 IV Metalworks Method of Measurement

Note: All fittings, locks, handles, handrails, ventilation grills are black.

Item 1 includes:

Purchase of materials, transport and construction of a fence out of steel profiles, 110 cm high. Horizontal and vertical separation by steel flat bar 40/4 mm, vertical supports and handrail out of steel box profiles 40/40/3 mm. Installation in line with detail.

Red lead coating and painting in RAL as Supervisor selects is included in price.

NOTE: contractor is obliged to give the construction details to Supervisor and investor for approval.

Calculation all complete per m1 of mounted fence.

- Stairway and landing fence

4.1.9.5 VI Various works Method of Measurement

Item 1 includes:

Purchase of material, construction, delivery and installation of a container - combined cabin on a prepared RC pad. Container has min. dimensions of 3.00x2.40 m, height 2.591m, all in line with the design.

The container structure is made of steel, covered in TI panels $U < 0.30$. Roof cover is also a thermal insulation panel with a single pitch, $U < 0.15$. Founding of the object is on a foundation pad (calculated in concrete works). Cabin floor has thermal and hydro insulation, raised from the island level, finishing PVC floor cover.

The containers have aluminum carpentry: entrance door, sliding counter window and windows are glazed with safety glass (tempered or laminated).

Aside from the counter, all other windows have standard fittings, tilt and turn mechanism.

The container is equipped with:

- electrical equipment
 - 7M (2 x shuko socket, 2xRJ45 cat 6, 1 x eyxo socket) pcs 4
 - Switch pcs 1
 - Fluo lamp 2 x 36 W pcs 2
- equipment for heating, ventilation and cooling

Calculation all completely mounted.

Note: Final color for panels, doors and windows is RAL 5009.

4.1.9.5.1 Item 3 includes:

Purchase, delivery and installation of mats in front of the entrance into the object.
Calculation per piece, mat dimensions 120/80 cm.

4.1.10 CABIN no. 5. at the entrance into the truck terminal (MI and CA) (OBJECT 16)

4.1.10.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m².

Item 2 includes:

Combined excavation in a previously backfilled terrain for the foundation construction – platform for placing the combined cabin, all in line with the design and given levels, mechanical excavation 80%, manual excavation 20%. Include excavation, soil trimming, ejection from the pit in price. Load excavated soil into a transport vehicle and unload it on a temporary landfill within the construction site, it shall be used for backfilling around concreted foundations and backfilling to the designed terrain level. Calculation all per m³.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to Ms = 10 - 15 Mpa.

Item 3 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the floor slab of the platform and under the foundation walls, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is d=30 cm, degree of compactability on the final layer Ms = 50 Mpa.

- under the floor slab
- (under the foundation beams)

Item 3/1 includes:

Purchase, transport, backfilling and compacting of crushed stone aggregate layer under the stairway, fraction 0-31.5 mm with compacting in layers from 20-30 cm up to achieving required density. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is d=30 cm, degree of compactability on the final layer Ms = 50 Mpa.

Item 4 includes:

Purchase, transport, backfilling and compacting of sand on a previously prepared base - level of terrain backfill in layers of 30 cm, under the floor slab of the object (replacement of the soil). Sand is compacted in layers up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Total thickness of compacted layer is d=1.25 m.

Item 5 includes:

Purchase, transport, backfilling and compacting of sand around the concreted object in layers of 30 cm, total width of sand layer cca 65 cm (30 cm lower than the level of the newly designed terrain around the object). Sand is compacted in layers up to degree of compactability $M_s = 25$ MPa. Include purchase, transport, spreading and compacting in price. Calculation per m³.

Note: part around the object 1.20 m wide is designed for backfilling, while the remaining backfill is included in the landscaping design.

4.1.10.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness $d=5$ cm under the RC foundation pad and foundation beams of the plateau for placing the combined cabin. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m².

- under the foundation beams
- under RC platform and stairway

Item 2 includes:

Purchase of material, transport and making of RC foundation beams of the platform object dim. 25/175 m, concrete CC30 in required formwork, all in line with Concrete design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price (reinforcement is calculated in reinforcement works position). Foundation beams-walls shall be concreted over a layer of screed all in line with the design and static calculation. Calculation per m³.

Item 3 includes:

Purchase of material, transport and making of RC floor slab of the platform for combined cabin, thickness $d=20$ cm, out of concrete CC30, all in line with Concrete design. Slab shall be concreted over a layer of screed all in line with the design and static calculation.

NOTE: prior to construction of the foundation slab, place PVC pipes for leading in the installations into the object, all in line with the design.

Item 4 includes:

Purchase of material, transport and making of stairway for accessing the platform, stairway footing, crank pad, steps made of reinforced concrete CC30, all in line with the design, structural calculation and details. Include required formwork in the unit price. Remove the excess on joints, clean and flatten after removing the formwork.

Calculation all complete per m³ of installed concrete with formwork.

- stairway footing
- crank pad for the stairway
- steps

4.1.10.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the house foundation, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m³ of concrete)

MA 500/560

B500B

4.1.10.4 IV Metalworks Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of a fence out of steel profiles, 110 cm high. Horizontal and vertical separation by steel flat bar 40/4 mm, vertical supports and handrail out of steel box profiles 40/40/3 mm. Installation in line with detail.

Red lead coating and painting in RAL as Supervisor selects is included in price.

NOTE: contractor is obliged to give the construction details to Supervisor and investor for approval.

Calculation all complete per m¹ of mounted fence.

Stairway and landing fence

4.1.10.5 VI Various works Method of Measurement

Item 1 includes:

Purchase of material, construction, delivery and installation of a container - combined cabin on a prepared RC pad. Container has min. dimensions of 3.00x2.40 m, min.height 2.6 m, all in line with the design.

The container structure is made of steel, covered in TI panels $U < 0.30$. Roof cover is also a thermal insulation panel with a single pitch, $U < 0.15$. Founding of the object is on a foundation pad (calculated in concrete works). Cabin floor has thermal and hydro insulation, raised from the island level, finishing PVC floor cover.

The containers have aluminum carpentry: entrance door, sliding counter window and windows are glazed with safety glass (tempered or laminated).

Aside from the counter, all other windows have standard fittings, tilt and turn mechanism.

The container is equipped with:

- electrical equipment

- 7M (2 x shuko socket, 2xRJ45 cat 6, 1 x eypo socket) pcs 4
- Switch pcs 1
- Fluo lamp 2 x 36 W pcs 2
- equipment for heating, ventilation and cooling, according to the electrical and mechanical project

Calculation all completely mounted.

Note: Final color for panels, doors and windows is RAL 5009.

Item 3 includes:

Purchase, delivery and installation of mats in front of the entrance into the object. Calculation per piece, mat dimensions 120/80 cm.

4.1.11 WATER METER SHAFT (OBJECT 24a)

4.1.11.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m2.

Item 2 includes:

Combined excavation of II category soil for foundation pit of the object, all in line with the design and given levels, mechanical excavation 70%, manual 30%. Include excavation, soil trimming, ejection from the pit in price. Load the excavated soil into a transport vehicle and unload it to a temporary landfill within the construction site. Calculation all per m3.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to $M_s = 10 - 15$ Mpa.

Item 3 includes:

Purchase, transport, backfilling and compacting of a layer of broken stone aggregate, fraction 0-31,5 mm, under the foundation structure, total thickness of the layer $d=35$ cm. Compacting by vibration up to degree of compactability of 30 Mpa. Include purchase, transport, spreading and compacting in price. Calculation, all per m3.

Item 4 includes:

Purchase, transport, backfilling and compacting of sand around the concreted object in layers of 30 cm, total width of sand layer cca 180 cm (30 cm lower than the level of the newly designed terrain around the object). Sand is compacted in layers up to degree of compactability $M_s = 25$ MPa. Include purchase, transport, spreading and compacting in price. Calculation per m3.

Item 5 includes:

Loading of excavated soil into a vehicle, transport, unloading on a landfill or a place designated by the Investor, up to 10 km away. Calculation per m3.

4.1.11.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness $d=2*5$ cm under the floor pad of the object - water meter shaft. The second layer serves as protection for installed hydro insulation. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m2.

Item 2 includes:

Purchase of materials, transport and production of the foundation pad of the water meter object, thickness $d = 20\text{cm}$, out of the waterproof reinforced concrete CC30, maximum water penetration into concrete of 30mm, in all according to the concrete design, with the correct vibration of the installed concrete in the required formwork, with fine surface processing of the upper surface of the pad.

Include purchase of materials, making, transport, installation and curing, required formwork and processing of working joints. Concrete the pad over a layer of screed all in line with static calculation and details from the structural design.

Calculation per m2.

Note: when concreting, i.e. for breaks in concrete, a waterstop is installed (Sika-Waterbars) or appropriate. Waterstops are installed in the joint between pad-wall, laid perpendicularly on the concreting break, so one half of the waterstop is included in first part and the second half transits into the further concrete. Installation per manufacturer's instructions. Installation price for waterstop is included in insulation works position.

Item 3 includes:

Purchase of material, transport and construction of walls for the water meter shaft object, out of waterproof reinforced concrete CC30, thickness $d=20$ cm, maximum water penetration into the concrete 30 mm, in double sided formwork.

Connection between walls and foundation pad shall be done in line with structural design, harmonize penetrations in the walls according to other parts of the design (ViK):

Include purchase of materials, making, transport, installation and curing, required formwork and scaffold, and processing of working joints i.e. concreting breaks. Calculation per m3.

Note no. 1: At points of extension when concreting, i.e. for breaks in concrete, and joints between walls, a waterstop is installed (Sika-Waterbars) or appropriate. Installation price for waterstop is included in insulation works position.

Note no. 2: during concreting of walls, it is necessary to leave openings for installations, all in line with supplied drawings (formwork plan with static position plan) and Supervisor's instructions.

Item 4 includes:

Purchase of materials, transport and production of the upper pad of the water meter object, thickness $d = 20\text{cm}$, out of the waterproof reinforced concrete CC30, maximum water penetration into concrete of 30mm, in all according to the concrete design, with the correct vibration of the

installed concrete in the required formwork, with fine surface processing of the upper surface of the pad.

Construct an entrance into the object while making the top pad. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork, and 1.6 m high supports in the price. Calculation per m³.

Note: it is necessary to leave an opening during concreting the top pad, all in line with supplied drawings, dim. 80/80 cm, (formwork plan with static position plan) and Supervisor's instructions.

Item 5 includes:

Purchase of material, transport and making of screed CC15, average thickness d=6 cm, above the top RC pad of the tank, the layer is made with a slope and serves as protection of hydro insulation. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price.

Calculation per m².

4.1.11.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the foundation pad, object walls, top pad, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m³ of concrete)

MA 500/560

B500B

4.1.11.4 IV Insulation works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of hydro-insulation for the reinforced concrete slab of the water meter shaft (floor slab), by placing the SIKA waterproofing membrane or equivalent over the first layer of the concrete base, the hydro insulation is also protected by a layer of concrete, included in the position of the concrete works.

Calculation per m² of completely constructed hydro-insulation

Item 2 includes:

Purchase of material, transport and making of hydro insulation for reinforced concrete slab at level +0.00 of water meter shaft, by placing SIKA plan waterproofing membrane or equivalent, over the top slab of the object.

Calculation per m² of completely constructed hydro-insulation

Item 3 includes:

Purchase of materials, transport and construction of external hydro insulation of water meter shaft reinforced concrete walls, by placing waterproofing membrane type SIKAPLAN or equivalent, over previously prepared walls, all in line with manufacturer's instructions. Include purchase of materials, transport, placing by the walls with proper final batten and quality putty.

Calculation per m² of completely constructed hydro-insulation

Item 4 includes:

Purchase of materials, transport and installation of protection for hydro insulation of tank walls and chamber lock, out of dimpled sheet layer, installed in line with manufacturer's instructions, calculation per m²

Item 5 includes:

Purchase, transport and installation i.e. processing of concreting joints at points of extensions or breaks in concreting at contact slab-wall, wall-wall and at designed breaks. Waterstops (Sika Waterbars types AP or V or appropriate) are placed on break points and joints.

Waterstops are installed perpendicularly on the concreting break, so one half of the waterstop is included in first part and the second half transits into the further concrete. Installation entirely in line with manufacturer's instructions.

Designed waterstop widths 25/19 mm

Calculation, all per m¹.

4.1.11.5 V Metalworks Method of Measurement

Note: All fittings, locks, handles, handrails, ventilation grills are black.

Item 1 includes:

Purchase, making, transport and installation of metal cover for going down into the water meter shaft object (standard cast iron cover), installation by anchoring into a concrete pad. Cover framework is made of steel L profile 50/50/4 mm, framework leaf is made of steel profiles with a steel sheet cover 5 mm thick. The cover is equipped with hinges, handle and lock for locking, all in line with details and metal works diagram.

Final processing is painting twice with base and finishing color.

Calculation per installed piece.

- cover dimensions 80/80 cm

Item 2 includes:

Purchase, construction, transport and installation of standard cast iron ladders, installed in the water meter shaft object, all in line with details and metal works diagram, final processing - hot dip galvanizing. Calculation all complete per piece of made and installed ladders.

- ladders [350x230x16 mm

4.1.11.6 VI Various works Method of Measurement

Item 1 includes:

Test filling of the object with clean water for checking the water tightness of the structure, in line with applicable regulations. In case of failed test, the contractor bears the repair costs and tests it again. Calculate all required works and material with draining the object in unit price.

Calculated as flat rate

Item 2 includes:

Purchase and installation of benchmarks on the object for monitoring possible subsidence. Calculation per piece of installed benchmark.

For calculation: since the object is buried, it is necessary to install the benchmarks on the foundation slab - 2 pcs and 2 pcs on the to slab as well.

Calculation, all per piece.

4.1.12 CHAMBER FOR PUMP/WATER TANK (OBJECT 24b & 24v)

4.1.12.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m2.

Item 2 includes:

Mechanical excavation of II category soil for the foundation pit of the water tank and chamber for pumps, with deposition of soil to temporary landfills next to the excavation pit, by casting aside or carried away in a wheelbarrow, up to 10 m away. Include excavation, soil trimming of slopes, discharge from the pit and removal to a temporary landfill. Calculation per m³

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to Ms = 10 - 15 Mpa.

Item 2/1 includes:

Manual excavation of soil in the shaft, within the floor slab of the water tank, include excavation, ejection of soil from the pit and removal to a temporary landfill. Calculation, all per m3 of excavated soil.

Item 3 includes:

Purchase, transport, backfilling and compacting of a layer of broken stone aggregate, fraction 0-31,5 mm, under the foundation structure, total thickness of the layer d=35 cm. Compacting by vibration up to degree of compactability of 30 Mpa. Include purchase, transport, spreading and compacting in price. Calculation, all per m3.

Item 4 includes:

Purchase, transport, backfilling and compacting of sand around the concreted object in layers of 30 cm, total width of sand layer cca 190 cm (30 cm lower than the level of the newly designed terrain around the object). Sand is compacted in layers up to degree of compactability Ms = 25 MPa. Include purchase, transport, spreading and compacting in price. Calculation per m3.

Item 5 includes:

Construction of a backfill out of excavated soil, around the tank with spreading, planning and compacting up to natural soil degree of density. Backfill in a slope 1:1, calculation per m3.

Item 6 includes:

Loading of excavated soil into a vehicle, transport, unloading on a landfill or a place designated by the Investor, up to 10 km away. Calculation per m3.

4.1.12.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness $d=2*5$ cm under the floor pad of the object - tank and chamber for shafts. The second layer serves as protection for installed hydro insulation.

Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price.

Calculation per m2.

Item 2 includes:

Purchase of materials, transport and production of the foundation pad of the water tank and chamber for pumps, thickness $d = 35\text{cm}$ (chamber pad thickness $d=30$ cm), out of the waterproof reinforced concrete CC30, maximum water penetration into concrete of 30mm, in all according to the concrete design, with the correct vibration of the installed concrete in the required formwork, with fine surface processing of the upper surface of the pad.

Construct a deleveling within the slab, light size 100x100 depth 55 cm, all in line with the design. Include purchase of materials, making, transport, installation and curing, required formwork and processing of working joints.

Concrete the pad over a layer of screed all in line with static calculation and details from the structural design.

Calculation per m2.

Note: when concreting, i.e. for breaks in concrete, a waterstop is installed (Sika-Waterbars) or appropriate. Waterstops are installed in the joint between pad-wall, laid perpendicularly on the concreting break, so one half of the waterstop is included in first part and the second half transits into the further concrete.

Installation per manufacturer's instructions. Installation price for waterstop is included in insulation works position.

Item 3 includes:

Purchase of material, transport and construction of walls of the water tank and chamber for pumps, out of waterproof concrete CC30, thickness $d=30$ cm (chamber lock wall thickness $d=25$ cm), max. water penetration in concrete 30 mm, in double formwork.

Connection between walls and foundation pad shall be done in line with structural design, harmonize penetrations in the walls according to other parts of the design (ViK):

Include purchase of materials, making, transport, installation and curing, required formwork and scaffold, and processing of working joints i.e. concreting breaks.

Calculation per m3.

- external walls of the tank
- partitions within the tank (baffles)
- walls of the chamber for pumps

Note no. 1: At points of extension when concreting, i.e. for breaks in concrete, and joints between walls, a waterstop is installed (Sika-Waterbars) or appropriate. Installation price for waterstop is included in insulation works position.

Note no. 2: during concreting of walls, it is necessary to leave openings for installations, all in line with supplied drawings (formwork plan with static position plan) and Supervisor's instructions.

Item 5 includes:

Purchase of materials, transport and production of the upper pad of the water tank and chamber for pumps, thickness $d = 25\text{cm}$, out of the waterproof reinforced concrete CC30 (thickness of the top slab of chamber lock $d=20\text{cm}$), maximum water penetration into concrete of 30mm, in all according to the concrete design, with the correct vibration of the installed concrete in the required formwork, with fine surface processing of the upper surface of the pad.

Construct an entrance into the object while making the top pad.

Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork, and up to 4m high supports in the price.

Calculation per m3 .

Note: it is necessary to leave an openings during concreting the top pad, all in line with supplied drawings, dim. 80/80 cm, (formwork plan with static position plan) and Supervisor's instructions.

- top slab of the tank with RC walls for entering the object:
- top slab of the chamber for pumps:

Item 6 includes:

Purchase of material, transport and making of screed CC15, average thickness $d=6\text{ cm}$, above the top RC pad of the tank, the layer is made with a slope and serves as protection of hydro insulation. Level out the upper surface and cure the concrete.

Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price.

Calculation per m2 .

4.1.12.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the foundation pad, object walls, top pad and support walls, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/m³ of concrete)

MA 500/560

B500B

4.1.12.4 IV Insulation works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of hydro-insulation for the reinforced concrete slab of the water tank (floor slab and top slab) and chamber for pumps (floor slab and top slab), by placing the SIKA waterproofing membrane or equivalent over the first layer of the concrete base, the hydro insulation is also protected by a layer of concrete, included in the position of the concrete works.

Calculation per m² of completely constructed hydro-insulation

Item 1/1 includes:

Purchase of materials, transport and construction of external hydro insulation of reinforced concrete walls of the water tank and chamber for pumps, by placing waterproofing membrane type SIKA plan or equivalent, over previously prepared walls, all in line with manufacturer's instructions. Include purchase of materials, transport, placing by the walls with proper final batten and quality putty.

Calculation per m² of completely constructed hydro-insulation

Item 2 includes:

Purchase of materials, transport and installation of protection for hydro insulation of tank walls and chamber for pumps, out of dimpled sheet layer, installed in line with manufacturer's instructions, calculation per m²

Item 3 includes:

Purchase of material, transport and coating the internal side of the walls, bottom and top slab of the water tank, with two layers of hydro-insulation coating that holds a certificate for potable water. Preparation of the base and installation per instructions and technology by material manufacturer.

