

## 6.BILL OF QUANTITIES

NO	Item description	Unit	quantity	unit rate	ukupno
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**NOTE: The prices specified in the Bill of quantities covered procurement, delivery and installation for each item of the Bill of quantities, unless otherwise described.**

### I PRIMARY HEATING SYSTEM

1.	Delivery and installation of pre-insulated steel seamless pipes of St.37.0 or St.35.8 according to JUS EN 253.2015. The pipes are supplied in the length of 6m.				
	Ø88,9x3,2 external diameter of the pipe 160mm	m	195		
2.	Works on welding, electrodes, technical gases for welding, wires for welding, production of solid and sliding supports, other supplies, will be charged 20% of the previous item.	%			
3.	Delivery and installation of pre-insulated steel arches R=3D, angle of 90°, made of steel St.37.0 or St.35.8 according to standard SRPS EN 448:2012.				
	Ø88,9x3,2	pcs	18		
4.	Delivery and installation of heat shrinking couplings with accessories (plastic handles, wires, sealing or vent cups, etc.), according to the standard EN448.				
	Ø88,9x3,2	pcs	58		
5.	Pre-insulated pipes in places of connecting shall be cleaned using wire brush and sand paper and coated with anti-corrosive alkaline two-tone paint.	m <sup>2</sup>	10		
6.	Fixed point, thermal and electrical pre-insulated with a maximum allowable axial stress of 185 N/mm <sup>2</sup> . In places of entry and exit of pipes in the anchor block shall be set appropriate wall rings.				
	Ø88,9x3,2 external diameter of steel plate 310mm	pcs	1		
7.	Testing of carried out sections of hot water pipeline using radiographic control (20% of the welds) and compressed air.	lump	1		

N0	Item description	Unit	quantity	unit rate	ukupno
8.	Geodetic surveying of the new route of the underground hot water pipeline to be entered in the cadastre of underground installations.	m	100		
	<b>TOTAL PRIMARY HEATING SYSTEM:</b>				

## II SECONDARY HEATING SYSTEM

9	Pre-insulated PEX pipes (supply + return) in a protective tube with PE-X foam as waterproofing material, type THERMO TWIN, Uponor product or similar, of the following dimensions:				
	Ø32x2,9 mm	m	130		
	Ø40x3,7 mm	m	15		
	Ø50x4,6 mm	m	50		
	Ø63x5,8 mm	m	50		
10	T pieces Q&E				
	PPSU 32/32/32	pcs	2		
	PPSU 40/32/32	pcs	2		
	PPSU 50/32/50	pcs	4		
	PPSU 63/32/63	pcs	6		
	PPSU 63/63/63	kom	2		
11	Elbows Q&E				
	PPSU 63-63	pcs	4		
	PPSU 50-50	pcs	8		
	PPSU 32-32	pcs	22		
12	Protective rubber at the end of the pipe				
	Twin 25+32+40/175	pcs	49		
	Twin 40+50+63/200	pcs	21		
13	Insulating kit in shape of arch				
	200/175/140	pcs	15		
14	The isolation chamber (manhole)				
	6x140/175/200	pcs	10		
15	Adapter-m				
	PL W 32 G1" MT	pcs	20		
	PL W 50 G5/4" MT	pcs	2		
	PL W 63 G 2" MT	pcs	2		
16	Reductions				
	PPSU 50/32	pcs	3		
	PPSU 50/40	pcs	2		
	PPSU 63/50	pcs	2		

N0	Item description	Unit	quantity	unit rate	ukupno
17	Works on connecting the pipes, clamping rings, PU glue, heat shrinkable joints, other supplies, will be charged 20% of the price of PEX pipes (item 9)			10.00%	
18	Testing of carried out sections of hot water pipeline using radiographic control and compressed air.	lump	1		
19	Geodetic surveying of the new route of the underground hot water pipeline to be entered in the cadastre of underground installations.	m	245		
	<b>TOTAL SECONDARY HEATING SYSTEM:</b>				

### III CONSTRUCTION WORKS

#### ROUTE OF THE PRIMARY HEATING SYSTEM

1.	Excavation of the trench and manholes. The route of the trench must correspond to the technical and urban conditions and design. Excavated material is deposited 1m from the edge of the trench. If, during the excavation other installations and facilities are encountered, the contractor is obliged to carry out their protecting, but in this part manual excavation shall be mandatory. The item includes clearing and preparing the ground for the execution of the excavation and installation of the pipeline, protection of other installations, disposal of soil at the required distance, rough planning of the trench bottom, labour, pumping of groundwater, securing of trench using warning signs, protective fence for the protection of unemployed persons on the construction site, maintenance of the trench, as well as all other costs that are charged to this item. Excavation will be done by machines 90% and 10% by hand, at the intersection with the existing installations. Calculation per m3 of the excavation.				
	mechanical excavation	m <sup>3</sup>	169		
	manual excavation	m	19		