Calculation per m² of entirely installed hydro-insulation.

Item 4 includes:

Purchase, transport and installation i.e. processing of concreting joints at points of extensions or breaks in concreting at contact slab-wall, wall-wall and at designed breaks. Waterstops (Sika Waterbars types AP or V or appropriate) are placed on break points and joints.

Waterstops are installed perpendicularly on the concreting break, so one half of the waterstop is included in first part and the second half transits into the further concrete. Installation entirely in line with manufacturer's instructions.

Designed waterstop widths 25/19 mm

Calculation, all per m1.

4.1.12.5 V Metalworks Method of Measurement

Note: All fittings, locks, handles, handrails, ventilation grills are black.

Item 1 includes:

Purchase, making, transport and installation of metal cover for going down into the water tank and chamber for pumps (standard cast iron cover), installation by anchoring into a concrete pad. Cover framework is made of steel L profile 50/50/4 mm, framework leaf is made of steel profiles with a steel sheet cover 5 mm thick. The cover is equipped with hinges, handle and lock for locking, all in line with details and metal works diagram.

Final processing is painting twice with base and finishing color.

Calculation per installed piece.

- cover dimensions 80/80 cm

Item 2 includes:

Purchase, construction, transport and installation of ladders, made of prochrome steel tubes, mounted on internal side of the water tank, for going down into the tank for maintenance of the equipment and similar, all in line with details and metalworks diagram. Calculation all complete per piece of made and installed ladders.

- ladders, height 4.20 m / cage height 2.20 m

Item 3 includes:

Purchase, construction, transport and installation of standard cast iron ladders, installed in the chamber lock, all in line with details and metal works diagram, final processing - hot dip galvanizing. Calculation all complete per piece of made and installed ladders.

- ladders [350x230x16 mm]

4.1.12.6 VI Various works Method of Measurement

Item 1 includes:

Test filling of the object with clean water for checking the water tightness of the structure, in line with applicable regulations. In case of failed test, the contractor bears the repair costs and tests it again. Calculate all required works and material with draining the object in unit price.

Calculated as flat rate

Item 2 includes:

Final washing and cleaning of water tank with disinfection.

Calculated as flat rate

Item 3 includes:

Purchase and installation of benchmarks on the object for monitoring possible subsidence. Calculation per piece of installed benchmark.

For calculation: since the object is buried, it is necessary to install the benchmarks on the foundation slab - 4 pcs and 4 pcs on the to slab as well.

Calculation, all per piece.

4.1.13 WELL CHAMBER (OBJECT 24g)

4.1.13.1 I Ground works Method of Measurement

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m2.

Item 2 includes:

Combined excavation of II category soil for foundation pit of the object, all in line with the design and given levels, mechanical excavation 70%, manual 30%. Include excavation, soil trimming, ejection from the pit in price. Load the excavated soil into a transport vehicle and unload it to a temporary landfill within the construction site. Calculation all per m3.

Include in unit price planning and compacting of subsoil of foundation pits for the objects by vibration up to $M_s = 10 - 15$ Mpa.

NOTE: excavation is done around the well, but the well and works related to it are a part of a separate design.

Item 3 includes:

Purchase, transport, backfilling and compacting of a layer of broken stone aggregate, fraction 0-31,5 mm, under the foundation structure, total thickness of the layer $d=35$ cm. Compacting by vibration up to degree of compactability of 30 Mpa. Include purchase, transport, spreading and compacting in price. Calculation, all per m3.

Item 4 includes:

Purchase, transport, backfilling and compacting of sand around the concreted object in layers of 30 cm, total width of sand layer cca 180 cm (30 cm lower than the level of the newly designed terrain around the object). Sand is compacted in layers up to degree of compactability $M_s = 25$ MPa. Include purchase, transport, spreading and compacting in price. Calculation per m3.

Item 5 includes:

Loading of excavated soil into a vehicle, transport, unloading on a landfill or a place designated by the Investor, up to 10 km away.

Calculation per m³.

4.1.13.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of screed base out of CC15, thickness d=2*5 cm under the floor pad of the object - well chamber. The second layer serves as protection for installed hydro insulation. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price. Calculation per m².

Item 2 includes:

Purchase of materials, transport and production of the foundation pad of the well chamber object, thickness d = 20cm, out of the waterproof reinforced concrete CC30, maximum water penetration into concrete of 30mm, in all according to the concrete design, with the correct vibration of the installed concrete in the required formwork, with fine surface processing of the upper surface of the pad.

Include purchase of materials, making, transport, installation and curing, required formwork and processing of working joints. Concrete the pad over a layer of screed all in line with static calculation and details from the structural design.

Calculation per m².

Note: when concreting, i.e. for breaks in concrete, a waterstop is installed (Sika-Waterbars) or appropriate. Waterstops are installed in the joint between pad-wall, laid perpendicularly on the concreting break, so one half of the waterstop is included in first part and the second half transits into the further concrete.

Installation per manufacturer's instructions. Installation price for waterstop is included in insulation works position.

Item 3 includes:

Purchase of material, transport and construction of walls for the well chamber object, out of waterproof reinforced concrete CC30, thickness d=20 cm, maximum water penetration into the concrete 30 mm, in double sided formwork. Connection between walls and foundation pad shall be done in line with structural design, harmonize penetrations in the walls according to other parts of the design (ViK): Include purchase of materials, making, transport, installation and curing, required formwork and scaffold, and processing of working joints i.e. concreting breaks. Calculation per m³.

Note no. 1: At points of extension when concreting, i.e. for breaks in concrete, and joints between walls, a waterstop is installed (Sika-Waterbars) or appropriate. Installation price for waterstop is included in insulation works position.

Note no. 2: during concreting of walls, it is necessary to leave openings for installations, all in line with supplied drawings (formwork plan with static position plan) and Supervisor's instructions.

Item 4 includes:

Purchase of materials, transport and production of the upper pad of the well chamber, thickness $d = 20\text{cm}$, out of the waterproof reinforced concrete CC30, maximum water penetration into concrete of 30mm, in all according to the concrete design, with the correct vibration of the installed concrete in the required formwork, with fine surface processing of the upper surface of the pad.

Construct an entrance into the object while making the top pad. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork, and 1.5m high supports in the price.

Calculation per m^3 .

Note: it is necessary to leave an openings during concreting the top pad, all in line with supplied drawings - square opening dim. 80/80 cm, (formwork plan with static position plan) and Supervisor's instructions.

Item 5 includes:

Purchase of material, transport and making of screed CC15, average thickness $d=6\text{ cm}$, above the top RC pad of the tank, the layer is made with a slope and serves as protection of hydro insulation. Level out the upper surface and cure the concrete. Include purchase of material, transport, mixing of concrete, spreading, leveling out and curing of concrete in the price.

Calculation per m^2 .

4.1.13.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the foundation pad, object walls, top pad, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/ m^3 of concrete)

MA 500/560

B500B

4.1.13.4 IV Insulation works Method of Measurement

Item 1 includes:

Purchase of materials, transport and construction of hydro-insulation for the reinforced concrete slab of the well chamber (floor slab), by placing the SIKA waterproofing membrane or equivalent

over the first layer of the concrete base, the hydro insulation is also protected by a layer of concrete, included in the position of the concrete works.

Calculation per m² of completely constructed hydro-insulation

Item 2 includes:

Purchase of material, transport and making of hydro insulation for reinforced concrete slab at level +0.00 of well chamber, by placing SIKa plan waterproofing membrane or equivalent, over the top slab of the object.

Calculation per m² of completely constructed hydro-insulation

Item 3 includes:

Purchase of materials, transport and construction of external hydro insulation of well chamber reinforced concrete walls, by placing waterproofing membrane type SIKa plan or equivalent, over previously prepared walls, all in line with manufacturer's instructions. Include purchase of materials, transport, placing by the walls with proper final batten and quality putty.

Calculation per m² of completely constructed hydro-insulation

Item 4 includes:

Purchase of materials, transport and installation of protection for hydro insulation of well chamber walls, out of dimpled sheet layer, installed in line with manufacturer's instructions, calculation per m²

Item 5 includes:

Purchase, transport and installation i.e. processing of concreting joints at points of extensions or breaks in concreting at contact slab-wall, wall-wall and at designed breaks. Waterstops (Sika Waterbars types AP or V or appropriate) are place on break points and joints.

Waterstops are installed perpendicularly on the concreting break, so one half of the waterstop is included in first part and the second half transits into the further concrete. Installation entirely in line with manufacturer's instructions.

Designed waterstop widths 25/19 mm

Calculation, all per m¹.

4.1.13.5 V Metalworks Method of Measurement

Note: All fittings, locks, handles, handrails, ventilation grills are black.

Item 1 includes:

Purchase, making, transport and installation of metal cover for going down into the well house object (standard cast iron cover), installation by anchoring into a concrete pad. Cover framework is made of steel L profile 50/50/4 mm, framework leaf is made of steel profiles with a steel sheet cover 5 mm thick. The cover is equipped with hinges, handle and lock for locking, all in line with details and metal works diagram.

Final processing is painting twice with base and finishing color.

Calculation per installed piece.

- cover dimensions 80/80 cm

Item 2 includes:

Purchase, construction, transport and installation of standard cast iron ladders, installed in the object, all in line with details and metal works diagram, final processing - hot dip galvanizing. Calculation all complete per piece of made and installed ladders.

- ladders [350x230x16 mm

4.1.13.6 VI Various works Method of Measurement

Item 1 includes:

Test filling of the object with clean water for checking the water tightness of the structure, in line with applicable regulations. In case of failed test, the contractor bears the repair costs and tests it again. Calculate all required works and material with draining the object in unit price.

Calculated as flat rate

Item 2 includes:

Purchase and installation of benchmarks on the object for monitoring possible subsidence. Calculation per piece of installed benchmark.

For calculation: since the object is buried, it is necessary to install the benchmarks on the foundation slab - 2 pcs and 2 pcs on the to slab as well.

Calculation, all per piece.

4.1.14 RETAINING STRUCTURE WITH A FENCE (OBJECT 25)

4.1.14.1 I Ground works Method of Measurement

RETAINING WALL

Item 1 includes:

Marking of the object and installation of corner profiles. Calculation per m1.

retaining wall

Item 2 includes:

Mechanical excavation of soil for foundations of retaining walls, with deposition of soil to a temporary landfill next to the excavation pit for later backfilling around the concreted foundations, all in line with the design and given levels.

Include in price excavation, soil trimming, ejection from the pit and deposition to a temporary landfill. Calculation per m3.

Item 3 includes:

Planning, leveling and compacting of subsoil of the foundation pit upon completed excavation, by vibration machines, up to degree of compactability of $M_s=10-15\text{MPa}$. Calculation per m^2 .

Item 4 includes:

Purchase, transport, backfill and compacting of sand in layers, maximum 30 cm, around the concreted retaining wall object, on the front side for restoring the level of the existing terrain. Traffic design includes and calculates backfilling of the terrain for achieving the designed level. Sand is compacted in layers up to degree of compactability $M_s = 25 \text{ MPa}$, everywhere. Include purchase, transport, spreading and compacting in price.

Calculation per m3.

Item 5 includes:

Purchase, transport, backfilling and compacting of a tampon layer made of natural gravel mixture, under the foundation beam, total thickness of the layer $d=20 \text{ cm}$. Include purchase of material, transport, spreading and compacting in price. Calculation, all per m3.

Item 6 includes:

Backfilling and compacting of excavated soil up to the level of the existing terrain, in layers of max. 30 cm, around the concreted retaining wall object, on the back side for restoring the level of the existing terrain. Compacting by vibration machines up to degree of compactability of natural soil. Include spreading and compacting in layers in price. Calculation per m3.

Item 7 includes:

Loading of excavated soil into a vehicle, transport, unloading on a landfill or a place designated by the Investor, up to 10 km away. Calculation per m3.

FENCE AROUND THE COMPLEX

Item 8 includes:

Marking of the object and installation of corner profiles. Calculation per m1.

- fence in the extension of the retaining wall
- fence next to the railroad

Item 9 includes:

Mechanical excavation of II category soil with a layer of humus for foundations of the fence, with deposition of soil to a temporary landfill next to the excavation pit for later backfilling around the concreted foundations, all in line with the design and given levels. Include in price excavation, soil trimming, ejection from the pit and deposition to a temporary landfill. Calculation per m3 including leveling and planning of the bottom of the foundation pit.

Item 10 includes:

Purchase, transport, backfilling and compacting of a tampon layer made of natural gravel mixture, under the foundation beam, total thickness of the layer d=20 cm. Include purchase of material, transport, spreading and compacting in price. Calculation, all per m3.

Item 11 includes:

Backfilling and compacting of soil from excavation around the concreted foundation beams up to the level of the existing terrain, in layer of max. 30 cm. Compacting by vibration machines up to degree of compactability of natural soil. Include spreading and compacting in layers in price. Calculation per m3.

Item 12 includes:

Loading of excavated soil into a vehicle, transport, unloading on a landfill or a place designated by the Investor, up to 10 km away. Calculation per m3.

FENCES IN THE INTERNAL PART OF THE COMPLEX

Item 13 includes:

Marking of the object and installation of corner profiles. Calculation per m1.

- fence around objects 11;10
- fence around objects 16; 23; 12; 6
- fence at objects 6; 8a; 5; 7; 8б; 8; до 16a.
- fence at objects 17; 24a-д.

Item 14 includes:

Combined excavation of backfilled material (sand) for foundation beam of the fence with removal to temporary landfills next to the pit, for later backfilling around concreted foundations all in line with the design and given levels. Include in price excavation, soil trimming, ejection from the pit and deposition to a temporary landfill. Calculation per m3 including leveling and planning of the bottom of the foundation pit.

Item 15 includes:

Purchase, transport, backfilling and compacting of a tampon layer made of natural gravel mixture, under the foundation beam, total thickness of the layer $d=20$ cm. Include purchase of material, transport, spreading and compacting in price. Calculation, all per m^3 .

Item 16 includes:

Backfilling and compacting of sand from excavation around the concreted foundation beams up to the level of the existing terrain, in layer of max. 30 cm. Compacting by vibration machines up to degree of compactability of natural soil. Include spreading and compacting in layers in price. Calculation per m^3 .

Item 17 includes:

Loading of excavated soil into a vehicle, transport and spreading of material within the site or transport to a place designated by the Investor, up to 10 km away.

Calculation per m^3 .

4.1.14.2 II Concrete and reinforced concrete works Method of Measurement

Item 1 includes:

Construction of tampon out of non-reinforced concrete CC15 $d=5$ cm under the foundation footing of the retaining wall and fence around the complex. Include purchase of material, transport, mixing of concrete and spreading. Calculation per m^2 .

- retaining wall
- fence around the complex
- fence in the internal part complex

Item 2 includes:

Construction of foundation footing for the retaining wall, thickness $d=45$ cm, out of reinforced concrete CC30 in required formwork, all in line with design and details in structural design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m^3 .

Note: design breaks in concrete (dilatations in the structure) at each 10-15 m all in line with design details, which should be included in unit price.

Item 3 includes:

Construction of retaining wall, thickness $d=50-40$ cm and various height, out of reinforced concrete CC30 in required double formwork. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m^3 .

Note: design breaks in concrete (dilatations in the structure) at each 10-15 m all in line with design details, which should be included in unit price.

- retaining wall:

section 1-1

section 3-3

section 4-4

Item 4 includes:

Construction of upper slab for the retaining wall, width 67 cm, thickness $d=10\text{cm}$, out of reinforced concrete CC30 in required formwork, all in line with design and details in structural design. Include purchase of material, transport, mixing, installation and curing of concrete as well as necessary formwork in the price. Calculation per m^3 .

Note: design breaks in concrete (dilatations in the structure) at each 10-15 m all in line with design details, which should be included in unit price.

Item 5 includes:

Construction of foundation beam of the fence, dimensions 25/105cm, out of reinforced concrete CC25 in required formwork, on a previously prepared base, all in line with static calculation and details from the structural design. Include in unit price purchase of material, transport, mixing, installation and curing of concrete, as well as construction, assembly and disassembly, and cleaning or required double formwork. Calculation per m^3 .

Note: design breaks in concrete (dilatations in the structure) at each 10-15 m all in line with design details, which should be included in unit price.

- fence around the complex
- fence in the internal part complex

4.1.14.3 III Reinforcement works Method of Measurement

Item 1 includes:

Purchase, transport, straightening, cutting, bending, binding and installation of reinforcement of all profiles and complexity with all auxiliary materials. Reinforcement of the foundation footings, retaining walls and foundation beams of the fence, all in line with the structural design, static calculation and reinforcement details. Price includes all smooth, ribbed and mesh reinforcement of small and large cross-sections. Calculation per kg of installed reinforcement.

Amounts were given based on estimations, final calculation shall be done based on really installed reinforcement.

(calculation 130 kg/ m^3 of concrete)

MA 500/560

B500B

4.2 TRAFFIC

4.2.1 General requirements road works

4.2.1.1 Preliminary works

4.2.1.1.1 *Cutting and marking of road and objects*

Prior to the commencement of works, the Contractor is obliged to perform the necessary marking of the axes of the roads, intersections and facilities. Marking should be done on the basis of a marking plan from the project. When performing works, ensure and maintain polygon points, repairs and permanent points. If the project does not provide data on polygonal points and repercussions, it should be obtained, or to impound, and the price will be calculated in this position.

The calculation of the performed works is carried out according to the **m'** of the marked route.

4.2.1.1.2 *Maintenance of traffic for time of execution of works*

If it is necessary to regulate public transport during the execution of works, it is necessary to create a work signal plan, for which the approval of the competent authorities should be obtained. Set the signaling according to the plan.

Calculation of works is done on the basis of all costs of installation, assembly and disassembly of signs and maintenance during the execution of works. The price includes 10% of the value of the purchase of signs.

4.2.1.1.3 *Demolition of existing pavement*

Existing roadways of all types, which according to the project should be removed, demolish with the machine along with the underlayer, which is the average thickness $d = 25 - 35$ cm, of different compositions. The material obtained by demolishing the existing carriageway, to be loaded into a transport vehicle, shall be transported to a landfill designated by the Supervising Authority, unloaded and planned, or preferably used for the construction of the embankment.

The calculation of performed works is done per **m²** of ruined pavement for all work, material and transport, and according to the above description.

4.2.1.1.4 *Demolition of existing curbs*

Existing curbs, regardless of the type, which according to the project should be removed, are demolished manually together with a concrete base under the curb. Clean the crushed curbs from concrete and plaster, load it into the vehicle, transport it to the landfill, unload and settle in the correct figures. Waste created after the rupture of the curb should also be loaded into the vehicle and transported to a landfill whose location will be determined by the Supervisor, disposed of and planned at the landfill. If the ruined curbs can be reused, they should be deposited in the place of new installation.

The calculation of the performed works is done by the **m'** removed curb, for all work, material and transport, and according to the above description.

4.2.1.1.5 *Demolition of pedestrian and bicycle lane*

Perform demolition of pedestrian and bicycle paths which are abolished according to the project. The average substrate thickness is 20 - 30 cm, of different composition. If the sidewalk is made with plates, install these plates manually, clean and load the vehicle. The shock caused by demolition is loaded into the vehicle and taken to the landfill by the Supervisor, unloaded and planned.

The calculation of performed works is done per **m²** of broken pavement or bicycle path for all work, material and transport, and according to the above description.

4.2.1.1.6 *Parking demolition*

Carry out planned demolition of the parking lot, regardless of the type, which is canceled according to the project.

The average thickness of the under layer is 20-30 cm. If the parking is made out of tiles, pull out this plate manually and fold it to the side. Waste caused by demolition are loaded into the vehicle and taken to the landfill according to the direction of the inspection body, unloaded and dismantled.

Calculations of performed works are done per **m²** of demolished parking lots, for all work, material and transportation, and according to the above description.

4.2.1.1.7 Preparation of temporary joints for continuing asphalt works

On the parts where the existing asphalt pavement, according to the project, extends or continues, a stepwise sanding of the asphalt pavement ($d = 6-10$ cm) should be performed by means of a pneumatic hammer with a blade or circular saw. The crossing line on the August surface should be right. The slats are height-adjustable at the height of the layers, with a horizontal stroke of about 10 cm for the asphalt layers. Dumped material is loaded into the vehicle, transported to the dump or used on site.

The calculation of the finished works shall be carried out by **m'** according to the prepared path for the continuation and the above description.

4.2.1.1.8 Scraping of the asphalt layer

At the part of the joining of the carriageway and the part where the joints have been raised in relation to the existing carriageway or on the holes of the holes, do asphalt screed in layers of about 5 – 10 cm thick. On the part of the climbing of the junctions, scraping or roughing is performed in order to obtain a better connection between the existing pavement and the new layer of asphalt. Take the necessary material to the place designated by the project or on the order of the Supervisor.

The calculation of the works is done on a **m²** of floor surface, and the price is included in the price of the excavated material.

4.2.1.1.9 Elevation regulation of manhole covers and drains

Existing sewers and drains, which do not match the newly designed holes with their height position, fit with the corresponding rise or fall (10-20 cm), with the demolition and the creation of a concrete cushion beneath the ram.

All material created by this job is loaded into the vehicle, transported to the dump on the instructions of the Supervisor, unloaded and dismantled.

The calculation of the finished works is done per **pieces** of height-regulated manhole cover and drain, for all work and material, and according to the above description.

4.2.1.1.10 Sealing the existing drains

Existing drains, which according to the project will no longer be used, are closed. Closure of drains consists of removing the grid, demolishing the concrete part to the required height, concrete filling of the drain and filling cavity with sand. Transfer the drainage grids to the place designated by the Supervisor.

The calculation of the finished works is carried out per **piece** of drain for all work and material, and according to the above description.

4.2.1.1.11 Removal of the traffic signs and billboards

This position covers the extraction and dismantling of traffic signs, billboards and traffic lights. Existing Traffic Signs and Advertising Panels, which are removed from the project, are unloaded manually together with the concrete foot (or disassembled), loaded into the vehicle and transported according to the Supervisor's instructions, unloaded and agreed at a specific location. The Supervisor will promptly notify the owners of advertising spots about the place and the time of decommissioning - removal of the board.

The calculation of the performed works is carried out per **piece** of removed and deposited traffic signs and advertising plates, and according to the above description.

4.2.1.1.12 Removal of waste and debris

Carry out the removal of debris and scrap, located in the construction sector of the future road, which is not due to the works envisaged under this project. This material should be collected, loaded into the vehicle, transported to the landfill, unloaded and disassembled, and according to the instructions of the Supervisor.

The calculation of the performed works is done per **m3** of removed waste, for all work and material and transportation

4.2.1.1.13 Adjustment and protection of supplementary and subsidiary electriclines

Dispose of in accordance with a special project or instructions of the owner of the electrical installation and the Supervisor, and the regulations applicable to this type of installation.

The calculation of the performed works is done per **piece** of interrupted electrical installation (as an estimated price, according to the subcontractor's bid, to be included in the calculation when making the bid).

4.2.1.1.14 Adjustment and protection of supplementary and subsidiary telephone cables

Dispose of in accordance with a special project or according to the instructions of the owner of the underground or overhead TT installations and the Supervisor, and the regulations applicable to this type of installation.

The calculation of the performed works is done per **piece** of broken TT installation (as an estimated price, according to the subcontractor's bid, which is to be included in the prospectus when making the bid).

4.2.1.1.15 Adjustment and protection of water and sewer installations

Dispose of in accordance with a special project or according to the instructions of the owner of the plumbing or sewerage installation and the Supervisor, and the regulations applicable to that type of installation.

The calculation of the works carried out is done per **piece** of interrupted installation (as an estimated price, according to the subcontractor's bid, to be included in the calculation when making the bid).

4.2.1.1.16 Adjustment and protection of gas installation and installation of petroleum lines

Dispose of in accordance with a special project or instructions of the owner of the pipeline or pipeline installation and the Supervisor, and the regulations applicable to that type of installation.

The calculation of the works carried out is done by one **piece** of gas pipeline or pipeline installation (as an estimated price, according to the subcontractor's bid, to be included in the calculation when making the tender).

4.2.1.1.17 Producing the project of derived state

After the completion of works on the construction of the road, the Investor and the Contractor are obliged to carry out the project of the completed condition if there were any significant changes in relation to the project solution.

The calculation of the performed works is performed on per **piece** of the route for which the project of the derived state was made.

4.2.1.1.18 Recording of the executed object by the authorized geometer with the permission of a license of rgz.

The video is submitted to the Republic Geodetic Authority for Mapping and Investor. The record is submitted to the investor at the end of the works - before the completion of the finished situation,

in paper (elaborate) and digital form on a CD in ACAD - ".DWG" format (with a table of absolute coordinates of all breakpoints on the route of the road), obtaining a certificate of submitted to the RGZ. This clip is the basis for the final calculation of works. A snapshot for mapping is submitted to the Republic Geodetic Authority. The position includes the payment of the cost of mapping to the Republic Geodetic Authority. The calculation is carried out flat - rate sum for all works on the complete traffic area.

4.2.1.2 Earthworks

4.2.1.2.1 Excavation in the wide trench

This work encompasses wide ranges that are foreseen by the project or the request of the Supervisor: in the slope, in the borrowing and in larger deviations. Execute digging in a wide hole according to projected holes and slopes according to transverse profiles. Before excavating, check out the prominent markings of the transverse profiles.

It is anticipated that 95% digging will be done by machine and 5% manually. Excavated ground material is tilted to the figures suitable for loading.

Calculation of finished works is done per **m³** of excavated, self-propelled material with pushing up to 20 m, prepared ground transport material.

4.2.1.2.2 Compaction of the subsoil

After the excavation of humus, under the embankment and the excavation of the hamlet, compacting of the subsoil should take place. Compacting of the subsoil should be executed with mechanical means. It is required to compact the substrate according to the standard Proctor process 100% of the maximum laboratory compactness, and in depth to $d = 50$ cm. In the event that the required compaction cannot be achieved in certain places, the pouring will continue with the addition of sandy - pebbly material until the required size of compactness is achieved. This supplementary work is not paid separately, but only costs for the procurement of sand-gravel material.

Calculation of performed works is carried out per **m²** of charged subsoil for all work, material and control tests.

4.2.1.2.3 Forming of the sand embankment or materials of the same characteristics specified in his technical conditions

The work on the construction of sand dunes involves the supply of sand with the driveway, bulk heading, disassembling, necessary wetting, planning, padding according to regulations and inspection. The construction of the embankment is performed according to the projected cross sections, angles and slopes from the project with a tolerance of up to 5 cm. Dip in horizontal layers up to 30 cm thick. Perform the collection of the embankments by vibrating means with compression until the required compaction is reached. The quantities for the embankment contain a part of the embankment below the bank. The control of the compactness of the derived layers should be carried out with a circular plate of diameter $d = 30$ cm, with a minimum value of the modulus of compressibility $M_s = 25$ MN / m².

The construction of the embankment must be done in layers. All work must be carried out in accordance with the project and these technical conditions and SRPS.U.E1.010.

The quality control of materials in the installation is carried out according to the regulations:

- SRPS.U.B1.010 - Sampling
- SRPS.U.B1.012 - Determination of soil moisture
- SRPS.U.B1.014 - Determination of specific soil weight
- SRPS.U.B1.016 - Determining the volume weight of the soil
- SRPS.U.B1.018 - Determination of granulometric composition
- SRPS.U.B1.020 - Determination of the consistency limits
- SRPS.U.B1.024 - The content of combustible and organic matter

- SRPS.U.B1.038 - Determination of optimal water content
- SRPS.U.B1.046 - Determination of the compressibility module

The calculation of the performed works is done per m³ of finished embankment, in a tight state, for all work, material, transport and control tests in accordance with the above description.

Organic waste, roots, bushes cannot be used in the dike.

Before filling, examine the materials to be used for filling in order to determine the most favorable conditions, i.e. optimal humidity.

The granting and loading of materials can begin only after the Supervisor has received the ground or the previous layer of embankment.

The filling is carried out in layers approximately horizontal in the longitudinal sense, or mostly in the projected longitudinal inclination. The thickness of each layer must be in accordance with the effect of compacting, the type of filler material and the required compactness. The compression of each layer is carried out at approximate optimum humidity of the material, mechanical means in full width. The construction of the dam should be interrupted when due to atmospheric conditions it is not possible to achieve satisfactory results (rain, high groundwater, floods).

Frozen material must not be embedded in the embankment.

Each charged layer must be tested, and only if it has given good results and if a good connection between them is enabled. Control is done by determining the degree of constriction or modulus of compressibility.

Criteria for quality control are:

- for embankments of non-coherent material and mixed material, where the Probe's experiment cannot be performed, the tightness control is performed by a circular plate, requiring a modulus of compressibility minimum $M_s = 25 \text{ MPa}$.

Compensation values and modulus of compressibility for individual materials are determined by the supervisor.

The finished embankment must have slopes of slopes, widths and angles with an accuracy of $\pm 5 \text{ cm}$ in relation to the project. The amount of embedded material is measured in m³ of derived and charged embankments.

Calculation and payment is done per **m³** of derived (charged) embankment.

4.2.1.2.4 Forming of the soil embankment

The work on the construction of embankments from earthy materials includes plowing of the earth from the use or borrowed from the borrowing, dismantling, necessary humidification or drying, planning, pouring according to regulations and control testing. The construction of the embankment is performed according to the projected cross sections, angles and slopes from the project with a tolerance of up to 5 cm. The bulkhead is to be applied in layers of thickness up to 30 cm, with a drainage slope. The embankment compaction is carried out by means of vibrating means or static rollers, with compression until the required compaction is achieved. The quantities for the embankment contain a part of the embankment below the bank.

The control of the compactness of the derived layers should be carried out with a circular plate of diameter $d = 30 \text{ cm}$, with a minimum value of the modulus of compressibility $M_s = 25 \text{ MN / m}^2$.

Calculation of completed works is done per **m³** of finished embankment in a compact condition for all work, material and control tests in accordance with the above description.

4.2.1.2.5 Planning and rolling the sub grade

Treatment of the sub grade consists of the design of the bed at projected angles and complementary compaction across the entire width of the plain to the required compaction. Final rolling is carried out with a smooth roller in order to obtain a flat surface of the bed, allowing for a deviation of $\pm 2 \text{ cm}$ in relation to the projected angles. To test the compression of the bed, perform an experimental circular plate of diameter $d = 30 \text{ cm}$, requiring a minimum value of the compression module $M_s = 25 \text{ MN / m}^2$.

Calculation of performed works is done per **m²** for all work and material, with control tests.

4.2.1.2.6 Spreading of the earthlike material in the landfill

The excess of humus and excavated earth material of the material up to category III that was brought to the landfill, spread to the landfill in the layers and roughly planned according to the instructions of the Supervisor.

The calculation of finished works is performed per **m3** of self-contained, extensive, material, for work and material.

4.2.1.2.7 Transportation of earthlike materials

The excess of excavation of humus and earth material and the delivery of materials from the buoyancy or humidification category up to III category, loaded and transported to the landfill or to the location of the embedding, at a distance from the pre-invoicing of the works. This position includes loading into vehicles, transport, unloading and rough handling.

The calculation of performed works is done per **m3** of loaded, transported, unloaded and roughly woven material in self-standing condition.

4.2.1.3 Pavement structure

4.2.1.3.1 Construction of the bearing thickness from the mechanically compacted granular rock material

The work involves the procurement and installation of granular stone material in the load-bearing layer of pavement structure. Works can only begin when the supervisor receives a sub grade in terms of straightness, projected angles, slopes, and constipation. Materials for the production of a carrier layer can be: natural pebbles, crushed stone material, a mixture of natural gravel and crushed material and mixtures made up of several fractions. All the above materials must meet certain conditions regarding mechanical characteristics, granulometric composition, load capacity and other conditions according to the applicable standards. SRPS.U.B1.010, SRPS.U.B1.012, SRPS.U.B1.016, SRPS.U.B1.024, SRPS.B.B8.042, SRPS.U.B1.030, SRPS.U.B1.048, SRPS.U.B1.050, SRPS.B.C1.010, SRPS.B.C1.011, SRPS.U.E9.024. On the planned and rolling sub grade, grain stone material is applied, it is spread by a grader or other suitable equipment, watering and compacting to the required compaction by suitable static and vibratory equipment. The supporting layer is carried out in layers of thickness from 20 to 40 cm, which is determined by the Supervisor. The material must also meet the requirements for resistance to cold. The upper surface of the supporting layer should be made according to the projected angles and slopes, while the level of the finished layer is controlled by a lath of length $l = 4$ m, and the allowed deviation is ± 1 cm. In terms of compactness, control tests should be performed with a circular plate of diameter $d = 30$ cm, and the smallest modulus of compressibility to be dependent on the type of stone material:

- for natural gravel $Me = 50$ MN / m².
- for the mixture of natural gravel and crushed material $Me = 60$ MN / m².
- for crushed stone material $Me = 70$ MN / m².

Calculation of performed works is carried out by **m3** of finished bearing layer from mechanically compacted grain material, for all work, material, procurement and transport of stone material and control tests

4.2.1.3.2 Construction of the top bituminous load-bearing thickness (bns)

The upper bituminous load-bearing layer (BNSS) is a load-bearing layer in a pavement construction made of a mixture of stone material, stone flour and bitumen as a binder. According to the largest grain size, they are delivered to BNS 22, BNS 32 and BNS 45.

Depending on the type of stone material used, depending on the design and the predetermined bearing capacity, can be sorted as:

- BNS A, made of crushed broken stone material according to SRPS.U.B.B3.100 (stone aggregate), with the addition of stone flour as required;
- BNS B, made of crushed separating stone material with at least three fractions and a maximum grain of 45 mm, with the addition of stone flour as needed;

- BNS C, made of unburned crushed stone material with correction by adding stone material, or unassembled natural unbound material with the addition of at least 30% of crushed stone mixture over 4 mm and up to 45 mm, corrected by addition of peat or stone flour;
- BNS D, made of unbound natural unbound material with the largest grain of 45 mm, with correction of composition by adding peach or stone flour.

Stone material, pebbles and stone flour must meet the conditions prescribed by the SRPS. In mineral mix, there must be no organic matter. The granulometric composition of the mixture must be such as to satisfy the prescribed incorrect standard deviations.

Bitumen BIT 60 and BIT 90 are used as binder. The bitumen is determined by the preparation of the previous mix, and it is orientated from 3.3 to 5.2% depending on the type. Prior to the beginning of the work, all material to be used must be subjected to laboratory testing, which must be in accordance with the technical conditions for the preparation of substrate SRPS.U.E9.020. Mass production is done with modern asphalt bases, and incorporation with finisher with required rolling combined with rubber and smooth rollers. Mass transport vehicles - trolleys with tin cans. During the mass production and installation, all control tests, material testing and asphalt masses must be carried out in accordance with the standards. Layers must be performed in projected thicknesses and projected transversal falls.

Testing of the asphalt mass produced is performed for every 1500 tons of mass produced: bitumen, granulometry, stability, stability and deformation ratio, penetration of the cavity and filling of the bituminous cavity. Testing of the embedded layer is performed on every 2,000 m² of the applied layer, including: cavity, degree of compactness and thickness of the layer. The calculation of the finished works is done in m² of the upper surface of the actually made

layer. The price includes all costs of material procurement, production and installation of asphalt mass, transportation, equipment, preliminary and control tests and all other costs necessary for the execution of works.

Exceptionally, when it comes to leveling the existing surface of the carriageway during the reconstruction of the traffic surfaces, the calculation can be done in **tons** or **m³** of built-in mass.

4.2.1.3.3 Construction of wearing layer with stone mastic asphalt 0/11s

This item of works includes the procurement, preparation, laying, and compaction of a wearing layer with stone mastic asphalt SMA 0/11S.

Stone mastic asphalt is a mix of crushed aggregate and sand of discontinuous grain distribution curve that, due to a relatively high content of aggregate (70- 80%), has an extremely skeletal structure that is filled with bituminous mastic composed of filler, dope, polymer-modified bitumen, and stabilizing fibres.

The basis for preparation of technical specifications for this item of works is SRPS U.E4.015 (Construction of skeletal asphalt surfacing for maintenance, strengthening, and construction of a new pavement structure) and SMA 0/11 - ZTV Asphalt-Stb, 1998 Empfehlungen für die Zusammensetzung, die Herstellung und den Neubau von Splittmastixasphalt, FGSV 1966.

Basic materials

- Crushed high-grade chippings 2/4, 4/8, and 8/11 mm;
- Crushed sand 0/2 mm (silicate or carbonate)
- Rock flour of carbonate composition,
- -Cellulose fibres, and
- -Polymer-bitumen PmB 60 S.

Quality of Component Materials

Polymer-Bitumen PmB 60S

Polymer-modified bitumen, based on SBS-polymer, 50-90S type, according to Austrian specifications ÖNORM B3613 (Elastomer-modifizierte Bitumen für den Strassenbau – Anforderungen) shall be used as binder, with the characteristics as given in the table below.

Врсте испитивања Test type	PmB 50-90S PmB 50-90C	Методе испитивања Test method
Пенетрација на 25°C (1/10 мм), (100 r/5s) Penetration at 25°C (1/10 mm), (100 r/5s)	50 – 90	СРПС Б.Х 8.612
Тачка размекшања по РК, (°C) Softening point according to PK, (°C)	> 65	СРПС Б.Х 8.613
Тачка лома по Frass-y (°C) Frass breaking point (°C)	< -19	СРПС Б.Х 8.616
Дуктилитет, (цм), на 25°C Ductility, (cm), at 25°C	> 50	СРПС Б.Х 8.615
Тачка паљења по Cleveland-y, (°C) Cleveland flash point, (°C)	> 250	ДИН ИСО 2592
Повратна еластична деформација на 25°C, % Reversible elastic deformation at 25°C, %	> 80	ÖNORM C 9219
Хомогеност током лагеревања, ^PK, (°C) Homogeneity during storage, ^PK, (°C)	< 2.0	TL PmB Teil 1 (1991) Туба Тест
После RTFOT према ASTM D 2872 / After RTFOT according to ASTM D 2872		
Губитак масе, %(м/м) Mass loss, % (m/m)	< 0.5	-
Промена пенетрације на 25 °C, (%) □ смањење □ пораст Change in penetration at 25 °C, (%) □ decrease □ increase	< 40 < 10	СРПС Б.Х.8.612
Повратна еластична деформација на 25°C, % Reversible elastic deformation at 25°C, %	> 80	ÖNORM C 9219

Instead of polymer-bitumen PmB 60S, standard road bitumen Bit 60 may be used, with the addition of 0.6% (m/m), with respect to asphalt mix, of polymer-modified bitumen cellulose granules.

Rock Flour

Rock flour for the preparation of asphalt mix SMA 0/11S shall be of carbonate composition, Quality Class I, according to SRPS B.B3.045.

Crushed Sand 0/2 mm

Crushed sand 0/2 mm, for the preparation of SMA 0/11S, may be of either silicate or carbonate composition, provided that it meets the following requirements:

Величина квадратног отвора сита (мм) Square mesh size (mm)	Пролази кроз односно сито, % (м/м) Passing through sieve, % (m/m)
0.09	0 – 10*
0.25	15 - 35
0.71	40 - 85
2.00	90 - 100
4.00	100
Модул зрнавости Grading modulus	1.70 - 2.55

* If the content of filler (particles < 0.09 mm in size) is larger than 10%, sand may be used only if of carbonate composition, and if the sand equivalent is larger than 60%. Silicate sand, with more than 10% of filler, shall not be used regardless of the sand equivalent value.