NO	Item description	Unit	quantity	unit rate	ukupno
2.	<p>Levelling bottom of the trench, in the average width of 1.2m using fine-grained sand and setting wood (poplar) beams 5x8cm, L = 600 mm. Beams are placed at a distance of 3m. (The price includes material)</p>	m	100		
3.	<p>Mechanical and manual filling of sand in the zone of the pipeline. Supply, transportation and installation of clean fine grained sand in the trench. After completing the installation of the pipe, sand shall be carefully backfilled from the sides, compacted with vibro-equipment or manual compacting with simultaneous lifting of formwork so that contact of sand and lateral field is achieved afterwards. Filling is done in layers of 10-20 cm with compacting of 90% compaction by Proctor to the top of the pipe. After that the sand shall be carefully (manually) backfilled and compacted to a height of 10cm above the pipe. The works shall be carried out fully in accordance with the conditions for the installation of PVC and GRP pipes. Calculation per m3 of embedded sand.</p>	m <sup>3</sup>	32		
4.	<p>Placing the warning strap at 40 cm from the pipe top.</p>	m	100		
5.	<p>Mechanical and manual filling of the remaining height of trench (over the sand) using material from excavation on the part of the route outside the zone of the road where the replacement of materials is not conducted. Backfill in layers of 30 cm, with a vibro compaction to natural compaction. As backfill material debris, stones, materials of organic origin, etc. must not be used. In the trenches inside the facilities backfilling shall be carried out in layers of 20cm. Around the pipe and on the pipe to the minimum height of 30cm fill the selected small-grained material from the excavation. Calculation per m3 of trench backfilled with earth.</p>	m <sup>3</sup>	149		

NO	Item description	Unit	quantity	unit rate	ukupno
6.	Planning of surplus material from the excavation of the trench or pit at a distance up to 300 m. The calculation includes transportation, unloading and rough planning of materials. Location of unloading and the planning method shall be determined by the Supervising engineer.	m <sup>3</sup>	34		
<b>ROUTE OF THE SECONDARY HEATING SYSTEM</b>					
1.	Excavation of the trench and manholes. The route of the trench must correspond to the technical and urban conditions and design. Excavated material is deposited 1m from the edge of the trench. If, during the excavation other installations and facilities are encountered, the contractor is obliged to carry out their protecting, but in this part manual excavation shall be mandatory. The item includes clearing and preparing the ground for the execution of the excavation and installation of the pipeline, protection of other installations, disposal of soil at the required distance, rough planning of the trench bottom, labour, pumping of groundwater, securing of trench using warning signs, protective fence for the protection of unemployed persons on the construction site, maintenance of the trench, as well as all other costs that are charged to this item. Excavation will be done by machines 90% and 10% by hand, at the intersection with the existing installations. Calculation per m3 of the excavation.				
	mechanical excavation	m <sup>3</sup>	168		
	manual excavation	m <sup>3</sup>	18		
2.	Levelling bottom of the trench, in the average width of 1.2m using fine-grained sand and setting wood (poplar) beams 5x8cm, L = 600 mm. Beams are placed at a distance of 3m. (The price includes material)	m	290		

NO	Item description	Unit	quantity	unit rate	ukupno
3.	<p>Mechanical and manual filling of sand in the zone of the pipeline. Supply, transportation and installation of clean fine grained sand in the trench. After completing the installation of the pipe, sand shall be carefully backfilled from the sides, compacted with vibro-equipment or manual compacting with simultaneous lifting of formwork so that contact of sand and lateral field is achieved afterwards. Filling is done in layers of 10-20 cm with compacting of 90% compaction by Proctor to the top of the pipe. After that the sand shall be carefully (manually) backfilled and compacted to a height of 10cm above the pipe. The works shall be carried out fully in accordance with the conditions for the installation of PVC and GRP pipes. Calculation per m3 of embedded sand.</p>	m <sup>3</sup>	93		
4.	Placing the warning strap at 40 cm from the pipe top.	m	290		
5.	<p>Mechanical and manual filling of the remaining height of trench (over the sand) using material from excavation on the part of the route outside the zone of the road where the replacement of materials is not conducted. Backfill in layers of 30 cm, with a vibro compaction to natural compaction. As backfill material debris, stones, materials of organic origin, etc. must not be used.</p> <p>In the trenches inside the facilities backfilling shall be carried out in layers of 20cm. Around the pipe and on the pipe to the minimum height of 30cm fill the selected small-grained material from the excavation. Calculation per m3 of trench backfilled with earth.</p>	m <sup>3</sup>	93		
6.	Planning of surplus material from the excavation of the trench or pit at a distance up to 300 m. The calculation includes transportation, unloading and rough planning of materials. Location of unloading and the planning method shall be determined by the Supervising engineer.	m <sup>3</sup>	93		