Физичко-хемијска својства дробљеног песка 0/2 мм

КАРАКТЕРИСТИКЕ CHARACTERISTICS	УСЛОВИ КВАЛИТЕТА QUALITY REQUIREMENTS
Садржај честица < 0.09 мм, %(м/м) Content of particles < 0.09 mm in size, %(m/m)	< 10
Еквивалент песка, % Sand equivalent, %	> 60
Садржај грудви глинe, % (м/м) Content of clay balls, % (m/m)	0
Садржај органских нечистоћа, %(м/м) Content of organic impurities, %(m/m)	0

Chippings

For the preparation of stone mastic asphalt, eruptive rock chippings shall be used, with the granulometric composition in conformity with requirements set out in SRPS U.E4.014/90 and SRPS B.B3.100.

Rock aggregates shall be accompanied with valid compliance certificates issued by an authorized laboratory pursuant to the "Ordinance on mandatory compliance testing of fractionated rock aggregate for asphalt and concrete", published in the Official Journal of SFRY No. 41 dated 19th June 1987. Chippings shall possess the following physical/mechanical characteristics:

Стандард Standard	Карактеристике Characteristics	Услови квалитета Quality requirements
1. SRPS B.B8.045	СРПС Б.Б8.045 Resistance to crushing and wear according to Los Angeles method	Отпорност према дробљењу и хабању по методи Los Angeles < 18 %(м/м)
2. SRPS B.B8.120	СРПС Б.Б8.120 Polished value	Вредност полирности > 48 ВПК
3. SRPS U.M8.096	СРПС У.М8.096 Percentage of rock aggregate surface coated in polymer-bitumen	Проценат обавијености површине каменог агрегата полимер-битуменом > 100/90
4. SRPS B.B8.044	СРПС Б.Б8.044 Frost resistance with sodium sulphate; mass loss after 5 cycles	Постојаност према мразу са натријум-сулфатом; губитак масе након 5 циклуса < 3 %(м/м)
5. SRPS B.B8.031	СРПС Б.Б8.031 Water absorption on 4/8 mm fraction	Упијање воде на фракцији 4/8 мм < 1.2 % (m/m)
6. SRPS B.B8.048	СРПС Б.Б8.048 Proportion of grains with the maximum-to-minimum size of grain >3:1	Удео зрна с односом највеће димензије према најмањој >3:1 < 20 % (m/m)
7. SRPS B.B8.037	СРПС Б.Б8.037 Proportion of weak grains in fractions > 4 mm	Удео слабих зрна у фракцијама > 4 мм < 3 % (m/m)
8. SRPS B.B8.038	СРПС Б.Б8.038 Proportion of clay balls in a particular fraction	Удео грудви глинe у појединој фракцији < 0.25 % (m/m)

Composition of Mineral Mix for SMA 0/11S**Granulometric Composition of Mineral Mix**

The proportion of basic materials in mineral mix shall be adjusted in such way that the grain size accumulation curve lies within the following limit range :

Величина отвора сита	Гранични појас СМА 0/11С
Mesh size	Limit range SMA 0/11S
0.09 mm / 0.09 mm	11 - 13
0.25 mm / 0.25 mm	13 - 17
0.71 mm / 0.71 mm	16 - 22
2.0 mm / 2.0 mm	23 - 27
4.0 mm / 4.0 mm	23 - 32
8.0 mm / 8.0 mm	50 - 64
11.2 mm / 11.2 mm	95 - 100
16.0 mm / 16.0 mm	100

Allowed deviations in granulometric composition

Allowed deviations in the granulometric composition of rock mix in a job mix formula and individual specimens in the course of production, from the granulometric composition of rock mix in a trial mix formula shall be within the following tolerances

Tolerances for variations in granulometric composition of mineral mix

Величина квадратног отвора сита	Допуштено одступање гранулометријског састава камене смесе радног састава и појединих узорака у току процеса производње од гранулометријског састава камене смесе претходног састава асфалтне мешавине, +/- % (м/м)
Square mesh size	Allowed variation of the granulometric composition of rock in a job mix and particular specimens during the production process from the granulometric composition of rock in a trial asphalt mix, +/- % (m/m)
0.09 mm / 0.09 mm	+/- 0.5
0.25 mm / 0.25 mm	+/- 1.0
0.71 mm / 0.71 mm	+/- 1.5
2.0 mm / 2.0 mm	+/- 1.0
4.0 mm / 4.0 mm	+/- 2.0
8.0 mm / 8.0 mm	+/- 3.0

Oriental asphalt mix formula

An orientational asphalt mix formula is:

- Filler 0-0.09 mm 10%
- Sand 0.09-2 mm 15%
- Chippings 2-11 mm 75%

Total :100%

In order to achieve good resistance to deformation, the ratio of fractions 0/2, 2/4, 4/8 and 8/11 mm in mineral mix shall be 1:1:3:4, and for good resistance to wear, the ratio of fractions shall be 1:1:2:4. An optimum composition of asphalt mix and polymer-bitumen shall be determined when preparing trial and job asphalt mix formulae.

Quantity of Polymer-Bitumen

The content of polymer-bitumen in asphalt mix SMA 11S shall fall within the range 6.0-6.5%. A precise amount of binder shall be defined when preparing trial and job mix formulae.

An optimum amount of polymer-bitumen in asphalt mix shall be checked with the Schellenberg test.

Quantity of Stabilising Fibres

In mixing SMA-11S, bitumen-impregnated cellulose fibres in granular shape are used as a stabilising admixture in the amount of 0.4% (m/m) in proportion to asphalt mix. Special mountable batchers are used to batch cellulose granules in the right amount per mass.

Trial asphalt mix design

Prior to the commencement of works, the Contractor shall prepare a trial asphalt mix design in an authorized laboratory approved by the Engineer in full compliance with requirements set in these Technical Specifications. No operation shall start before the Contractor has proposed the trial mix design to the Engineer for approval and the Engineer has issued formal written approval. Compliance certificates for basic materials and trial mix shall not be older than 6 months. If any changes in basic materials or their selection occur, the Contractor shall submit to the Engineer a written proposal for modification of the adopted asphalt mix, i.e. propose a new trial mix design for approval, before the use of these materials starts.

Testing of Characteristics of Component Materials

When designing a trial asphalt mix, the supplied specimens of basic materials shall be subjected to the following tests:

- Testing of polymer bitumen: softening point according to PK, penetration at 25°C, penetration index, ductility at 25°C, reversible elastic deformation, homogeneity and thermostability tests, relative density at 25°C, and Frass breaking point.
- Testing of rock flour: granulometric composition, Rigden voids, and density at 25°C.
- Testing of sand: granulometric composition, proportion of particles smaller than 0.09 mm in size, sand equivalent, and grading modulus.
- Rock aggregate: granulometric composition of fractions, water absorption for 4/8 mm chippings fraction, resistance to crushing and wear (Los Angeles), adhesion of binder to aggregate, and grain shape.

Designing of Asphalt Mix Formula and Physical/Mechanical Properties

The granulometric composition of rock mix in a trial mix formula shall be designed within the limit range given in these Technical Specifications. The mineral mix and quantity of polymer bitumen shall be designed so that the physical/mechanical properties of asphalt mix meet the following requirements:

Врста узорка	Карактеристика	Стандард	Претходна и радна асфалтна мешавина
Type of specimen	Characteristic	Standard	Trial and job asphalt mix
1.	Лабораторијско пробно тело сабијено са 2 x 50 удараца на температури од 155 +/- 5°C ----- Laboratory test specimen compacted with 2 x 50 blows at the temperature of 155 +/- 5°C	Стабилност по Маршалу на 60°C, (кН)	CPIC У.М8.090 > 8.0
Marshall stability at 60°C, (кН)		SRPS U.M8.090	
2.	Однос стабилности и течења на 60°C, (кН/мм)	CPIC У.М8.090	> 2.0
Stability/Flow ratio at 60°C, (кН/мм)		SRPS U.M8.090	
3.	Садржај шупљина, % (в/в)	CPIC Б.Б8.031	3.5 - 4.5
Void content, % (v/v)		SRPS B.B8.031	
4.	Шупљине камене смесе испуњене битуменом, % (в/в)	CPIC Б.Б8.031	70 - 85
Voids in rock mix filled with bitumen, % (v/v)		SRPS B.B8.031	
5.	Шупљине у минералној мешавини % (в/в)	CPIC Б.Б8.031	17 - 19
Voids in mineral mix, % (v/v)		SRPS B.B8.031	

Карактеристике Characteristics	Услови квалитета Quality requirements
1. Шупљине у уграђеном слоју, % (в/в)	3 - 5
Voids in constructed layer, % (v/v)	3 - 5
2. Степен збијености, %	> 98 %
Compaction degree, %	> 98 %
3. Равност слоја одређена летвом дужине 4м	< 3 мм
Evenness of layer determined with a 4 m levelling staff	< 3 mm
4. Одступање површине слоја од утврђене нивелете	< 3 мм
Variation of the surface of layer from the specified reference level	< 3 mm
5. Одступање од захтеваног попречног пада	< +/- 0.2 %
Variation from the specified cross fall	< +/- 0.2 %
6. Гранулометријски састав екстрахиране минералне мешавине мора да се налази у појасу прописаном у овим техничким условима	-
Granulometric composition of extracted mineral mix shall lie within the range set out in these Technical Specifications	-
7. Одступање количине везива од утврђеног у претходном саставу асфалтне мешавине	< +/- 0.3 % (м/м)
Variation of the amount of binder from the amount specified in the trial asphalt mix	< +/- 0.3 % (m/m)
8. Физичко-механичка својства асфалтних узорака морају да испуне услове из ових техничких услова	-
Physical/mechanical properties of asphalt specimens shall meet the requirements from these Technical Specifications	-

Job Mix Formula for Asphalt

Prior to the commencement of works, a job mix formula for asphalt shall be prepared and submitted for the approval of the Engineer. The job mix formula for asphalt shall serve as proof that the asphalt plant can produce asphalt mix of quality designed in the trial asphalt mix design to the full satisfaction and approval of the Engineer. The prerequisite for proving the trial asphalt mix formula is the verification of quality of component materials stored in the asphalt plant.

Proving Quality of Produced Asphalt Mix (Trial Production)

The production of asphalt mix is considered proven when the testing of at least three specimens of asphalt mix taken from continuous production shows that: Specifications values given in the trial asphalt mix design, and

The job mix formula for asphalt is to be given in a form of written report.

When a job mix formula for asphalt in the asphalt plant cannot fully fit into allowed variations, it is necessary to correct the trial mix formula for asphalt with the Supervisor's approval and also subject to the approval of the Engineer.

The trial mix formula for asphalt shall be redesigned, if it cannot be proven in the asphalt plant due to major differences in the composition and properties of component materials in the asphalt plant or due to specifics of the asphalt plant, or as otherwise directed by the Engineer.

Proving Quality of Laid Asphalt Mix (Trial Section)

Prior to the commencement of works, a trial section shall be constructed. The trial section serves as proof that the job mix, with an appropriate work technology, can construct a regulating course in the quality specified in these Technical Specifications to the full satisfaction and approval of the Engineer. In the course of construction of a trial section, the following shall be controlled:

The quality of a trial section is considered to be proven once the testing of at least three specimens from the laid asphalt layer obtain satisfactory characteristics in accordance with the criteria from these Technical Specifications and subject to the approval of the Engineer.

The assessment of trial section quality, including test results, shall be given in the form of a written report. Based on the proved quality of trial production and trial section, the Engineer shall approve the commencement of works in writing.

Technology of Work

Production of Asphalt Mix

Asphalt mix shall be produced mechanically. For the production of asphalt mix, a discontinuous plant, with a minimum capacity of 60 t/h and automatic batching and production control, shall be used.

The asphalt plant shall have at least two back-up tanks, and a working tank for storing polymer-bitumen. The tanks shall be equipped with thermometers.

The asphalt plant shall have an incorporated automatic batcher by mass for cellulose granules. The batching method, according to the Manufacturer's instructions, shall foresee the feeding of granules along with rock material directly into the asphalt mixer, followed by rock flour, and, after 10-15 seconds of mixing in dry, by binder.

The asphalt plant shall have sieves according to adopted trial mix, and batchers for component materials shall have four scales for: rock aggregate, rock flour, polymer-bitumen, and cellulose granules.

The asphalt plant shall be equipped with thermometers for binder and mineral aggregate, and also for hot asphalt mix in a silo.

The number of pre-batchers shall be at least six; each of them shall have mechanical and automatic flow regulation.

A cyclone in the asphalt plant shall have an option to adjust the degree of dedusting and removal of silty particles in order to remove the content of filler above 10% in sand fractions, as needed.

The plant shall have at least 4 hot bunkers for fractions of rock material. There shall be appropriate square mesh sieves put in place in the plant, so that the following fractions could be provided in hot bunkers:

– fraction 8/11 mm

Furthermore, in the set of sieves, there shall also be a limit sieve that will remove grains of chippings above 11 mm in size.

Immediately after production, asphalt mass shall not be stored, but transported to the place of laying without delay, so as not to cool down.

To prevent asphalt mass to stick to the transport hopper, it is necessary to regularly lubricate the hopper with 40% silicone emulsion sprayed through an automatic nozzle.

Rock aggregate foreseen for the production of asphalt mix shall be stored on special, new stockpiles. It is not allowed to mix it with earlier supplies of material. The stockpiles shall be on a firm surface (concrete, asphalt, macadam); it is forbidden to use stockpiles on earth surfaces. The stockpiles shall be at sufficient distance to prevent any mixing of fractions; the stockpiles shall be clearly marked by aggregate fractions.

Rock flour shall be stored in a special silo that shall be previously emptied from any prior supplies.

Polymer-bitumen shall be delivered to the asphalt plant immediately before the commencement of production of asphalt mass in order to avoid any unnecessary storage in a higher temperature. The delivery schedule for polymerbitumen shall be arranged so that the amount of binder delivered to the asphalt plant is immediately used for the production of asphalt mix. In the asphalt plant, polymer-bitumen shall be discharged into working and back-up tanks previously emptied from old bitumen.

The delivery of basic materials shall be submitted for the approval of the Engineer based on a quality certificate issued by an authorized institution.

Preparation of Rock Aggregate

Rock aggregate shall be dried and heated in a heating drum at the temperature of 170-

Preparation of Binder – Temperatures of Polymer-Bitumen and Asphalt Mix

Temperatures of polymer-bitumen, during storage and preparation of asphalt mix, shall not be higher than those shown in the table below. Also, the time of exposure of polymer-bitumen to elevated temperatures during storage shall be limited. Polymer-bitumen should be exposed to elevated temperatures as little as possible, in order to prevent its demixing and separation of polymer on top of bitumen.

Температура ПмБ Temperature of PmB У цистерни In a tank	Препоручена Recommended 155°C	Највиша Maximum 165°C
СМА приликом изласка из мешалице SMA at the mixer discharge point	170°C - 175°C	180°C

Mixing

The time of mixing, and the entire batching and mixing process shall be adjusted so that all aggregate grains are coated with binder uniformly. The mixing time shall be determined by the Contractor and submitted for the approval of the Engineer.

Hot mineral mix, cellulose granules, and rock flour shall be mixed together in the asphalt mixer for 10-15 seconds, and then heated binder shall be added, with everything mixed together for another 30 seconds. The mixing of asphalt mix components shall be proportioned according to the approved job mix formula.

To prevent the sticking of asphalt mass, the hopper shall be sprayed with 40% solution of silicone emulsion or water solution of potassium soap.

Temperature of aggregate, polymer-bitumen and asphalt mix shall be in compliance with temperatures stated in Sub- Section 9.9.4. If the temperatures of asphalt mix, after mixing, are lower or higher than those specified in the table, the mass shall be discarded. The same applies to the mix, if foamy or contains moisture.

Asphalt Mix Transport

Transport vehicles for asphalt mix shall have a tipping mechanism. Every truck shall have a tarpaulin to protect asphalt mix from cooling, weather conditions, dust, and wind, i.e. to keep its temperature until laying and prevent the moistening of asphalt mix. The temperature of asphalt mix during laying shall neither be lower than 165 oC nor higher than 180oC. The Contractor shall ensure a sufficient number of trucks for transport, with regard to the capacity of asphalt plant, transport distance, and the size of site, in order to avoid interruptions in the work of paver.

The paver shall not stop!

The hopper of a truck for transport of asphalt mix shall be clean and sprayed before every feeding with an agent that prevents asphalt mix from sticking to its sides. The most suitable agents for that are a 40% silicone emulsion, or a water solution of potassium soap. The use of oil derivatives for spraying is not allowed.

Every truck of delivered asphalt mix shall be accompanied with a delivery note with specified weight, temperature, and time of loading of asphalt mix, signed by the Contractor and submitted for the approval of the Engineer.

Without this document, the laying of delivered asphalt mix shall not be allowed..

It is allowed to keep asphalt mix in silos in the asphalt plant up to 2 hours, or if the silos are thermally insulated, that time can be longer, all this provided that the temperature of asphalt mix remains within the prescribed range and subject to the approval of the Engineer.

Laying of Asphalt Mix

General Note

The construction of an asphalt layer may start only when the Engineer accepts and confirms approval for the report on trial section, and/or report of performed trials.

Weather Conditions During Construction

A wearing layer made of stone mastic asphalt may be constructed only in warm and dry weather, only in the attention to that, because SMA mix cools down rapidly and the prescribed compaction will not be reached. The laying of asphalt mix may start only when approved by the Engineer

SMA Laying Machines

Pavers

Pavers shall be electronically guided over a steel wire rope, or laser-guided.

Rollers

For the compaction of SMA layers, only 10-tonne static steel-rim rollers shall be used. The use of combined rollers or rubber-tyre rollers is not allowed. Vibrations during rolling are not allowed. 4-5 rollers in total are needed. Rollers shall have functional water sprayers for wheels.

Preparation of Underlying Surface

The underlying surface on which the asphalt layer is to be constructed shall be dry and dedusted (with compressed air). The surface on which SMA 0/11S is laid shall be dry and clean, and shall not be frozen. Before constructing the layer, the underlying surface shall be sprayed with bituminous emulsion in the amount of 0.2 kg/m².

Temperature of Mix on Place of Construction

The temperature of spread asphalt mix on the place of construction shall neither be lower than 165°C nor higher than 180°C. Asphalt mix that does not have a specified temperature shall be discarded.

Spreading of Asphalt Mix

The layer shall be spread mechanically, with a paver with automatic height guidance.

The Contractor shall set the timing of production, transport, and spreading of asphalt mix so as to avoid interruptions in the work of paver, since longitudinal joints are not foreseen.

The paver shall be adjusted regarding all elements, and its speed adjusted so that the layer has a flat surface, and its thickness and cross fall are as specified in the design. There shall be no segregated spots, nor scratched places due to the unheated screed, or asphalt stuck to the screed; there shall be no oily stains, etc. Before the commencement of work, the screed shall be heated from a separate source (butane-gas). The compaction obtained with the paver shall be at least 90% of the laboratory value.

Compaction of Asphalt Mix

The compaction of asphalt mix shall be performed in a standard way, with 10-tonne static steel-rim rollers. The use of vibrations is not allowed. Rollers go immediately behind a paver and shall pass 6 runs in one direction to achieve the specified compactions, which is determined on a trial section. Rolling shall be below 130°C. A minimum compaction of the layer shall be 98 %.

Rollers are not allowed to stay on a still non-co filling up with water, rollers shall be out of the working surface. All precaution measures shall be taken to prevent any leakage of oils, diesel, and lubricants to the pavement under rollers.

During rolling, the thickness, profile, and evenness of layer shall be checked constantly.

Longitudinal and Transverse Joints

If traffic cannot be diverted in the course of works, and one half of the road has to be constructed at a time, it is necessary, when joining the layer of asphalt concrete – SMA mix, use a joint tape. This

tape is used for all asphalt layers in the surfacing, and for the bond between concrete and asphalt, or asphalt and stone. Joint tapes are bitumen-coated machined thermoplastic sections that soften under higher temperature (heating). These tapes contain different approx. 5 mm than the layer thickness. A usual height of these tapes is 25-50mm. The width of tape is 10 mm and shall not be increased.

The tapes are placed in the same weather conditions as asphalt: in dry weather and at ambient temperatures over +5°C. After the completion of works, the redundant part of tape above the pavement shall be cut and ground.

Opening to Traffic

A properly rolled layer of asphalt may be opened to traffic not earlier than 24 hours after rolling.

Quality Assurance

Quality assurance requires the pretesting of quality, the testing of job mix, the construction of a trial section, regular and control tests, fully in compliance with these Technical Specifications and to the full satisfaction and approval of the Engineer.

Regular Tests

The primary objective of regular control is to have the clearest possible comprehension of the quality of basic materials, produced and laid asphalt, in order to act in the production process if needed and thus ensure the specified quality of asphalt. Regular tests shall be performed by the Contractor or at the Contractor's expense, by a laboratory registered for that type of control subject to the approval of the Engineer.

Laboratory Equipment for Regular Control

The laboratory shall have all equipment for specified tests, for regular tests in the production process, and for tests performed during the production of a job mix formula for asphalt and the work on a trial section, as defined in these Technical Specifications. The regular control includes the testing of component materials and asphalt mix, as follows:

- bitumen (PK, penetration) It mix, and Asphalt mix specimens are taken at the place of production or construction from a hot, just spread asphalt mix behind the paver. The control of compaction, voids, and thickness shall be performed by the extraction of asphalt specimens (cores) at the same place where the specimens of hot asphalt mix are taken.

The scope and frequency of regular tests shall be such to ensure a uniform quality in compliance with these Technical Specifications, namely:

- bitumen shall be performed at the beginning and at every 25 t of consumed polymerbitumen, And f the composition and physical/mechanical properties of asphalt mix shall be performed at every 500 t of produced asphalt mix.

Control tests

Control tests shall be performed by the Contractor or, at his expense, at a laboratory registered for this type of work subject to the approval of the Engineer.

Control tests include the testing of quality of: polymer-bitumen, rock flour, sand, and chippings.

The scope and frequency of control tests shall be such to ensure a comprehension of quality of constructed layer in compliance with these Technical Specifications, namely:

- bitumen – at least 1 specimen at every 50 t of delivered polymer-bitumen (full-scale testing in accordance with these Technical Specifications)

- at least 1 sample at every 1000 t of produced asphalt (granulometric composition, proportion of voids in dry compacted condition),

- at least 1 sample at every 1000 t of produced asphalt (granulometric composition, content of particles <0.09 mm, and sand equivalent)

- at least 1 sample from each fraction at every 1000 t of produced asphalt (granulometric composition, content of particles < 0.09 mm, grain shape, and content of friable grains).

In the course of works, the physical/mechanical properties and composition are checked on the samples of asphalt mix taken from hot, just spread, asphalt mix at every 1000 t of produced asphalt mass. The quality of constructed layer shall be determined by the extraction of cores at the same place where hot asphalt mix samples are taken, at least at 6000 m² of constructed layer, when the following is tested: density, thickness, voids, compaction, and adhesion to the underlying surface. Furthermore, evenness, variations from the profile and reference levels, and the position of centre line shall be checked as well.

Measurement and Payment:

Measurement and payment shall be performed per m² of an actually constructed stone asphalt layer, fully in accordance with this description and criteria, the Technical Specifications, and subject to the approval of the Engineer.

4.2.1.3.4 PRODUCTION OF THE PEDESTRIAN SURFACES AND ISLANDS FROM CONCRETE SLABS

Thickened 4/8 mm thick 4 cm thick stone layer over the constructed and tested tampon layer. On the layer of stone, the concrete slabs are dimensioned per project. Laying the concrete slabs is manually collapsed. The level of the finished surfaces is controlled by a length of 4 m. The type of concrete slabs as well as the way of making everything according to the details of the project. The fuses between the plates are filled with dirt or they are fed by the design given in the project. If the joints are pressed together, the same should be done before the vibration. The fizzes are squeezed with a brush by means of a needle, where by the weft should have a grain size of 0/2 mm.

Rolled concrete elements should be fitted with a light static roller in two directions. The method of installation and the type of material to be applied must be in accordance with the applicable regulations: Adhesives and paint according to EH 12878 standard 2-5%, pressure strength according to DIN 18501, more than 50 kN / mm², Tensile strength DIN EN 1338 more than 35 kN / mm², volume mass according to ISO 6275 water absorption up to 1%, abrasion resistance to B.B8015, frost resistance and salt performance according to SRPS U. M1.055 loss at 25 cycles less than 0.50 kg / m³, Concrete Resistance to Frost M100 SRPS.U.C4.019, Slip Resistance to SRPS.U.C4.019, aging according to IMS method.

The calculation of completed works is done per m² of built-up area, and the price includes the purchase of necessary construction materials, transport and installation.

4.2.1.3.5 LAYING OUT THE CONCRETE CURBS

The work covers the laying of concrete curbs of the most common dimensions 18/24 and 12/18. The floats are laid on the prepared concrete base of the MB 20, according to the project. Some details about digging, concrete substrate, concrete laying, joining joints and the rest should be made in all the details of the project. The joining of the 1 cm wide joint is made with cement mortar, which is made up of 1: 3. The height and position of the curb must be in accordance with the project. Fliers must be MB 40 and have the required quality assurance. Only healthy and undamaged buffers can be incorporated.

The calculation of completed works is carried out per m' of laid curb, for all work and material including the purchase and transportation of curbs.

4.2.1.4 Construction of absorbers thrust from concrete MB 30

The coagulers are needed to be from the charged concrete MB 30. They are ordered as finished. Perform the work in everything according to the manufacturer's instructions. Calculation of performed works is carried out per piece.

4.2.2 I Preliminary works Method of Measurement

Item 1,01 "Cutting and marking of road and objects" includes:

The calculation of the performed works is carried out according to the m' of the marked route.

Axis 1=304.5 m1

Axis 2=306.7 m1

Item 1,06 "Demolition of existing pavement" includes:

The calculation of performed works is done per m2 of ruined pavement for all work, material and transport. L= 305 m, d=25-35 cm, b=1 m

Item 1,07 "Demolition of existing curbs" includes:

The calculation of the performed works is done by the m' removed curb, for all work, material and transport

Item 1,08 "Demolition of pedestrian and bicycle lane" includes:

The average substrate thickness is 20 - 30 cm, of different composition. The calculation of performed works is done per m2 of broken pavement or bicycle path for all work, material and transport

Item 1,09 "Parking demolition" includes:

The average thickness of the under layer is 20-30 cm. Calculations of performed works are done per m2 of demolished parking lots, for all work, material and transportation

Item 1,11 "Preparation of temporary joints for continuing asphalt works" includes:

The calculation of the finished works shall be carried out by m' according to the prepared path for the continuation

Item 1,12 "Scraping of the asphalt layer" includes:

At the part of the joining of the carriageway and the part where the joints have been raised in relation to the existing carriageway or on the holes of the holes, do asphalt screed in layers of about 5 – 10 cm thick. The calculation of the works is done on a square meter of floor surface, and the price is included in the price of the excavated material.

Item 1,14 "Elevation regulation of manhole covers and drains" includes:

The calculation of the finished works is done per pieces of height-regulated manhole cover and drain, for all work and material

Item 1,15 "Sealing the existing drains" includes:

Closure of drains consists of removing the grid, demolishing the concrete part to the required height, concrete filling of the drain and filling cavity with sand. The calculation of the finished works is carried out per piece of drain for all work and material (slatted drain, approximately 40 m long)

Item 1,16 "Removal of the traffic signs and billboards" includes:

Existing Traffic Signs and Advertising Panels, which are removed from the project, are unloaded manually together with the concrete foot (or disassembled), loaded into the vehicle and transported according to the Supervisor's instructions, unloaded and agreed at a specific location. The calculation of the performed works is carried out per piece of removed and deposited traffic signs and advertising plates.

Item 1,18 "removal of waste and debris" includes:

Carry out the removal of debris and scrap, located in the construction sector of the future road, which is not due to the works envisaged under this project. The calculation of the performed works is done per m³ of removed waste, for all work and material and transportation

Item 1,26 "Producing the project of derived state" includes:

The calculation of the performed works is performed on the piece of the route for which the project of the derived state was made.

Item 1,30 "Recording of the executed object by the authorized geometer with the permission of a license of rgz" includes:

The video is submitted to the Republic Geodetic Authority for Mapping and Investor. The record is submitted to the investor at the end of the works - before the completion of the finished situation, in paper (elaborate) and digital form on a CD in ACAD - ".DWG" format (with a table of absolute coordinates of all breakpoints on the route of the road), obtaining a certificate of submitted to the RGZ. This clip is the basis for the final calculation of works. A snapshot for mapping is submitted to the Republic Geodetic Authority. The position includes the payment of the cost of mapping to the Republic Geodetic Authority. The calculation is carried out pausally sum for all works on the complete traffic area.

4.2.3 II Earthworks Method of Measurement

Item 2,03 "Excavation in the wide trench" includes:

It is anticipated that 95% digging will be done by machine and 5% manually. . Calculation of finished works is done per m³ of excavated, self-propelled material with pushing up to 20 m, prepared ground transport material. Fi1=182.94 m³, Fi2=0.57m³

Item 2,05 "Compaction of the subsoil" includes:

Compacting of the subsoil should be executed with mechanical means. It is required to compact the substrate according to the standard Proctor process 100% of the maximum laboratory compactness, and in depth to d = 50 cm. Calculation of performed works is carried out per m² of charged subsoil for all work, material and control tests

Item 2,06 "Forming of the sand embankment, or materials of the same characteristics specified in the technical conditions" includes:

The work on the construction of sand dunes involves the supply of sand with the driveway, bulk heading, disassembling, necessary wetting, planning, padding according to regulations and inspection. Calculation and payment is done per m³ of derived (charged) embankment.

F_{n1}=3464.44m³, F_{n2}=11055.11m³

Item 2,09 "Treatment of the sub grade consists" includes:

of the design of the bed at projected angles and complementary compaction across the entire width of the plain to the required compaction. To test the compression of the bed, perform an experimental circular plate of diameter $d = 30 \text{ cm}$, requiring a minimum value of the compression module $M_s = 25 \text{ MN / m}^2$. Calculation of performed works is done per m^2 for all work and material, with control tests.

Item 2,12 "Spreading of the earthlike material in the landfill" includes:

The excess of humus and excavated earth material of the material up to category III that was brought to the landfill, spread to the landfill in the layers. The calculation of finished works is performed per m^3 of self-contained, extensive, material, for work and material.

Item 2,13 "Transportation of earthlike materials" includes:

The excess of excavation of humus and earth material and the delivery of materials from the buoyancy or humidification category up to III category, loaded and transported to the landfill or to the location of the embedding, at a distance from the pre-invoicing of the works. This position includes loading into vehicles, transport, unloading and rough handling.

The calculation of performed works is done per m^3 of loaded, transported, unloaded and roughly woven material in self-standing condition.

4.3 WATER SUPPLY

4.3.1 External water supply

4.3.1.1 I Geodetic works Method of Measurement

Item 1 "Staking and marking of pipeline route" includes:

Prior to the commencement of construction works, stake out and mark the pipeline route and issue the protocol, and record of as-built design with introduction of data in KAT-KOM. Regular controls during work execution are done by the contractor and supervisory organ.

Calculation per m' of pipeline.

- Sanitary water supply network
- Hydrant network

4.3.1.2 II Ground works Method of Measurement

Item 1 "Mechanical excavation of the trench" includes:

Trench excavation with soil trimming in backfilled terrain width 0.8 (1.0) m, maximum depth of 1.50 m, with deposition of material on one side at minimum distance of 1.0 m from the trench edge, or direct loading in a transport vehicle for transport to a landfill.

Position price includes all required works and costs for marking the excavation by warning signs, security and maintenance of the trench until complete finalization of works.

Calculation per m3 of excavated compact soil, for all required works and materials.

- Sanitary water supply network
- Hydrant network

Item 2 "Manual excavation of the trench" includes:

Trench excavation with soil trimming in backfilled terrain width 1.0 and 0.8 m, maximum depth 1.50 m, with deposition of material on one side at min. distance of 1.0 m from the trench edge.

Position price includes all required works and costs for marking the excavation by warning signs, security and maintenance of the trench until complete finalization of works.

Calculation per m3 of excavated compact soil, for all required works and materials.

Item 3 "Making of sand bedding, hp=10 cm" includes:

Price includes purchase, delivery, transport along the trench, installation in the trench, planning and compacting of sand. Sand bedding load should be $M_e > 15$ Mpa.

Calculation per m3 of installed compacted sand, for all required works and materials.

Item 4 "Backfilling of the trench by sand" includes:

Price includes purchase, delivery, transport along the trench, installation in the trench, and compacting of sand around the pipe and 30 cm above the pipe top.

Calculation per m3 of installed compacted sand, for all required works and materials.

Item 5 "Backfilling of the trench by soil from the excavation" includes:

Backfilling of the trench by soil from the excavation in layers of 30 cm, up to natural density.

Calculation per m³ of backfilled compacted trench, for all required works and materials.

Item 6 "Transport of excess soil from the trench. ATD 10 km" includes:

Price includes transport of excavated material to a landfill ATD 10 km, unloading and planning of the material.

Calculation per m³ of transported compact material, for all required works and materials.

4.3.1.3 III Carpentry works Method of Measurement

Item 1 "Shoring of trench sides" includes:

Position price includes: purchase of material, transport to the site, transport along the trench, installation and maintenance of the support during work execution, disassembly, stacking, loading and transport from the site.

Calculation per m' of trench where the shoring was done, for all required works and material.

4.3.1.4 IV Installation works Method of Measurement

Item 1 includes:

Purchase of materials, loading, transport to the site, unloading, delivery along the trench and installation of all fittings, valves and pipes, with required seals and connection material. Average transport distance (ATD) is 10 km.

a) Pipes

Water pipes made of polyethylene PE-100, NP 10 bar, Ø110 mm (ND 100 mm)

Water pipes made of polyethylene PE-100, NP 10 bar, Ø75 mm (ND 65 mm)

Water pipes made of polyethylene PE-100, NP 10 bar, Ø 65 mm (ND 50 mm)

Water pipes made of polyethylene PE-100, NP 10 bar, Ø 40 mm (ND 32 mm)

Item 2 includes:

Compact pressure boosting system according to DIN 1988 and DIN EN 806, for direct or indirect connection.

Consisting of non-self-priming, parallel-connected, vertical stainless steel high-pressure centrifugal pumps in glanded design. Ready for connection with stainless steel piping mounted on base frame, incl. control unit with all necessary measuring and setting devices.

For fully automatic water supply and pressure boosting in residential, office and administration buildings, hotels, hospitals, department stores and industrial systems.

For pumping hydrant water or other service water which does not chemically or mechanically attack the materials used and does not contain abrasive or long-fibre components.

Piping within the system, made of stainless steel, fittings within the system, made of brass, for automatic operation in compact design, stable and low-vibration installed, pump design with normal suction, pressure vessel on the discharge pressure side.

Nominal duty point:

Volume flow	36 m ³ /h
System delivery pressure	3,5 bar

Specifications:

Min flow system	15 m ³ /h
Max flow	80 m ³ /h
Head max	77.8 m
Number of pumps	2
Maximum operating pressure	16 bar
Maximum inlet pressure	8,2 bar
Manifold inlet	DN100
Manifold outlet	DN100
Pressure rating	PN 16
Mains frequency	50 Hz
Rated voltage	3 x 380-415 V
Enclosure class (IEC 34-5)	IP54

Calculation for complete pressure boosting system including installation and commissioning

e.g. Grundfos Hydro MPC-S 2 CR32-4 U4 D-C-A-A or equivalent.

Item 3 includes:

Compact pressure boosting system according to DIN 1988 and DIN EN 806, for direct or indirect connection.

Consisting of non-self-priming, parallel-connected, vertical stainless steel high-pressure centrifugal pumps in glanded design. Ready for connection with stainless steel piping mounted on base frame, incl. control unit with all necessary measuring and setting devices.

For fully automatic water supply and pressure boosting in residential, office and administration buildings, hotels, hospitals, department stores and industrial systems.

For pumping drinking water or other service water which does not chemically or mechanically attack the materials used and does not contain abrasive or long-fibre components.

Piping within the system, made of stainless steel, fittings within the system, made of brass, for automatic operation in compact design, stable and low-vibration installed, pump design with normal suction, pressure vessel on the discharge pressure side.

Nominal duty point:

Volume flow	2,5 m ³ /h
System delivery pressure	3,1 bar

Specifications:

Min flow system	0.8 m ³ /h
Max flow	5.8 m ³ /h
Head max	36 m
Number of pumps	2
Pump housing	Cast iron
Manifolds	Stainless steel
Maximum operating pressure	10 bar
Maximum inlet pressure	PN 10 bar
Flange standard	DIN ISO 7/1
Manifold inlet	R 2
Manifold outlet	R 2
Mains frequency	50 Hz
Rated voltage	3 x 380-415 V
Start. method	electronically
Enclosure class (IEC 34-5)	IP54

Calculation for complete pressure boosting system including installation and commissioning

e.g. Grundfos Hydro Multi-E 2 CRE1-4 U1 A-A-A-A or equivalent.

Item 4 includes:

Purchase and installation of standpipe.

Calculation for completely installed standpipe.

Item 5 includes:

Purchase and installation of valves with all required equipment (flange adaptors, flanges ...).

Calculation for completely installed valve.

4.3.1.5 V Concrete works Method of Measurement

Item 2 "Construction of concrete slabs" includes:

Construction of concrete slabs d=15 cm, out of compacted concrete MB20, around the standpipes and round cover cap.

* Around the standpipe and cover dim. 100x50/15 cm

* Around the cover cap dim. 30x30/15 cm

Item 3 "Construction and installation of a water meter" includes:

Purchase of material, transport, for making of inspection shaft (all in line with detail). Works include planning of the trench bottom and making of concrete screed, installation of concrete, installation of cast iron ladders, purchase and installation of sewerage cover, 600 mm in diameter.

Calculation per completed shaft for all work and material.

Item 4 "Construction and installation of well pump shaft" includes:

Purchase of material, transport, for making of shaft (all in line with detail). Works include planning of the trench bottom and making of concrete screed, installation of concrete, installation of cast iron ladders, purchase and installation of steel cover, 600 mm in diameter.

Calculation per completed shaft for all work and material.

4.3.1.6 VI Other works Method of Measurement

Item 1 "Pressure testing of the pipeline" includes:

Position price includes work and material required for performing individual and group testing of installed pipeline in line with applicable regulations.

Calculation is done per m' of pipeline route where the works were executed.

Item 2 "Flushing, disinfection of pipeline and bacteriological examination of water" includes:

Position price includes work and material required for obtaining a certificate on water quality sampled from the newly constructed pipeline, in line with applicable regulations.

Calculation is done per m' of pipeline route where the works were executed.

Item 3 "Placing a temporary pedestrian crossing" includes:

Place wooden pedestrian crossings made of quality wood at each 100 m of the route. Price includes purchase of material, transport to the site, making and maintenance of the crossing during construction works, disassembly and transport of materials after completion of works.

Calculation per piece of pedestrian crossing.

Item 4 "Lowering the ground water level" includes:

Lowering the water level is done by waterpoints, during excavation of the trench, bottom planning, strutting, installation works, construction of shafts and backfilling above the level of ground water.