NO	Item description	Unit	quantity	unit rate	ukupno
<b>TOTAL CONSTRUCTION WORKS:</b>					
<b>IV HEATING SYSTEM SUBSTATION</b>					
1.	<p>Plate heat exchanger, the product of "EUROHEAT" TR100 - Kragujevac or equivalent of the same characteristics.  The temperature on the primary 115/75°C  The temperature on the secondary 90/70°C  - Capacity: 168kW  - The maximum pressure drop through the primary heat exchanger: 15 kPa  - Calculated pressure drop through the primary heat exchanger: 6,66 kPa  - The maximum working pressure in the secondary: 25 bar  - Calculated operating pressure in the secondary: 13,36 bar  - Maximum operating temperature: 150 °C  - The number of plates: 30  The price includes making the stand of steel supports.</p>	pcs	1		
2.	<p>Standing closed expansion vessel ELBI 150 capacity 150 l Ø150 x 1025</p>	pcs	1		
3.	<p>Ultrasonic flow meter and energy consumption with computer unit type ULTRA S II, the product of Techem or the like of the following characteristics:  -Nominal flow rate 3,5 m³/h  -Maximum flow rate 7 m³/h  -Minimum flow rate 35 l/h  -Starting flow rate 7 l/h  -Operational temperature 5-130 °C  -Nominal width DN 25  -Nominal pressure 16 bar  -Pressure drop 44 mbar  The ultrasonic meter is supplied with an appropriate power supply.</p>	pcs	1		
4.	<p>Transient electric control valve (bifurcated) for controlling fluid flow, the type PVP-040/25 the product of Phoenix or the like. With the valve is supplied also electric actuator EPV 3N-BELIMO along with accessories for electric drive and fitting elements.</p>	pcs	1		

N0	Item description	Unit	quantity	unit rate	ukupno
5.	Electromagnetic valve 2/2 Bürkert Type 6281 EV, normally closed, threaded connection openings G 3/4 ", nominal flow diameter DN 20mm, valve body made of brass, NBR seal material, for working fluids of temperature to 80 ° C and pressures of 0, 2 to 16bar, power supply 230V/50Hz/8W.	pcs	1		
6.	Electronics Type SE30 flow transmitter Bürkert type 8030, the output signal frequency NPN / PNP, 12 - 36 V DC	pcs	1		
7.	Fitting Bürkert type S030, body of fitting made of brass, with threaded connection opening G 1/2" nominal flow diameter DN 15mm, for fluids of temperature of up to 100° C, PN16	pcs	1		
8.	The locking plate on the joint for charging installation, set with counter flanges, screws, nuts and gaskets. With the plate shall be calculated also two flange valves DN20, PN16, set with counter flanges, screws, nuts and gaskets.	set	1		
9.	Thermometer in a protective metal casing for measuring range 0-120°C. Product "Bianchi" - Italy, or equivalent, of the following characteristics: Dn 15, PN 25,	pcs	7		
10.	Manometer for measurement range 0-6 bar diameter of the box Ø110mm along with a three-pointed gauge tap. The product of "Bianchi" - Italy, or equivalent, of the following characteristics: DN 15, PN 6	pcs	5		
11.	Manometer for measurement range 0-25 bar diameter of the box Ø110mm along with a three-pointed gauge tap. The product of "Bianchi" - Italy, or equivalent, of the following characteristics: DN 15, PN 25	pcs	2		

NO	Item description	Unit	quantity	unit rate	ukupno
12.	Pipe water temperature sensor water temperature control in the passing through the secondary model: pipe immersed with sleeve spindles temperature range t = 0 - 120 (° C) connection: R 1/2 " installation: measuring point	pcs	4		
13.	Circulation pump with variable flow rate based on operating conditions in the system in set with flanges, counter flanges and bolts of the following characteristics: Product of "Grundfos" Denmark, or similar the characteristics as following: - type MAGNA 3N 32-120F - triple-phase,400V,50 Hz - V=7,9 m³/h -H=5,9 m - P=0.34 kW	pcs	2		
14.	Irreversible flap DN 65 PN 16	pcs	2		
15.	Silencer of noise and vibration set with counter flanges, screws and gaskets of the following dimensions:				
	DN 50 PN16	pcs	2		
15.	Execution of hot water collectors with connections as in the graphic documentation. The collectors are made of steel pipes. The connectors are of the following characteristics: DN 50 – 1 pc DN 40 – 1 pc The dimensions of the collector are:				
	Ø114,3x3,6mm, length 700mm	pcs	2		
16.	Execution of de-sludge vessels of steel pipes with fittings as in graphic documents. The connectors are of the following dimensions: DN 50 – 1 pc DN 80 – 1 pc The dimensions of the de-sludge vessel are:				
	Ø168,3x4,5 mm, length 700mm	pcs	2		
17.	External temperature sensor type QAC22 product of SIEMENS or similar.	pcs	1		

NO	Item description	Unit	quantity	unit rate	ukupno
18.	Strainer for hot water with a set of flanges, counter flanges, screws and seals, product of HERZ or equivalent of the following dimensions:				
	DN 50 PN 50	pcs	1		
	DN 20 P16	pcs	1		
18.	Safety valve - screw with spring Product "ICMA" or the like, of the following characteristics: -Dimensions DN 20 -Maximum input pressure 16 bar -Manometer value of valve opening pressure 4bar	pcs	2		
19.	Black seamless steel pipes P235GH according to EN 10216-2: 2014 for hot water distributions, of the following dimensions:				
	Ø21,3x2,0	m	10		
	Ø26,9x2,3	m	4		
	Ø48,3x2,6	m	18		
	Ø60,3x2,9	m	26		
	Ø76,1x2,9	m	10		
20.	For the connecting parts, sealing materials, fittings, metal casings, hemp, varnish, oxygen, disugas, welding wire, electrodes, fixed points, brackets, mounts, nickel-plated two-piece rosettes on all passages through walls and protective sleeve through the ceiling and all the rest fine material, shall be paid 50% of the value of the Item of pipes. Note: Only for pipelines smaller than DN50	50.00%			
21.	Black seamless steel arches P235GH according to EN 10216-2: 2014 for hot water distribution, of the following dimensions:				
	Ø60,3x2,9	pcs	18		
	Ø76,1x2,9	pcs	12		
22.	Black seamless steel T pieces of P235GH according to EN 10216-2: 2014 for hot water distribution, of the following dimensions:				
	DN 50/DN40/DN50	pcs	1		
	DN 65/DN40/DN65	pcs	1		
	DN 65 EQ	pcs	3		

N0	Item description	Unit	quantity	unit rate	ukupno
23.	Black seamless steel reductions of P235GH according to EN 10216-2: 2014 for hot water distribution, of the following dimensions:				
	DN50/DN25	pcs	2		
	DN65/DN32	pcs	4		
	DN65/DN50	pcs	2		
24.	Black steel coupler				
	6/4"	pcs	2		
	2"	pcs	2		
25.	Butterfly valve for hot water with a set of flanges, counter flanges, screws and seals, for temperatures up to 120° C, of the following dimensions:				
	- DN50 PN16	pcs	3		
	- DN65 PN 16	pcs	6		
	- DN80 PN16	pcs	2		
26.	Ball valve for hot water with threaded connection for operating temperatures up to 120° C of the following dimensions				
	DN20 P16	pcs	1		
	DN 40 P16	pcs	2		
	DN 50 P 16	pcs	2		
27.	Manual control valve supplied with the flanges, counter flanges, bolts and gaskets, of the following dimensions:				
	DN 50	pcs	1		
28.	Tap for filling and emptying the installation of the following dimensions:				
	- DN15 PN6	pcs	6		
29.	Cleaning and degreasing pipeline network of steel pipes, then applying two coats, basic color stable at operating temperatures up to 120° C. Coatings of the basic colours are required in different tones. Calculation per running meter of pipes:				
	Ø21,3x2,3	m	10		
	Ø26,9x2,3	m	4		
	Ø48,3x2,6	m	18		
	Ø60,3x2,9	m	26		
	Ø76,1x2,9	m	10		
	Ø114,3x3,6	m	2		
	Ø168,3x4,5	m	2		

NO	Item description	Unit	quantity	unit rate	ukupno
30.	Insulation of mineral wool in lining of aluminum sheet for the pipe network and equipment in the substation room. Mineral wool 50mm thick in stitching of the sheet thickness 0.55 mm is used to isolate pipe network and thickness of 70mm in the stitching of sheet thickness 0.7mm is used to insulate hot water collectors. Note: at measuring site for setting an ultrasonic flow meter when balancing circuits - leave the removable piece in the insulation. Calculation				
	- thickness 50 mm	m <sup>2</sup>	8		
	- thickness 70 mm	m <sup>2</sup>	2		
31.	Painting uninsulated metal parts in the heating substation using paint stable at operating temperatures up to 120° C, in the tone according to the type of fluid and purpose of equipment such as: supporting structure - black, distribution line, the return line - blue, raw water - green. Valve bodies painted in gray or silver colour (Vatrostal), and wheels and handles - as intended. Calculation per m <sup>2</sup>	m <sup>2</sup>	12		
32.	Supports for carrying circulation pumps. Supports are done of steel supporting profiles, with hard rubber pads a minimum thickness of 20mm. Calculation per set:	set	2		
33.	Delivery, transportation and installation of fire extinguishers				
	S-6	pcs	1		
	CO2-5 kg	pcs	1		
36	Air vent, dimensions Ø114,3x4,0 l=200mm	kom	4		
37	Relief valve typ AVDO 25, manufactured by DANFOSS or similar, with characteristics as follows: Entrance: 1" Output: 1" setting range: 0,05-0,5 bar	kom	1		
	<b>TOTAL HEATING SYSTEM SUBSTATION:</b>				