Position price includes all work and material designed for this type of work.

Calculation shall be done per full hour of drainage.

Designed time of water drainage by waterpoints is

Item 5 "Purchase, transport and placing a cabinet for standpipe equipment" includes:

The cabinet consists of 2 trevira hoses 52 15m long, nozzle, key and other required equipment for hydrants outside the object.

Calculation per piece of installed cabinet.

4.3.2 Internal water supply

4.3.2.1 I Water supply installation Method of Measurement

Item 1 includes:

Purchase and installation of polypropylene (plastic) water supply pipes with all required fittings on the pipe network. The position includes hanging of pipes on the wall and structure, chiseling and penetrating through walls of mezzanine structure, as well as required excavation with backfilling.

Calculation per m of finished pipeline.

- Ø20,DN 15 mm
- Ø25,DN 20 mm
- Ø32,DN 25 mm

Item 2 includes:

Pressure testing of the pipeline. Replace the defective pipes or joints.

Calculated as flat rate.

Item 3 includes:

Disinfection and bacteriological examination of the pipeline.

Calculated as flat rate.

Item 4 includes:

Purchase and installation of electric water heater, under pressure.

Calculation for completely installed heater.

V = 50 l., V = 10 l.

Item 5 includes:

Purchase and installation of thermal insulation for pipes out of POLYURETHANE or other proper foam insulator.

Calculation per m'.

- Ø 15-20 mm
- Ø 25-40 mm

4.3.2.2 II Sanitary devices Method of Measurement

Item 1 includes:

Purchase, transport and installation of a complete white fayans washbasin, II class. Washbasin size is 55/44 cm. Equip the washbasin with drain siphon Ø32 with a plug with ball chain and rosette.

Making and installation of fixings or plastic pins in wall for fixing the washbasin is included in work price.

Calculation per piece for work and material.

Item 2 includes:

Purchase, transport and installation of a complete white fayans accessible washbasin, II class. Washbasin size is 64/55 cm. Equip the washbasin with drain siphon Ø32 with a plug with ball chain and rosette. Making and installation of fixings or plastic pins in wall for fixing the washbasin is included in work price. Produced by JIKA Laufen group or appropriate.

Calculation per piece for work and material.

Item 3 includes:

Purchase, transport and installation of a complete metal washbasin, II class. Washbasin size is 45/35 cm. Equip the washbasin with drain siphon Ø32 with a plug with ball chain and rosette. Making and installation of fixings or plastic pins in wall for fixing the washbasin is included in work price.

Calculation per piece for work and material.

Item 4 includes:

Purchase, transport and installation of a complete white fayans toilet, II class. Mount an EK valve Ø15 mm with a nickel cap on the water inlet into the cistern. Mount a seat made of plastic on the toilet pan. Equip the toilet with low level wall mounted cistern, single flush type with plastic flush pipe and other required material. The price includes all joining and sealing material.

Calculation per completely mounted and tested device.

Item 5 includes:

Purchase, transport and installation of the entire sanitary equipment for WC, for people with disabilities, which consists of: console ceramic WC pan for people with disabilities, class I, and concealed cistern for 6 l flushing, raised above the floor min. 6 cm and a seat and lid, and an activation button. Produced by INCEA.

Calculation per piece for work and material.

Item 6 includes:

Purchase, transport and installation of white fayans trocadero, domestic production, with a grid, cistern, flush pipe and required sealing material.

Calculation per piece for work and material.

Item 7 includes:

Purchase and installation of fayans urinal which consists of: urinal pan, siphon set, flush valve with elbow valve, PE drain elbow Ø50 mm, flat valve DN 15.

Calculation for completely installed urinal.

Item 8 includes:

Purchase, transport and installation of the entire sanitary equipment for Asian style WC pan (retention room) which consists of: metal Asian style WC pan, concealed flush cistern with activation button.

Calculation per piece for work and material.

4.3.2.3 III Sanitary fittings Method of Measurement

Item 1 includes:

Standing single lever mixer for hot and cold water with flexible connections and outlet for washbasin.

Calculation per pc.

Item 2 includes:

Standing single lever mixer for hot and cold water with flexible connections and outlet for kitchen sink.

Calculation per pc.

Item 3 includes:

Standing single lever mixer for hot and cold water with flexible connections and outlet for accessible washbasin.

Calculation per pc.

Item 4 includes:

Purchase and installation of wall mounted single lever mixer for hot and cold water with a fixed outlet for trocadero.

Calculation per pc.

Item 5 includes:

Purchase and installation of gate valve with internal thread:

- gate valve with a wheel: Ø 20 mm
- EK valve
- water heater relief valve: Ø 15 mm

Item 6 includes:

Required accessories in bathrooms and toilets, as selected by the Supervisor, with all required fixing material:

- paper towel dispenser produced by "Kimberly-Clark" or similar
- toilet paper dispenser produced by "Kimberly-Clark" or similar
- dispenser produced by "Kimberly-Clark" or similar
- hangers-hooks for suits (mounted on the internal we cabin door)
- WC brush
- mirror, dimensions 150x80 cm
- mirror, dimensions 70x80 cm
- mirror, dimensions 60*80 cm for people with disabilities
- fixed wall grab bar for people with disabilities

- mobile wall grab bar for people with disabilities
- hand dryer

4.3.2.4 IV Hydrant network Method of Measurement

Item 1 includes:

Purchase and installation of galvanized water supply pipes with all required fittings on the pipe network. Position includes hanging of pipes on the wall and structure. The position includes all required material for sealing the pipe joints and anticorrosion protection of the pipeline.

Calculation per m' of finished pipeline.

Ø 50 mm

Ø 65 mm

Item 2 includes:

Purchase and installation of thermal insulation for pipes out of POLYURETHANE or other proper foam insulator.

Calculation per m'.

Ø 50 mm

Ø 65 mm

Item 3 includes:

Purchase, transport and installation of complete wall hydrant. Hydrant consists of a steel cabinet, standard dimensions 50x50 cm, with a lock. Trevira hose Ø50 mm with a proper nozzle fixed to the end of the hose is placed in the cabinet. The other end of the hose is connected to the hydrant - union valve. Inlet vertical is placed next to the hydrant cabinet. Inclined union valve with a wheel Ø50 mm installed at the end of the pipe is included in price. Position includes purchase and installation of plugs for screws and hanging the hydrant.

Calculation per entire hydrant, installed and tested.

4.3.3 Well structure and design geological

4.3.3.1 I well structure Method of Measurement

Item 1 includes:

Making of structural bore Ø146 mm, direct method with continuous monitoring of lithology of extracted material and other occurrences important for defining hydro-geological characteristics.

Calculation per m' of bore.

Item 2 includes:

Electric - bore hole logging (own potential, gamma-gamma and electrical resistance). Price includes services of measuring set, definition of well structure and making of a report in three copies. Bore hole logging serve to detect the most perspective layers for placing filters in those zones. This method will determine the most optimal conditions for catching ground water;

Calculated as flat rate.

Item 3 includes:

Extension of the bore hole by a chisel \varnothing 240 mm with flushing by light bentonite slurries in interval between 0.0 and 98.0 m.

Item 4 includes:

Purchase, preparation and installation of PVC well structure:

1. Water well column \varnothing 125 mm, in interval from + 0.5 to 70.0 m.
2. Perforated filters \varnothing 125 mm with PVC screen and galvanized wire \varnothing 4 mm, in intervals 70.0 - 73.0 m, 80.0 - 82.0 m, 86.0 - 89.0 m, 96.0 - 100.0 m, 110.0 - 112.0 m, 132.0 - 136.0 m;
3. Intermediate filters \varnothing 125 mm, in intervals 73.0 - 80.0 m, 82.0 - 86.0 m, 89.0 - 96.0 m, 100.0 - 110.0 m, 112.0 - 132.0 m;
4. Settler \varnothing 125 mm, in interval 136.0 to 140.0 m;

Item 5 includes:

Purchase, preparation and installation of filter backfill our of granulated quartz aggregate d=1-3 mm, in interval from 140.00 to 60.00 m.

Item 6 includes:

Insulation of aquifer with clay, with swelling properties, in interval 60.00 - 55.00 m.

Item 7 includes:

Purchase and installation of backfill made of drilled material, in ring interspace above the clay tampon in interval 55.00 to 0.00 m.

Item 8 includes:

Development of the well by a pumping station, by stages, with packers up to clarification.

Item 9 includes:

Testing the well with three lowerings and rising of level, during 24 h

Item 10 includes:

Making of technical report on executed works with certificates for installed material and recommendations for further exploitation;

4.4 SEWERAGE

4.4.1 External Sewerage

4.4.1.1 I Geodetic works Method of Measurement

Item 1 "Staking and marking of pipeline route" includes:

Prior to the commencement of construction works, stake out and mark the pipeline route and issue the protocol, and record of as-built design with introduction of data in KAT-KOM. Regular controls during work execution are done by the contractor and supervisory organ.

Calculation per m' of pipeline.

- Sewerage network

4.4.1.2 II Ground works Method of Measurement

Item 1 "Mechanical excavation of the trench" includes:

Trench excavation with soil trimming in backfilled terrain width 0.8 (1.0) m, maximum depth of 1.50 m, with deposition of material on one side at minimum distance of 1.0 m from the trench edge, or direct loading in a transport vehicle for transport to a landfill.

Position price includes all required works and costs for marking the excavation by warning signs, security and maintenance of the trench until complete finalization of works.

Calculation per m3 of excavated compact soil, for all required works and materials.

Item 2 "Manual excavation of the trench" includes:

Trench excavation with soil trimming in backfilled terrain width 1.0 and 0.8 m, maximum depth 1.50 m, with deposition of material on one side at min. distance of 1.0 m from the trench edge.

Position price includes all required works and costs for marking the excavation by warning signs, security and maintenance of the trench until complete finalization of works.

Calculation per m3 of excavated compact soil, for all required works and materials.

Item 3 "Making of sand bedding, hp=10 cm" includes:

Price includes purchase, delivery, transport along the trench, installation in the trench, planning and compacting of sand. Sand bedding load should be $M_e > 15$ Mpa.

Calculation per m3 of installed compacted sand, for all required works and materials.

Item 4 "Backfilling of the trench by sand" includes:

Price includes purchase, delivery, transport along the trench, installation in the trench, and compacting of sand around the pipe and 30 cm above the pipe top.

Calculation per m3 of installed compacted sand, for all required works and materials.

Item 5 "Backfilling of the trench by soil from the excavation" includes:

Backfilling of the trench by soil from the excavation in layers of 30 cm, up to natural density.

Calculation per m³ of backfilled compacted trench, for all required works and materials.

Item 6 "Transport of excess soil from the trench. ATD 10 km" includes:

Price includes transport of excavated material to a landfill ATD 10 km, unloading and planning of the material.

Calculation per m³ of transported compact material, for all required works and materials.

4.4.1.3 III Carpentry works Method of Measurement

Item 1 "Shoring of trench" includes:

Position price includes: purchase of material, transport to the site, transport along the trench, installation and maintenance of the support during work execution, disassembly, stacking, loading and transport from the site.

Calculation per m' of trench where the shoring was done, for all required works and material.

4.4.1.4 IV Installation works Method of Measurement

Item 1 includes:

Purchase of materials, loading, transport to the site, unloading, delivery along the trench and installation of all fittings, valves and pipes, with required seals and connection material. Average transport distance (ATD) is 10 km.

b) Main fecal sewerage route

PVC pipes Ø160 mm, class C-20, length L=1.0 m.

KGF lead-in made of PVC Ø160 mm for installation in concrete.

Item 2 includes:

Purchase and installation of pump for draining the tank.

Calculation for completely installed pump.

4.4.1.5 V Concrete works Method of Measurement

Item 1 "Making and installation of RC shafts Ø 1000 mm" includes:

Purchase of material, transport, for making of inspection shaft (all in line with detail). Works include planning of the trench bottom and making of concrete screed, installation of concrete, installation of cast iron ladders, purchase and installation of sewerage cover, 600 mm in diameter.

Calculation per completed shaft for all work and material.

4.4.1.6 VI Other works Method of Measurement

Item 3 "Placing a temporary pedestrian crossing" includes:

Place wooden pedestrian crossings made of quality wood at each 100 m of the route. Price includes purchase of material, transport to the site, making and maintenance of the crossing during construction works, disassembly and transport of materials after completion of works.

Calculation per piece of pedestrian crossing.

Item 4 "Lowering the ground water level" includes:

Lowering the water level is done by waterpoints, during excavation of the trench, bottom planning, strutting, installation works, construction of shafts and backfilling above the level of ground water.

Position price includes all work and material designed for this type of work.

Calculation shall be done per full hour of drainage.

Designed time of water drainage by waterpoints is

Item 6 "Testing the watertightness of joints" includes:

Testing of sewerage pipes, by water under pressure, separately for each part of sewerage (from shaft to shaft), all in line with regulations for this type of works. Replace the defective pipes or joints. Make a record of the performed testing.

Calculation per m' of tested pipeline.

Item 7 "Excavation, backfilling by crushed stone and concreting of bottom, retaining layer of waste water purifier" includes:

Calculation per piece of installed prefabricated wastewater treatment plant.

- excavation

- backfilling by crushed stone 30 cm

- concreting of the bottom retaining layer 30 cm

Item 8 "Purchase, transport and installation of waste water treatment plant" includes:

Prefabricated Wastewater Treatment Plant including treatment processes: Mechanical pre-treatment, Biological treatment by activated sludge and sludge separation in final sedimentation tank in accordance with EN 12566, Population Equivalent 80.

Wastewater treatment plant type ACO CLARA TYPE BOD5 48-96, or equivalent.

Installation per producer's instructions.

Calculation per piece of installed treatment plant.

Item 9 "Purchase, transport and installation of shaft cover for waste water treatment plant" includes:

Purchase, transport and installation of sewerage cover, diameter 600 mm, class D400.

Calculation per piece of installed cover.

4.4.2 Internal water supply

4.4.2.1 I Sewerage installation Method of Measurement

Item 1 includes:

Purchase and installation of PVC sewerage pipes with proper fittings. Pipes are installed by hanging, chiseling and penetrating through walls of mezzanine structure or by burying in walls or floors in a strictly designed drop of 2%. This position includes sealing material for pipe joints as well.

Calculation per m of finished pipeline. Sanitary devices

Ø 50 mm - PVC

Ø 75 mm - PVC

Ø 110 mm - PVC

Ø 160 mm - PVC

Item 2 includes:

Purchase and installation of PVC vent cap.

Calculation for completely installed vent cap.

Ø 110 mm

Item 3 includes:

Purchase and installation of vertical floor drains with plastic housing and chrome grid.

Calculation for completely installed drain.

Ø 50 mm

4.5 ATMOSHERIC SEWAGE

4.5.1 I Geodetic Works Method of Measurement

Item 1 "Marking and recording of sewer rout." includes:

Marking (stakeout) of sewer rout on field before beginning of construction, establishing benchmarks along the rout with a marking protocol. The calculation is conducted per m1 of marked pipeline.

- Surface water sewer - pipeline
- Connection pipeline
- Under road connection pipeline

Item 2 "Marking of as-build sewage" includes:

Marking (stakeout) of as-build sewer with the input of data in KAT-KOM. Perform a marking and make a cadastre of underground installations that should contain all installations and facilities on the route of the sewage system. Upon completion of the works, the contractor is obliged to submit to the Investor a certificate of performed geodetic marking of the implemented facility, issued by an authorized institution. The calculation is done per m marked pipeline.

4.5.2 II Earth Works Method of Measurement

Item 1 "Mechanical excavation for placing pipes" includes:

III category mehanical excavation with trench width $b=0.8 -1.2$ m. Digged material will be placed minimum 1.0m away from the trench or directly loaded on transport vehicles for disposal to a temporary landfill. Mechanical excavation is performed according to data from longitudinal section. The calculation is conducted per m3 of digged material. 80% of excavation will be done with machinery.

Item 2 "Manuall excavation for placing pipes" includes:

III category manual excavation with trench width $b=0.8 -1.2$ m. Digged material will be placed minimum 1.0m away from the trench. Manual excavation is performed according to data from longitudinal section. The calculation is conducted per m3 of digged material. 20% of excavation will be done manually.

Item 3 "Making the tranch bottom flat" includes:

Fine surface of the trench bottom is made manually with the accuracy of $+ - 1$ cm according to the levels and slopes data from the Project. Trench bottom must be made flat before the pipeline placing. Digged material must be placed 1.0 m away from the trench and trench must be placed under trench bracing.

After finishing the bottom of the trench, the compaction of the subsoil is carried out with mechanical means up to the required compaction, which is min. 15 MPa. The calculation is conducted per m2 flattend and compacted trench bottom.

Item 4 "Putting 10cm thick sand pipe bed" includes:

Putting sand pipe bed on the sewage network rout with planning precision of $+ - 1$ cm according to the projected elevations and downs. Trench width is 0.8 m. The price includes procurment, transposrt, inserting into the trench, planning and compacting. Load capacity of sand bed should be

$M_e > 1.5 \text{ kN/cm}^2$. Quantity according to the calculation of work. Calculation is conducted per m³ of finished work for all work and material.

Item 5 "Filling the trench with sand" includes:

Filling the trench with sand is carried out to the lower edge of pavement bed of the pavement structure or up to 30 cm above the pipe for sewage system in the green zone. The width of the trench is 0.8-1.2 m. Filling with sand is done in layers of 20 - 30 cm with simultaneous compacting and wetting. After finishing filling the trenching, carry out a load test. Calculation is conducted per m³ of filled trench in compressed state for all work and material.

Item 6 "Filling the trench with excavated soil" includes:

Filling the trench is done with selected excavated soil. Trench width is 0.8 m. The filling starts after checking the quality of the pipeline installation, that is, after geodetic survey of the installed pipeline, as well as filling of sand above the pipe in a layer of 30cm. Filling is done in layers of 20cm with mechanical compactin. Filling is done to the ground level. Calculation is conducted per m³ of filled trench in compressed state for all work and material.

Item 7 "The trench extension at the installation place of inspection manhole" includes:

The extension of the trench at the installation place of inspection chambers, construction pit should be 2.0x2.0 m, the average depth of the chambers is 2.5m. Calculation per m³ of excavated land. $2.0 \times 2.0 \times 2.5 = 10.0 \text{ m}^3$ $2.0 \times 0.8 \times 2.5 = 4.0 \text{ m}^3$ $10.0 - 4.0 = 6.0 \text{ m}^3 \times 22 = 132.0 \text{ m}^3$

Item 8 "Excavation for placing connection pipes between road drain and inspection manhole" includes:

Excavation of the trench for installation of drainage pipes and grids. Trench width is 0.8 m. Calculation per m³ of digged material.

Item 9 "Transport of surplus material to landfill determined by the Supervisor" includes:

To carry out the loading, transport, unloading and rough planning of land surplus from excavation to landfill, determined by the Supervisor. Transport distance is up to 10 km. Quantities for calculation are done by measuring the actually carried transported material in a loose state. Calculation of performed work is done per m³ of transported material.

4.5.3 III Timber works Method of Measurement

Item 1 "Wooden support for trench" includes:

The excavated trenches should be provided with the appropriate wooden support at 100% coverage of the trench. For the descent into the trench and out of it use the appropriate ladder. The excavated trench can not be left unsecured during the interruption of works (holidays, overnight, rest hours). Calculation is conducted per m² of supported surfaces for all work and material.

4.5.4 IV Assembly works Method of Measurement

Item 1 "Corrugated sewer pipes" includes:

Acquiring, transport and placing of corrugated pipes PEHD SN 8 and their fittings. Pipe connection is muff and rubber caulker, i.e. joint. Pipes are placed in previously prepared sand bed, according the Project and technical recommendations for this type of pipes. Price includes all necessary material, preparation works and labour. Cost will be calculated per m.

- PEHD pipe Ø 500 mm
- PEHD pipe Ø 400 mm
- PEHD pipe Ø 300 mm
- PEHD pipe Ø 250 mm
- PEHD pipe Ø 200 mm
- PEHD pipe Ø 150 mm

Item 2 "Short corrugated sewer pipes" includes:

Acquiring, transport and placing of short corrugated pipes PEHD and their fittings, L=1.0 m. Pipe connection is muff and rubber caulker, i.e. joint. Pipes are placed in previously prepared sand bed, according the Project and technical recommendations for this type of pipes. Price includes all necessary material, preparation works and labour. Cost will be calculated per piece.

- PEHD pipe Ø 500 mm
- PEHD pipe Ø 400 mm
- PEHD pipe Ø 300 mm
- PEHD pipe Ø 250 mm
- PEHD pipe Ø 200 mm
- PEHD pipe Ø 150 mm

Item 3 " Road manhole cover" includes:

Acquiring, transport and placing of ductile road manhole cover Ø600 with high carrying capacity and frame placed on manhole top. Cost will be calculated per piece.

- Cover for inspection manhole
- Cover for separator

Item 4 " Cast iron steps" includes:

Acquiring, transport and placing of cast iron steps placed inside manhole walls at a distance of 30 cm. Cost will be calculated per piece.

Item 5 "Coalesce separator for oil derivatives" includes:

Acquiring, transport and placing of coalesce separator for oil derivatives with bypass for separation of light oil derivatives from atmospheric rain water, max flow $Q_{max}=180$ l/s similar to ACO OLEOPATOR -K with BY-PASS. Price includes earth works, gravel bed h=30 cm, prefabricated reinforced concrete rings, finishing conic elements, manhole cover, connecting pipes and all completed work and materials. Cost will be calculated per separator piece.

Item 6 "Linear storm water drainage" includes:

Acquiring, transport and placing of ACO Monoblock RD elements or similar, for plateau linear drainage. Elements are made from polymer concrete and drain cover with high carrying traffic

capacity, 40 KN. Elements are embedded in concrete MB 30, concrete bed height from 20 to 30 cm. Concrete width is 30-35 cm. Price includes standard inflow and outflow elements. Cost will be calculated per m.

- RD 300 V
- RD 200 V

4.5.5 V Concrete works Method of Measurement

Item 1 "Manhole bottom slab" includes:

Production of manhole bottom slab from reinforced concrete MB 30, thickness 20 cm. Cost will be calculated per m³.

Item 2 "Prefabricated reinforced concrete rings Ø 1000 mm" includes:

Acquiring, transport and placing of prefabricated reinforced concrete rings Ø1000 mm for manhole construction. In manhole walls embed cast iron steps at a distance of 30 cm. Make the bottom of the manhole with concrete kinet. All wall surfaces and kinet should be overlaid with cement mortar 1: 2. Cost will be calculated per piece.

Item 3 "Finishing conic reinforced concrete ring" includes:

Acquiring, transport and placing of prefabricated finishing conic reinforced concrete rings Ø1000/700 mm for manhole construction. In manhole walls embed cast iron steps at a distance of 30 cm. All wall surfaces and kinet should be overlaid with cement mortar 1: 2. Cost will be calculated per piece.

Item 4 "Reinforced concrete manhole with inner dimensions 1.2*1.2 m and average depth 3 m" includes:

Acquiring, transport and placing of formwork and reinforcement bars for production square waterproof reinforced concrete manhole with inner dimensions 1.20*1.20 m and average depth 3.0 m. Wall thickness is 20 cm, thickness of bottom and upper slab is 20 cm. Price includes additional excavation and production of base layer from skinny concrete. In manhole walls embed cast iron steps at a distance of 30 cm. All wall surfaces and kinet should be overlaid with cement mortar 1:2. Cost will be calculated per piece.

Item 5 "Reinforced concrete manhole cover frame" includes:

Production of reinforced concrete frame MB 30, inner diameter 62.5 cm, for the inspection manhole cover. Price includes all necessary material, preparation works and labour. Cost will be calculated per piece.

Item 6 "Concrete road drain with grating" includes:

Acquiring, transport and placing of concrete road drain with road drain grating. Cost will be calculated per piece.

Item 7 "Outflow facility" includes:

Acquiring, transport and placing of reinforced concrete outflow facility with vertical grating according to Project. Width of outflow facility reinforced concrete is 1.40 m. Facility is placed at atmospheric water outflow drainage pipe in existing channel. Price includes paving the part of a trapezoidal

channel in a length of 4 m and width of 1.20 m, on both sides. Price also includes all necessary material, preparation works and labour.

Cost will be calculated per piece.

4.5.6 VI Miscellaneous works Method of Measurement

Item 2 "Recording a newly constructed sewage network with a special camera for sewage recording" includes:

Perform a recording of constructed pipeline with a special rotating head camera and device for recording gradient. The camera must be supplied with software from which the gradient level of the pipeline can be monitored. The professional service authorized to perform such works should be hired for recording. The Contractor is obliged to provide the Investor with the recorded material (CD) and the opinion of the expert service. Calculation is conducted per m' of recorded pipeline for all work and material.

Item 3 "Elaboration of as-built design" includes:

After completion of the sewage contractor is required to do a elaboration of as-built design if there were significant changes in relation to the design solution. The calculation of the performed work is done on a flat basis for the complete project of the as-built design.

Item 5 " Technical inspection " includes:

Technical inspection of the facility will be carried out by an accredited (authorized) institution.

The calculation shall be made on a flat basis by the invoice of an accredited (authorized) institution.

4.6 ELECTRIC INSTALLATION

4.6.1 I Preparation works Method of Measurement

Item 1 includes:

Removal of existing equipment, cables and installation equipment and unbundling in existing distribution cabinets from which they are supplied. The equipment is stored in the appropriate place and handed over to the Investor.

The equipment to be disassembled is as follows:

- existing external cable distribution
- existing pillars of exterior lighting
- existing exterior lighting lamps
- existing distribution cabinets
- existing electrical equipment (sockets, switches, electrical switches ...)
- current lightning installation

Item 2 includes:

Visits to the site prior to the beginning of the performance of the Contractor's representative, the examination of the terrain and possible preliminary tests of the existing installations

Item 3 includes:

Possible correction of the project on the proposal of the contractor to make savings and easier performance

4.6.2 II Cabel Sewage Method of Measurement

A cable sewage system is designed. This system involves the excavation of a trench in which pipes will be installed through which the cables for supplying the distribution cabinets and external lighting will be routed, as well as the pipes through which the sewage signaling cables, structural cable system and video surveillance will be routed. Sewage is dimensioned according to Technical Recommendation no. 3 (Selection and laying of power cables in power distribution networks).

Item 1 includes:

Geometric marking of the cable trunk route. The protocol is handed over to the investor or on paper control at the very beginning of the work. Calculation per meter of the route.

Item 2 includes:

Control excavation ("stitching") to determine the exact position of existing installations. The frame dimensions of the control trench are: width 0,4m, depth 1 - 1,2m, and length 2-3m. Calculation per cubic meter.

Item 4 includes:

Delivery and installation of concrete shaft for cable sewage, type DO-1.

Concrete shaft, equivalent to type DO-1, internal dimensions 800x1000x1000, concrete MB-350, prefabricated concrete elements, "ELPOS" Belgrade or equivalent. In the price calculate the excavation of the cave for setting up the shaft and the cover for the shaft intended for havy traffic.

Item 5 includes:

Delivery and installation of concrete shaft for cable sewage, type PO-2.

Concrete shaft, equivalent to type PO-2, internal dimensions 600x1200x1000, concrete MB-350, prefabricated concrete elements, "ELPOS" Belgrade or equivalent. In the price calculate the excavation of the cave for setting up the shaft and the cover for the shaft intended for heavy traffic.

Item 6 includes:

Excavation of cable trench.

Combined excavation of cable trenches depth up to 1,0 m in soil category 3. Together with filling in the trench in layers is not thicker than 20cm, cleaning and bringing the route into the original condition. Place a warning tape over the cable. Width of the tape 0.4m. Calculation per meter of route excavated.

Item 8 includes:

Delivery and installation of red PVC pipes in cable trench.

Red PVC pipes ϕ 110 / 3,2mm for EE cables. Pipes are placed at the bottom of the trench, on the sand layer, one next to the other. Pipes are placed in a type carrier (comb) for three tubes ϕ 110mm.

Item 15 includes:

Recording of the route of laid cables with the production of the catastrophe of the derived state. The record is submitted to the investor at the end of the works - before the completion of the finished situation, in paper and digital form on a CD in ACAD - "*.DWG" format (with a table of absolute coordinates of the breakpoints of the cable trace). This clip is the basis for the final billing. Calculation per meter of cable length.

4.6.3 III Police and custom objects Method of Measurement

Item 1 includes:

Power cables. Cables are laid through PVC pipes Φ 110mm that are laid in a previously excavated cable trench. Cables are of the type and cross-section as given in the specification and calculations.

- PP00-A 4x150mm² (for powering GRO-UC)
- PP00-A 4x150mm² (for powering GRO-Police)
- PP00 5x4mm² (for powering RT-KK4)
- PP00 5x4mm² (for powering RT-KK13)
- PP00 5x4mm² (for powering RT-KK14)
- PP00 5x4mm² (for powering RT-KK15)
- PP00 5x4mm² (for powering RT-KK16)
- PP00 5x4mm² (for powering PT-KK16a)

Item 2 includes:

Delivery and installation of cables for air conditioning and ventilation system:

The cables are placed on the wall beneath the mortar, through PVC pipes.

- PP00 5x6mm² (for powering VRV S1) police

- PP00 3x2.5mm² (for powering INV S2) REK MUP
- PP00 3x2.5mm² (for powering INV S3) KK 4
- PP00 3x2.5mm² (for powering INV S4) REK UC
- PP00 5x6mm² (for powering VRV S5) UC
- PP00 3x2.5mm² (for powering INV S6) KK 14
- PP00 3x2.5mm² (for powering INV S7) KK 16a
- PP00 3x2.5mm² (for powering INV S14) KK 13
- PP00 3x2.5mm² (for powering INV S15) KK 15
- PP00 3x2.5mm² (for powering INV S16) KK 16

Item 3 includes:

Delivery and installation of the following lamp:S1 - ARCO DLM 2, BUCK, 33W, 4000lm, 4000K, CRI80 or equivalent.

Built-in lighting for general lighting. Double Dark Parabolic Matt Dark Alloy 99.9% Anodized aluminum with a silver diffuse reflection coating designed to provide efficient illumination with limited glare, according to EN 12464 - UGR <16, cut off limit 65 °, L <200 cd / m², LOR> 90%. Light source LED modules interchangeable, life span min. 60,000h with characteristic L80B10 / SDCMZ. Power supplies and light sources are from renowned manufacturers (Philips, Vosslox, ...). Dimensions of the lamp 595x595x60mm.The lamp is serviceable, warranty is 5 years.

Item 4 includes:

Delivery and installation of the following lamp:S2 - ASTRA DO, BUCK, 17W, 2000lm, 4000K, CRI80 or equivalent.

B57 Prize-hanging Industrial High BAU LED luminaire with aluminum sheet housing, housing design ensures good cooling at high ambient temperatures, which ensures reliable and long-lasting operation of the luminaire, UV-stable PMMA lenses do not yellow in time and have an optical efficiency of 99%; the lamp is designed for ambient temperature from -20 ° C to + 50 ° C. Light source 2xLED module interchangeable according to the ZHAGA standard, lifetime LED module min. 75,000h with characteristic L70B10 / SDCMZ. Power supplies and light sources are from renowned manufacturers (Philips, Vossloh, ...). The luminaire in the separate part has a positioned driver, insulation class II, equipped with quick connectors and mounting accessories.The lamp is serviceable, warranty is 5 years.

Item 5 includes:

Delivery and installation of the following lamp:S3 - ORIEN CDP 2, BUCK, 38W, 3500lm, 4000K, CRI80 or equivalent.

Direct-lighting headlamp. Housing made of steel sheet steel, 0.6 mm thick, finished with polyurethane powder coating. A glossy aluminum raster for increased energy efficiency. The highly transparent diffuser of the micropismatic structure provides protection against glare and uniform diffused light. The shielding film provides a uniformly illuminated surface, without the presence of a light source for full visual comfort (UGR <19). The lamp is serviceable. Light source 2 x Fortimo LED Strip 2ft, Characteristic, Ra> 80, 4.000K exchangeable according to the ZHAGA standard, life span 50.000h with L80B10 / SDCM characteristics 3. The switching accessories and LED light sources are EU or domestic origin from renowned manufacturers (Philips , VosslohSchwabe ...). Dimensions of the lamp 600x466x58mm.The lamp is serviceable, warranty is 5 years.

Item 6 includes:

Delivery and installation of the following lamp: S4 - CENT, BUCK, 11W, 800lm, 4000K, CRI90, 60 or equivalent.

Built-in fixed lighting for general lighting. Housing made of cast aluminum, finely protected epoxy polyester with fine silica texture. Suitable for mounting in all types of suspended ceilings with the possibility of sizing, the dimensions of the lamp $\varnothing 76$, h = 120mm. Light source LED module features Ra > 80, 4.000K, interchangeable according to the international ZHAGA standard. LED module lifetime min. 50.000h with characteristic L80B10. Intelligent accessories and light sources are EU or domestic origin, from renowned manufacturers (Philips, Osram, VosslohSchwabe ...). The lamp is serviceable, warranty is 5 years.

Item 8 includes:

Delivery and installation of the following lamp: PANIK P1.

Antipanic lamp, 8W, with the inscription "EXIT". The lamp has a working autonomy of 3h. Built-in / overhead lighting fixture, with local power supply in a permanent or stand-by connection, optional SA / SE, made of V2 self-extinguishing polycarbonate with transparent, polycarbonate diffuser. Luminaire complete with LiFePO 6,4V battery, 1h autonomy, with energy efficient electronic charger, charging time max. 12h. Light source LED module 1W, 135lm. The luminaire is equipped with an electronic self-test kit AT and battery protection against total discharge, as well as a LED indicator of the status of the network and the battery. Supplied with the appropriate sticker with the "EXIT" pictogram.

Item 9 includes:

Delivery and installation of the following lamp: PANIK P2.

Antipanic lamp, 8W, with up and down direction indicator. The lamp has a working autonomy of 3h. Built-in / overhead lighting fixture, with local power supply in a permanent or stand-by connection, optional SA / SE, made of V2 self-extinguishing polycarbonate with transparent, polycarbonate diffuser. Luminaire complete with LiFePO 6,4V battery, 1h autonomy, with energy efficient electronic charger, charging time max. 12h. Light source LED module 1W, 135lm. The luminaire is equipped with an electronic self-test kit AT and battery protection against total discharge, as well as a LED indicator of the status of the network and the battery. It is delivered with the appropriate sticker with the pictogram ↓.

Item 10 includes:

Delivery and installation of the following lamp: PANIK P3.

Antipanic lamp, 8W, with left-right direction indicator. The lamp has a working autonomy of 3h. Built-in / overhead lighting fixture, with local power supply in a permanent or stand-by connection, optional SA / SE, made of V2 self-extinguishing polycarbonate with transparent, polycarbonate diffuser. Luminaire complete with LiFePO 6,4V battery, 1h autonomy, with energy efficient electronic charger, charging time max. 12h. Light source LED module 1W, 135lm. The luminaire is equipped with an electronic self-test kit AT and battery protection against total discharge, as well as a LED indicator of the status of the network and the battery. Supplied with the appropriate sticker with the pictogram →; ←.

Item 15 includes:

	pcs
Delivery and installation of the distribution cabinet GRO-UC: Two-door double-deck door distribution cabinet, made of double-decked sheet of not less than 1.5mm thickness, RAL7035 colors. The wardrobe must have a self-adhesive pocket for accommodating project documentation. It is necessary to provide the possibility of locking the distribution cabinet with a type key. The dimensions of the cabinets should be adapted to accommodate the mentioned equipment while providing 20% of the spare space for the accommodation of the contingency equipment:	1
Hexagon switch, three-pole, nominal current $I_n = 150A$ for door installation.	1
Miniature circuit breaker - automatic fuse, single-pole, nominal current 6A, tripping beam B, breaking capacity 6kA. (signal lights, photo light for outdoor lighting)	8
Miniature circuit breaker - automatic fuse, single-pole, rated current 10A, tripping beam B, breaking capacity 6kA. (internal, external, panic)	18
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for modular outlets, PP central, REK	20
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for REK Klim	1
Miniature circuit breaker - automatic fuse, single-pole, rated current 25A, tripping beam B, breaking capacity 6kA. for climate VRV S5	3
Miniature circuit breaker - automatic fuse, single-pole, rated current 20A, tripping beam B, breaking capacity 6kA. for combined homes 1-6 (4,13,14,15,16,16a)	18
Miniature circuit breaker - automatic fuse, single-pole, rated current 20A, tripping beam B, breaking capacity 6kA. for RO-MAG	3
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for RT-VC	3
clamps, rails and other materials	3

Item 16 includes:

	pcs
Delivery and installation of distribution cabinet GRO-MUP: Two-door arc wiring cabinet, made of double-decked sheet with thickness not less than 1.5mm, color RAL7035. The wardrobe must have a self-adhesive pocket for fitting project documentation. It is necessary to provide the possibility of locking the distribution cabinet with a type key. The dimensions of the cabinets should be adapted to the accommodation of the mentioned equipment while providing 20% of the spare space for the accommodation of unpredictable equipment:	1
Hexagon switch, three-pole, nominal current $I_n = 80A$ for mounting on the door.	1
Miniature circuit breaker - automatic fuse, single-pole, nominal current 6A, tripping beam B, breaking capacity 6kA. (signal lights)	3
Miniature circuit breaker - automatic fuse, single-pole, rated current 10A, tripping beam B, breaking capacity 6kA. (internal, external, panic)	10
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for modular outlets, PP central, REK	17
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for REK Klim	1
Miniature circuit breaker - automatic fuse, single-pole, rated current 25A, tripping beam B, breaking capacity 6kA. for climate VRV S5	3
clamps, rails and other materials	3

Item 17 includes:

	pcs
Delivery and installation of distribution board RT-KK:	1
Miniature circuit breaker - automatic fuse, single-pole, rated current 10A, tripping beam B, breaking capacity 6kA. for lighting (internal, external, panic)	1
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for modular outlets, PP central, REK	1
Miniature circuit breaker - automatic fuse, single-pole, rated current 16A, tripping beam B, breaking capacity 6kA. for climate INVERTER	1
clamps, rails and other materials	3

4.6.4 VI External light Method of Measurement

Item 1 includes:

Geometric marking of cable route and position of candelabra pillars. The protocol is handed over to the investor on paper at the very beginning of work and can also be used to accurately determine the length of the cable due to the order. Calculation along the length meter of the route of all cable trenches. Kit with graphical and tabular specification of surfaces for picking up (type, location and quantity)!

Item 4 includes:

Construction of concrete foundation, dim 0,7x0,7x1,1m.

Construction of concrete foundation, concrete MB30 of given dimensions in meters. During the construction, install the pvc pipes f110mm and the double "K" ramp, pillar anchors and central hook f22 for transport and installation of the foundation ("K" crossbar and transport hook are placed in two vertical levels). A set with a foundation of a foundation made of rolled stone rubble with a thickness of 10cm. Calculation by done, transported and embedded concrete foundation. The dimensions and shape of the foundation will be determined for each pillar location depending on the installations in the vicinity! After the installation, sand is put around the foundation by watering with water (at the top of the earth, or the soil depending on the final appearance of the soil) - the compaction of the tampon and around the foundations is proven by the attestation, and it is defined in the drawing of the foundations.