NO	Item description	Unit	quantity	unit rate	ukupno
<b>V SETTING UP, TESTING, MEASURING AND BALANCING</b>					
1.	Setting the built-in regulating valves to setpoint position of regulation in accordance with the data from the design.	lump	1		
2.	Works on mechanical washing installations of heating substation with the control of dirtiness and compiling the minutes of the executed works.	lump	1		
3.	Measuring flow rate and balancing installation of heating substation using a differential pressure gauge and other certified instruments.	lump	1		
4.	Works on washing the installation of central heating to pressure and tightness in accordance with SRPS M.E6.012	lump	1		
<b>TOTAL TESTING:</b>					
<b>VI PRE-FINAL WORKS</b>					
1.	Preliminary works: introduction to the facility, measuring and setting out, transportation of materials and tools, small construction works, organizing the site and reviewing with the technical documentation.	lump	1		
2.	Finishing works: Trial tests, regulation, the trial operation of the installation for a period of 7 (seven) days, compiling the instructions for operation and maintenance of installations in three copies, marking elements of the installation, site clearance and handover of the works.	lump	1		
3.	Measuring noise caused by work of the equipment.	lump	1		

NO	Item description	Unit	quantity	unit rate	ukupno
4.	Drilling holes for the passage of the pipe network in the walls of the heat substation and floor structures and their reparation after the completion of installation. The item involves tiny constructing holes that are not covered by the design AG. All holes in the reinforced concrete walls are the subject of the design AG.	lump	1		
5.	Elaboration of as built design and instructions for operation and maintenance.	lump	1		
<b>TOTAL PRE-FINAL WORKS:</b>					

**SUMMARY:**

<b>I</b>	<b>HEATING SYSTEM</b>				
<b>II</b>	<b>SECONDARY HEATING SYSTEM</b>				
<b>III</b>	<b>CONSTRUCTION WORKS</b>				
<b>IV</b>	<b>HEATING SYSTEM SUBSTATION</b>				
<b>V</b>	<b>SETTING UP, TESTING, MEASURING AND BALANCING</b>				
<b>VI</b>	<b>PRE-FINAL WORKS</b>				
	<b>OVERALL:</b>				

**NOTE: Cost for the connection of newly designed primary heating system on the existing one dim. Ø88,9x3,2mm on the section of hot-water for TP69 beard by PUC "Toplovod" Obrenovac**

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<b>1. BILL OF QUANTITIES – Heating substation</b>					
No.	Item description	Unit	Quality	Unit rate	Total
<b>I</b>	<b>EARTHWORKS</b>				
1.	Cleaning the land before construction begins with removing shrubs, weeds and cutting trees, under and around the respective building. Calculation per m <sup>2</sup> of cleaned terrain.	m <sup>2</sup>	72.25		
2.	setting out the facility with all the necessary designed elements specified in the layout of the Design. Data on the geodetic benchmarks of state network at that location shall be taken from the municipal register. Setup solid benchmarks using wooden or metal stakes, and at least one benchmark needs to be provided as a permanent geodetic landmark throughout the entire building of the complex. Permanent landmark must be connected to the national coordinate system. During construction the contractor must regularly maintain all permanent marking points and staked landmarks, thereby ensuring the normal construction and allowing smooth control by the technical inspection. The price includes elaboration of protocols on setting out, surveying of foundation carried out and surveying as built facility. The calculation is lump sum.	lump	1.00		
3.	Mechanical cleaning of the area and removing the surface layer of soil thickness of 20-40 cm. Usable humus, for finishing treatment, shall be separated to a separate landfill, which is included in the price. Excess soil shall be loaded on a truck and transported to the city dump. Calculation per m <sup>2</sup> .	m <sup>2</sup>	42.25		
4.	Mechanical excavation of soil 3 category for strip foundations in bulk excavation, with disposing. Excavation shall be carried out according to the design and specified elevations. The lateral sides shall be properly cut and the bottom leveled. Execute also manual excavation where necessary. The excavated soil shall be transported and deposited to the landfill of the construction site, and excess of soil to the city dump. Calculation per m <sup>3</sup> , measured overgrown.	m <sup>3</sup>	13.85		

No.	Item description	Unit	Quality	Unit rate	Total
5.	Supply, transportation, spreading in layers, compacting and fine gravel planning. Gravel shall be in the layer of 15 cm below the foundation, the foundation plate and sidewalk. Calculation per m <sup>3</sup> .	m <sup>3</sup>	8.85		
6.	Filling the area next to the foundations using the soil from the excavation to the required levels. Soil shall be backfilled in layers of 20 cm, sprayed with water and compacted to the required compaction. For the filling use the soil deposited during excavation. Calculation per m <sup>3</sup> .	m <sup>3</sup>	3.60		
<b>TOTAL EARTHWORKS:</b>					
<b>II CONCRETE AND REINFORCED CONCRETE WORKS</b>					
1.	Procurement of materials, transportation and installation of compacted concrete below strip foundation. Compacted concrete thickness is d = 7 cm. The concrete class is MB 15. The top surface of the concrete must be free of unevenness and damage. Calculation per m <sup>2</sup> .	m <sup>2</sup>	11.55		
2.	Procurement of materials, transportation and placing of compacted concrete under the floor slab. Compacted concrete thickness is d = 7 cm. The concrete class is MB 15. The top surface of the concrete must be free of unevenness and damage. Calculation per m <sup>2</sup> .	m <sup>2</sup>	16.00		
3.	Construction of reinforced concrete strip foundations class MB 20 in a trench without formwork. The foundations shall be reinforced by the design and the structural calculation. Concrete shall be placed according to the design of the structure, general description and current Regulations for concrete and reinforced concrete. Calculation per m <sup>3</sup> of concrete.	m <sup>3</sup>	4.10		
4.	Construction of reinforced concrete foundation walls MB20. Execute formwork of foundation walls and reinforce by the design, details and structural calculation. Concrete shall be placed and cured by the regulations. The price includes formwork as well. Calculation per m <sup>3</sup> of concrete.	m <sup>3</sup>	4.52		

No.	Item description	Unit	Quality	Unit rate	Total
5.	Construction of reinforced concrete floor slab class MB 20, 15 cm thick. Execute formwork and reinforce slab using Q-188 in the lower zone. Concrete shall be placed and cured by the regulations. The price also includes formwork. Calculation per m <sup>3</sup> of executed slab.	m <sup>3</sup>	2.50		
6.	Construction of reinforced concrete ring beams class MB 20. The formwork shall be conducted and ring beams reinforced according to the design, details and structural calculation. Concrete shall be placed and cured by the regulations. The price also includes formwork and extra scaffolding. Calculation per m <sup>3</sup> of ring beam.	m <sup>3</sup>			
	vertical ring beam	m <sup>3</sup>	0.60		
	horizontal ring beam	m <sup>3</sup>	0.40		
	oblique ring beam	m <sup>3</sup>	0.35		
7.	Construction of reinforced concrete lintels (on doors and windows), class MB 20. Formwork shall be conducted and reinforced by the details and structural calculation. Concrete shall be placed and cured by the regulations. The price includes the formwork, supports and extra scaffolding. Calculation per m <sup>3</sup> of concrete.	m <sup>3</sup>	0.24		
8.	Execution of sidewalks around the building made of reinforced concrete, thickness d = 10 cm, class MB 20. The sidewalk track shall be reinforced using Q-188 reinforcement. The top surface of the sidewalk track shall be treated using broom. Expansion joints d = 4 mm shall be conducted at a distance of 1.5m between the fields, and poured using bitumen. The price includes reinforcement as well. Calculation per m <sup>3</sup> of sidewalk track.	m <sup>3</sup>	2.60		
	<b>TOTAL CONCRETE AND REINFORCED CONCRETE WORKS:</b>				
	<b>III REINFORCEMENT WORKS</b>				

No.	Item description	Unit	Quality	Unit rate	Total
1.	<p>Procurement of materials, transportation, straightening, cutting, cleaning, bending and assembly of reinforcement in the formwork according to the details specified in the structural calculation.</p> <p>Concrete steel must meet the applicable standards and the relevant provisions of the applicable Regulations for concrete and reinforced concrete. The quantity of reinforcement has been provided on the basis of plans and specifications of reinforcement.</p> <p>Calculation per kg of final assembled and embedded reinforcement.</p>	kg	660.00		
<b>TOTAL REINFORCEMENT WORKS:</b>					
<b>IV MASONRY WORKS</b>					
1.	<p>Procurement of materials, transportation and building walls of hollow clay blocks d = 20 cm. Refer to the technical specifications and norms that regulate this type of work, as well as the manufacturer's instructions.</p> <p>The price includes also extra scaffolding.</p> <p>Calculation per m<sup>3</sup> of completed wall.</p>	m <sup>3</sup>	9.53		
2.	<p>Procurement of materials, transportation and installation of the cement screed d = 4 cm with ironing to black gloss. Cement screed is placed over the conducted floor slab and waterproofing. Fibrin fibers are incorporated in the screed to prevent cracking, which is included in the price.</p> <p>Calculation per m<sup>2</sup>.</p>	m <sup>2</sup>	16.00		

No.	Item description	Unit	Quality	Unit rate	Total
3.	Plastering using extension mortar in two layers on interior walls. Before plastering surfaces shall be cleaned and sprayed with milk. The first layer, grunt, shall be conducted with lime mortar thickness up to 2 cm of sieved gravel, "units " and lime. Mortar shall be continuously mixed to avoid lime milk to be isolated. Mortar shall be applied over dampened substrate and cut for better binding of the second layer. The second layer shall be made of fine and clean sand without impurities and organic matter. Parget with wetting and ironing with small scrapers. Plastered surface must be flat, without waves, and the edges sharp and straight. Mortar shall be wet to prevent rapid drying and "burnout". The price includes extra scaffolding as well. Calculation per m <sup>2</sup> of plastered surface.	m <sup>2</sup>	55.00		
4.	Plastering exterior walls using extension mortar over galvanized rabic and wire mesh Q-131. Rabic reinforcement mesh shall be sprayed twice with cement milk. Then apply a thick layer of mortar to cover rabic mesh. Grunt shall be made using sieved sand "unit" and applied to the ceiling. The second layer shall be made of fine clean sand without impurities and organic matter and applied over the first layer. Parget with wetting and iron using small scrapers. The price includes the extra scaffolding and reinforcement. Calculation per m <sup>2</sup> .	m <sup>2</sup>	64.00		
	<b>TOTAL MASONRY WORKS:</b>				
<b>V</b>	<b>WATERPROOFING WORKS</b>				