Item 5 includes:

Lifting and installation of a galvanized tubular pillar with a console. Install the terminal box in the pillar. Set of P / F-Y 16mm² Pulp Kit with length 0,30 m with cable pads at both ends. A set with a marking of the pillar and painting in two layers of the base of the pillar with a special bituminous coating approximately 0.5kg per pillar. This corrosion-resistant mass is ordered at the pillar supplier.

Item 6 includes:

Making of the connection of the pillar and the ground with the help of a cross-cut SRPS N.B4.936 lead and Fe-Zn tape or Cu rope 25mm² (between the tape and the Cu rope is mandatory lead-in lead) with or without a pinched pedestal connected to the pivot earthing pin (the other end of the rope). The average length of the water is 2m. Calculation at the stairwell.

Item 7 includes:

Mechanical (and if necessary manual) excavation of a depth of 1,0 m in the green area, under the pedestrian paths and parking, or 1,4 m below the road; exceptionally in some places in agreement with the supervisory authority - depth as needed, in category III soil. The kit with the stuffing and stuffing in the layers does not thicken by 20 cm and by obtaining the certificates on the compaction of the soil (compaction according to the purpose of the surface!). Below the pedestrian walkway, the parking lot and the traffic jams are filled with sand. Calculation per excavation meter.

Item 8 includes:

Laying, in already excavated hollow at a depth of 90cm, galvanized steel strips Fe-Zn 30x4mm, SRPS N.B4.901, in a bed of fine earth 0.1m thick. Calculation by the meter of the laid tape.

Item 9 includes:

Papers on the implementation of measures of equalization of electrical potential. This implies the joining of all metal masses, which in normal operation are not under voltage (pipes, metal parts of shafts, pedestrian bridge railings, traffic protective reflective fences ...) using star-studded washers in a unique galvanic whole with a basic public lighting. Kit with all necessary material, with cut pieces, Cu rope 25mm² with an average length of 3m and a 25x4mm band with an average length of 2m for connecting the covers of the shafts, the bridge railings and other masses. Calculation at the stairwell.

Item 14 includes:

During the laying of cables and PVC pipes (before trenching), the tracking of laid cables, protective pipes and public lighting columns with the creation of a cadastre of the created state is recorded. The video is submitted to the Republic Geodetic Authority for Mapping and Investor. The record is submitted to the investor at the end of the works - before the completion of the finished situation, in paper and digital form on CD in ACAD - "*" .DWG" format (with absolute coordinates of all pillars as well as breakpoints of the cable route). This footage is the basis of a legal billing. A snapshot for mapping is submitted to the Republic Geodetic Authority. A set with the receipt of a certificate of the submitted documentation to RGA. Calculation per meter of cable length.

Item 16 includes:

During excavation of the trench and pillar pit, loading the excavation directly into the truck or first into the trolley, then into the truck. Kit with removal and unloading at the city landfill (the organization at the landfill is the obligation of the contractor). Calculation per m³ of discharged excavation. Before loading, the method is approved by the supervisory authority!

Item 20 includes:

Testing cables, other conductors, and connections in the installation. Obtaining verification reports from the competent institution, especially on the quality of the insulation, protection against dangerous contact stress, soil compaction and photometric measurements.

- Attestation of soil compaction
- electrical attestation
- photometric measured lights at budget parking points.

Item 21 includes:

Delivery and installation of lighting column.

10m high lighting column with stand, concrete foundation, wiring and louvers, as well as all accompanying equipment. Hollow tubular, conical, galvanized, non-colored, pillar made in accordance with SRPS EN 40- (1 to 9) and SRPS U.C7.110; dimensioned for wind speed 35m / sec, with an inspection hole of 500x100 and a corresponding lid (lower edge of the hole at a height of 500mm), with an anchor plate whose distance between the anchor bolts is 300mm (slip openings for adjustability based on ± 10 mm). The joint of the pillar and the flange is made by welding without reinforcement in the form of ribs for stiffening; inside the pillar is a welded earthing screw and a mounting box carrier. Pillar height is 10m - with one console length of 1.5m, at 9m; angle 5°. Set with fitted anchor bolts, nuts, washers and protective plastic lids. In accordance with the specified technical specification, as a typical product "Aruba" - PetitJean, or corresponding to the given type.

Item 22 includes:

Luminaire suitable for access roads and parking lots with degree of mechanical protection: IP66, impact resistance: IK08, light source: LED NW (3700K – 4300K), luminaire wattage: not higher than 280W, luminaire current: not higher than 750mA, luminaire initial flux: not lower than 36700lm, luminaire distribution: road lighting in plane C0 – C180 and max intensity planes C 15 – C165, $I_{max} \geq 520 \text{cd/klm}$, in plane C90 –angle of asymmetry 50°, $I \geq 300 \text{cd/klm}$, G* class (according to EN 13201): $G^* \geq 2$. Offerer needs to submit following documents: ENEC certificate, Impact resistance test (IK test) according to EN 62262, Ingress Protection test (IP test) according to EN 60598-1, test report for electrical and photometric measurements according to LM79-08, CIE 121-1996 and EN 13032-1, ISO 17025 certificate as a proof for Photometry Laboratory Competence test report for lumen maintenance and lifetime of LED luminaires according to LM80/TM21, created either by LED chip or LED luminaire manufacturer, declaration of conformity with CE marking, issued solely from the factory where this exact luminaire type is produced or assembled. Lifetime: L90@100.000 hours (luminous flux decreases to 90% of initial luminous flux after 100.000h).

Item 23 includes:

Luminaire suitable for access roads and parking spaces with carrier, with connector on cable $l = 0.8 \text{m}$ and switchgear in the cabinet, with: degree of mechanical protection: IP66, impact resistance: IK08, light source: LED NW (3700K – 4300K), luminaire wattage: not higher than 315W, luminaire current: not higher than 750mA, luminaire initial flux: not lower than 42500lm. Luminaire distribution: road lighting in plane C0 – C180 and max intensity planes C 25 – C155, $I_{max} \geq 520 \text{cd/klm}$, in plane C90 – angle of asymmetry 45°, $I \geq 330 \text{cd/klm}$. G* class (according to EN 13201): $G^* \geq 2$. Offerer needs to submit following documents: ENEC certificate, Impact resistance test (IK test) according to EN 62262, Ingress Protection test (IP test) according to EN 60598-1, test report for electrical and photometric measurements according to LM79-08, CIE 121-1996 and EN 13032-1, ISO 17025 certificate as a proof for Photometry Laboratory Competence test report for lumen maintenance and lifetime of LED luminaires according to LM80/TM21, created either by LED chip or LED luminaire manufacturer, declaration of conformity with CE marking, issued solely from the factory where this exact luminaire type is produced or assembled. Lifetime: L90@100.000 hours (luminous flux decreases to 90% of initial luminous flux after 100.000h).

Item 25 includes:

Luminaire suitable for roofs, with: degree of mechanical protection: IP66, impact resistance: IK08, light source: LED NW (3700K – 4300K), luminaire wattage: not higher than 215W, luminaire current: not higher than 750mA, luminaire initial flux: not lower than 27000lm. Luminaire distribution: maximum intensity in plane C0 – C180 $I_{max} \geq 400 \text{cd/klm}$, in planes C90-270 –symmetrical distribution. G* class (according to EN 13201): $G^* \geq 4$. Offerer needs to submit following documents: ENEC certificate, Impact resistance test (IK test) according to EN 62262, Ingress Protection test (IP test) according to EN 60598-1, test report for electrical and photometric measurements according to LM79-08, CIE 121-1996 and EN 13032-1, ISO 17025 certificate as a proof for Photometry Laboratory Competence test report for lumen maintenance and lifetime of LED luminaires according to LM80/TM21, created either by LED chip or LED luminaire manufacturer, declaration of conformity with CE marking, issued solely from the factory where this exact luminaire type is produced or assembled. Lifetime: L90@100.000 hours (luminous flux decreases to 90% of initial luminous flux after 100.000h).

Item 28 includes:

Delivery and installation of automatic road ramp, length 4m, for restricting and controlling access to the vehicle. The system is made of galvanized steel. Rampa has a connecting cabinet for connecting the power cable. The battery contained in the connecting cabinet provides a ramp function in the event of a power failure. The ramp is a modern rounded image with integrated LED lighting. The ramp requires a single-phase connection of 1kW

4.6.5 VII Transformer station Method of Measurement

Transformer station MBTS EV21 10 / 0,4 kV "Customs" is foreseen for GP Kotroman. The transformer station is 1000 KVA size, with energetic equipment for 630kVA, and energetic transformer size 250kVA.

Mounting disassembly, type MBTS EV 21. It is divided into two spaces: construction room 10 Kv and 0.4 Kv, room for transformation of the transformer.

Transformer: Predefined three-phase transformer transformer 250 kVA, $100 \pm 2 \times 2,5\%$ / 0,4 / 0,231 kV, spindle Dyn5. It is built on a special carriage from trained steel profiles that are placed overhang in the floor. According to the applicable regulations under the transformer, not necessary to construct a special storage hole for the Isseyrelog transformer oil. At that point, under the transformer, transformer supplied a trough that can receive an entire amount of transformer oil. Weighing a high voltage transformer transformer and a transformer cell of 10 kV, a single-core cable with isolation from the network polyethylene for voltage of 10 kV intersects $3 \times (1 \times 150)$ mm². In the floor of the facility, there are left-mounted cables for transforming the cable from the transformer cell 10 kV to the transformer room. The side of the country's transformer on the wall is supplied with cable carriers. Compound NN the country of the transformer and NN Diversion cabinet 0,4 kV floor boiler is made of copper bushes 50 x 10 mm.. Join the transformer is safe by protective colored protective pipe. Position the transformer and equip the TC date of disassembly equipment.

Transformer protection: The following protection of the transformer is foreseen: from a short-circuit of the sides 20 kV, from inside drawers - buholz cover – SL, from overloading of LV sides - secondary bimetallic relay –FR, from overheating - contact thermometer –ST.

Ground point: Protective and operational grounding shall be separated and a minimum distance of at least 20 m shall be allowed. The landing must be carried out at the warehouse with applicable regulations. The ground transformer station has been brought together as a satisfactory requirement of the applicable regulations. Landings are derived by drawing. A joint eagle is wrapped: protective grounding construction of 10 kV and 0,4 kV and transformer 10-0,4 (kV-kV), low voltage drive grounding - (zero-stop NN wound the transformer).

4.6.6 VIII Finishing Works Method of Measurement

After completion of work on the performance of the above mentioned installations, the contractor is obliged to perform:

- the splitting of walls at the points of installation, as well as the deposition of corrugated parts
- removal of possible technical and aesthetic errors of the installed installations in the facility
- cleaning the rooms from the shaft and taking it outside the facilitya.

Upon completion of the inspection of the completed works, perform all the necessary regulations prescribed for the tests as:

- Measurement of resistance of insulation of cables, electrical equipment and devices of individual and all-installed installations

- testing the functionality of certain devices and equipment as well as the functionality of the entire installation,
- testing of protection against contact voltage in the installation,
- Measurement of voltage drops at the consumer terminal
- Measurement of transient ground resistance and the like.

After the performed measurements, the contractor will make a protocol and submit to the Investor all necessary certificates with the assignment of the obtained values.

For all performed works and embedded material, which he himself has purchased for the purpose of performing this installation, the contractor is obliged to provide a written guarantee in accordance with the applicable regulations, standards and existing contractual obligations.

Issuing all necessary instructions for later maintenance is also the obligation of the Contractor.

Make a state-of-the-art project based on a certified copy recorded during installation. The study must contain all the changes that occurred during the performance and must be verified by the official seal of the working organization that performed the necessary recording

During the installation, make sure to include all changes in one copy of the study. The changes must be certified by the contractor and the Supervisor.

4.7 TELECOMMUNICATION AND SIGNAL INSTALLATION

4.7.1 II Fire and signal installation Method of Measurement

The positions of this section include the procurement, transport and delivery of materials and equipment: installation, installation of necessary testing, measuring and commissioning of a stable fire alarm system. All works must be carried out with professional work force and material of first class quality, and in accordance with current regulations and standards.

Item 1 includes:

Microprocessor addressable fire alarm system (central unit) type ZITON ZP3-1L. The switchboard is powered by a voltage of 220V, 50Hz from the distribution cabinet from a special circuit. The header contains a 24V, 2.5A power supply, 2x12V, 12Ah battery backups for a minimum 72 hours of power backup and 30 minutes of alarm in the event of a power outage. Operating voltage: 10 to 30 VDC. Operating temperature: -5 to +50 oC. Degree of protection: IP 30. Dimensions WxHxD: 340x300x80 mm. The central unit meets standard EN 54-2 and has VdS attestation.

Item 3 includes:

Addressable smoke detector, type 1. The transmitter meets EN 54-7 and EN 54-5. Designed for mounting on the ceiling. Type ZP730-2 analogue optical smoke sensor ZITON or appropriate. Operating voltage: 9 to 60 VDC. Operating current of the siren: 4-45 mA. Flash working current: 5 mA. Degree of protection: IP65. Ambient temperature: -25 to +70 oC. Dimensions Øxh complete with base: 97.5 x 104 mm.

Item 4 includes:

Addressable smoke detector, type 2. The transmitter meets EN 54-7 and EN 54-5. Designed for mounting above the suspended ceiling. Analogue optical smoke sensor ZITON or suitable. Operating voltage: 9 to 60 VDC. Operating current of the siren: 4-45 mA. Flash working current: 5 mA. Degree of protection: IP65. Ambient temperature: -25 to +70 oC. Dimensions Øxh complete with base: 97.5 x 104 mm.

Item 5 includes:

Addressable manual fire alarm taster. The transmitter meets EN 54-7 and EN 54-5. Designed for mounting on a wall, at a height of 1.5m from the floor. Type ZP785-3 Manual addressable Call Point / Red or appropriate.

Item 8 includes:

Alarm siren for indoor installation. The siren is placed at a height of 2.2-2.5m from the upper floor layer and is fed directly from the fire alarm or from a separate power supply unit. Operating voltage: 9 to 60 VDC. Operating current of the siren: 4-45 mA. Degree of protection: IP21. Ambient temperature: -25 to +70 oC. Dimensions Øxh complete with base: 100 x 81 mm

Item 9 includes:

Alarm siren with flash for external IP65 protection. The siren is placed at a height of 2.2-2.5m from the upper floor layer and is fed directly from the fire alarm or from a separate power supply unit. Operating voltage: 9 to 60 VDC. Operating current of the siren: 4-45 mA. Flash working current: 5

mA. Degree of protection: IP65. Ambient temperature: -25 to +70 oC. Dimensions Øxh complete with base: 97.5 x 104 mm.

Item 11 includes:

Commissioning. Service includes:

- checking the correctness of the installed installation, mounted and connected elements of the fire alarm system,
- marking fire detection equipment,
- assembly of signal lines to the fire alarm system
- central switching, functional testing and commissioning,
- user training and handling,
- delivery of documentation (instruction manual and programming, device log and attestation),
- handover and compilation of the record of accuracy and functional testing.

4.7.2 III Network Method of Measurement

Item 1 includes:

Rack cabinet: 42U / 19 "standing - flexible construction, vertical cable ropes with full river height, wheels and pegs with leveling, side and back side can be removed for easy access to equipment, glass door with lock, mobile front and rear rails 19" with marked units unitar, static capacity up to 800kg, dimensions 800x800x2000mm (WxDxH). Fan with 2 fans and thermostat dim.600x800mm. 220V distribution panel 7 sockets, switch and overvoltage protection, 19 "/ 1U, with cable 2m and socket. Cable carrier with cover 19 "/ 1U. Shelf for rek 19 "fixed heavy duty - for a depth of 800mm. Telegärtner patch panel 19 "/ 1U with 24 RJ-45 cat. 7 Fully Shielded with earthing (P / N J02023E0021) - fixed ports, LSA reglets, has a rear cable holder and a grounding cable.

Item 2 includes:

RJ 45 sockets are provided in the modules M3 and M7, the price and accuracy is shown in the scope and calculation of the electricity installation project

4.8 MECHANICAL INSTALLATION

4.8.1 Methods of Measurement

Items 1 and 2 were intentionally omitted.

Item 3 includes

Copper tubes, hard or semi-solid, in bars or bundles which, in their quality and dimensions, correspond to SRPS or DIN standards.

Item 5 includes

Isolation of production ARMACEL, self-extinguishing, with steam barrier, made of synthetic rubber (halogen free), for temperatures from -40 ° C to +105 ° C type AC or equivalent, complete with original adhesive and insulating tape for copper tubes.

Item 11 includes

The outdoor unit of air conditioning system with freon variable flow (VRV) of the following characteristics:

The price of the outboard carriers is included in the price.

Power supply: 380-415/3/50, capacity range: 50%-130%

EER/COP 3.89/4.14

Dimensions 960x1615x765mm

Air supply: 11700 m³/h

Noise of the outdoor unit: 57 dB(A)

- type: MDV Plus Outdoor Unit, tip MDV-280(10W)/DRN1(B), Qc=28kW, Qh=31,5kW, Pel=4,39kW

Item 12 includes

Indoor air conditioning system with variable freon flow (VRV) system, ceiling model with mask, condensate conveyor pump and wired remote control with connection cable (with connection to indoor air conditioner).

- type: Four-way Cassete, MDV-D36Q4, Qc=3,6kW, Qh=4,0kW, Pel=80W
- type: Four-way Cassete, MDV-D28Q4, Qc=2,8kW, Qh=3,2kW, Pel=80W

Item 13 includes

Indoor air conditioning system with variable freon flow system (VRV), parapet model with mask, condensate pump and wired remote control with connection cable (with connection to the indoor air conditioner), built-in model with mask and installation according to the regulations of the Mup Republic of Serbia for human retention rooms (jail).

- type: MDV-D36D, Qc=3,6kW, Qh=4kW, Pel=80W

Item 23 includes

Split inverter system (1on1) with external unit type MOU-18HDN1-Q, Qh = 5,6kW, Qg = 6,14kW, Pel = 2,5kW and internal cassette unit Four-way Cassete, MDV-18HRN1-Q, Qh = 5,6kW, Qg = 6,14kW, Pel = 80W with copper tubes in isolation for connection of indoor and outdoor units, with condensate pump and remote control with connection cable (with connection to indoor air conditioner).

Item 24 includes

Split inverter system (1on1) type MS12FU-12HRFN1-QRD0GW (F8) Qh = 1,29-4,45kW, Qgr = 1,2-4,87kW, Pe = 1,17kW with an external unit and an internal wall unit, with copper tubes in isolation for connecting the indoor and outdoor units, with a condensate transport pump and a remote control with a connecting cable (with connection to the indoor climate unit).

Item 25 includes

Electric radiator, type Beha, with on / off switch, electronic thermostat and connection cable, 1.5 m long, with DIN connector. Electrical protection IP 24 (water spray protection) and protection against overheating. Ready for installation of economical TP100 module for lowering room temperature. The price includes the delivery and installation of the economical module TP100. White (RAL 9010). Radiator thickness 83mm. Calculation per piece.

Item 26 includes

Ventilation system cabins (maintenance of overpressure and prevention of carbon monoxide penetration into cabins): duct air distribution, duct fans VKM100, duct heater 3kW, exit elements - Aero valve 160, sensors, non-return duct valve F160, rain gut BN 200x200, mineral wool in Al-lime wrap 0.8mm, auxiliary mounting material.

Item 27 includes

Ventilation room P-13 on the ground floor of object MUP and UC which includes: aero valve Ø100 in room, duct air distribution from galvanized sheet connected on exit-air element with flexible non-isolatin hole Ø100, duct fan type: Decor100, rain gut BN200x200, grille EX 200x100, auxillary mounting material.

4.9 TRAFFIC SIGNALIZATION AND EQUIPMENT

There are no additional comments to the Bill of Quantities traffic signalization and equipment.