No.	Item description	Unit	Quality	Unit rate	Total
1.	Execution of horizontal waterproofing above the reinforced concrete slab. Insulation shall be conducted over completely dry and clean surfaces. Cold coating bitulite "A" shall be applied by brush or spray at a temperature higher than 10 degrees. Bitumen tape shall be bonded immediately with a 15 cm overlap. Waterproofing shall be carried out of the following layers: - cold coat using bitulite "A" - Condor 3, bonded to the substrate. Calculation per m <sup>2</sup> of waterproofing.	m <sup>2</sup>	21.00		
2.	Supply and installation of rock wool in the form of semi-hard plates with a thickness of 5 cm, density of 100 kg/m <sup>3</sup> . Rock wool shall be set as thermal insulation. Calculation per m <sup>2</sup> .	m <sup>2</sup>	63.00		
<b>TOTAL WATERPROOFING WORKS:</b>					
<b>VI COVERING WORKS</b>					
1.	Supply and installation of roof "sandwich" cladding consisting of: * Bottom sheet TR 40/230/0,7 mm. * Spacers d=2 mm h=14 cm. * Mineral wool d=6 cm. * PVC foil * Top sheet TR 60/150/0,7 mm. The price includes extra scaffolding as well. Calculation per m <sup>2</sup> .	m <sup>2</sup>	20.25		
<b>TOTAL COVERING WORKS:</b>					
<b>VII LOCKSMITHING WORKS</b>					
1.	Supply, fabrication and installation of the roof structure. The roof structure shall be made of steel hot-rolled profiles [50x100 mm, according to the design, details and designer's instructions. Joints and welds shall be executed perfectly, cleaned and treated. Before installing, the components shall be cleaned of corrosion and dust, applied impregnation and basic colour, and after the installation, fixed. The price also includes anchors, screws, washers, scaffolding. Calculation per kg.	kg	235		

No.	Item description	Unit	Quality	Unit rate	Total
2.	Fabrication and installation of metal glazed windows. Windows shall be made of box-profile steel 50x50x2cm and glazed using reinforced glass thickness of 6 mm, according to the design and details. Socket shall be chosen by the designer. Before painting metal shall be cleaned of corrosion and dust, treated and cleared. Impregnation and base color shall be applied on the window, and then treated and shaped. Apply the first coat of paint for metal, treat and apply the final paint for the second time. On the windows protective grid shall be placed.	pcs			
	Dim. 145/60 cm	pcs	2		
3.	Procurement of materials and installation of metal door of single-box profiles 50x50x2cm on both sides coated with steel sheet filled with hard glass wool d = 5 cm with overlight. Overlight shall be glazed with reinforced glass thickness of 6 mm and protective screens shall be set up. The required mountings, cylinder lock and three keys with the final painting shall be envisaged.	pcs			
	Dim. 100/220+60 cm	pcs	1		
	<b>TOTAL LOCKSMITHING WORKS:</b>				
	<b>XIII SHEET METAL WORKS</b>				
1.	Fabrication and installation of gutter galvanized pipes, with a full width (FW) of 40 cm, 10x10 cm cross section, 0.60 mm thick sheet. Parts of gutter pipes must enter into each other at least 50 mm and welded with tin of at least 40%. Galvanized clamps with brackets shall be set at distance of 200 cm. Over the clamps decorative tape shall be placed. The pipes must be distanced from the wall at least 20 mm. The ending of the pipe shall be according to the detail. Calculation per m.	m	3.50		

No.	Item description	Unit	Quality	Unit rate	Total
2.	Production and installation of rectangular hanging gutters made of galvanized sheet, with a full width (FW) of 33 cm, gutters width of 15 cm, thickness of 0.60 mm. Gutters shall be connected using studs, one row with a maximum spacing of 3 cm and soldered using tin of at least 40%. Supports of hanging gutters shall be conducted from galvanized metal frames 25x5 mm and studded on the front of the gutter using studs of 0 4 mm at a distance of 80cm. Calculation per m.	m	4.50		
3.	Formwork of roof edges using galvanized sheet with a full width (FW) 35 cm, thickness of 0,60mm. Formwork shall be carried out by the design, details and designer's instructions. Calculation per m.	m	46.05		
	<b>TOTAL SHEET METAL WORKS:</b>				
	<b>IX PAINTING AND DECORATING WORKS</b>				
1.	Painting with plastering walls, using semi-dispersive colours. Plastered walls shall be skimmed with dispersive kit. The surfaces shall be smoothed, cleaned and neutralization shall be performed. Review and place putty to minor damages and cracks. Impregnate and coat with dispersion putty three times. All surfaces shall be smooth, impregnated and minor damages covered with putty. Paint and correct using tinted dispersion putty and then paint using the semi-dispersive paint to even colour. Colour and tone shall be chosen by the designer. (The item includes interior walls which are not lined with ceramic tiles). Calculation per m <sup>2</sup> of painted surface.	m <sup>2</sup>	54.00		
	<b>TOTAL PAINTING AND DECORATING WORKS:</b>				
	<b>X FACADE WORKS</b>				
1.	Procurement of materials, transportation and processing of water-repellent facade walls using decorative mortar. Calculation per m <sup>2</sup> .	m <sup>2</sup>	64.00		

No.	Item description	Unit	Quality	Unit rate	Total
2.	Procurement of materials, transportation and processing of plinths around the building at a height of h = 11 cm using silicone finish. Calculation per m <sup>2</sup> .	m <sup>2</sup>	2.50		
	<b>TOTAL FACADE WORKS:</b>				
<b>XI</b>	<b>CERAMIC WORKS</b>				
1.	Procurement of materials, transportation and installation of wall tiles of I class, glued to the wall, with closed joints. The tiles are placed on the wall where the sink is located. Height of tiling is 1.6 m. Works and materials used must comply with the standards, technical specifications and norms that have been defined for this type of work. Calculation per m <sup>2</sup> of the finished wall.	m <sup>2</sup>	1.60		
	<b>TOTAL CERAMIC WORKS:</b>				
<b>SUMMARY:</b>					
<b>I</b>	<b>EARTHWORKS</b>				
<b>II</b>	<b>CONCRETE AND REINFORCED CONCRETE WORKS</b>				
<b>III</b>	<b>REINFORCEMENT WORKS</b>				
<b>IV</b>	<b>MASONRY WORKS</b>				
<b>V</b>	<b>WATERPROOFING WORKS</b>				
<b>VI</b>	<b>COVERING WORKS</b>				
<b>VII</b>	<b>LOCKSMITHING WORKS</b>				
<b>VIII</b>	<b>SHEET METAL WORKS</b>				
<b>IX</b>	<b>PAINTING AND DECORATING WORKS</b>				
<b>X</b>	<b>FACADE WORKS</b>				
<b>XI</b>	<b>CERAMIC WORKS</b>				
<b>OVERALL</b>					

### 3. BILL OF QUANTITIES

No.	Item description	Unit	Quantity	Unit rate	Total
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**Note: Water inlet from the street pipe to watermeter shaft (including the water system reinforcement in the shaft), as well as access from the street sewer pipe to an inspection hole at the heat substation shall be performed by PUE "Vodovod i kanalizacija" Obrenovac at the employer's expense. This Bill includes works from the water meter or an inspection manhole to heat substation as well as works in the heating substation.**

#### EXTERNAL WATER SUPPLY AND WASTEWATER

##### I SURVEYING WORKS

1.	SETTING OUT THE ROUTE				
	Before starting work on the excavation it is necessary to set out the route with all the necessary elements, as well as sewer manholes and other facilities on the network. The calculation is per m of set out route.				
	water	m'	7.85		
	sewer	m'	2.60		

**SURVEYING WORKS:**

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##### II EARTHWORKS

1.	TRENCH EXCAVATION				
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No.	Item description	Unit	Quantity	Unit rate	Total
	Mechanical and manual excavation of trench in the soil category III for laying pipes, fully in accordance with the designed layout and longitudinal section. Excavated material is deposited 1m from the edge of the trench. If, during the excavation other installations and facilities appear, the contractor is obliged to carry out their protection. The item includes clearing and preparing the ground for the execution of the excavation and installation of the pipeline, the protection of other installations, disposal of land at the required distance, rough planning of the trench bottom, labour, protection of the trench using warning signs, protective fence for the protection of unemployed persons on the construction site, maintenance of the trench, and all other costs which are charged to this item. Excavation shall be done manually. The designed width of the trench is 60cm. The average depth of the trench is 0.9m for water, i.e. 1.15m for sewer. Calculation per m3 of the excavation.				
	manual excavation, 0-2 m water	m3	4.36		
	manual excavationp, 0-2 m sewer	m3	1.80		
	manual excavation, 0-2 m sewer manhole	m3	1.30		
	manual excavation, 0-2 m watermeter shaft	m3	7.20		
2.	<b>PLANNING TRENCH BOTTOM</b>				
	After the completion of the excavation, and prior to filling with sand, fine planning of the trench bottom shall be done according to the provided elevations and inclines + - 3cm. Prior to fine planning the necessary corrections shall be made (excavation and backfilling) to obtain the required inclination. Calculation per m2 of the planned area.				
	water	m2	4.71		
	sewer	m2	1.56		
3.	<b>PLACING OF SAND</b>				

No.	Item description	Unit	Quantity	Unit rate	Total
	Supply, transportation and installation of medium-grained sand below, above and around the pipe. After placing the pipe on a subgrade of sand d = 10 cm, and the completed hydraulic tests, shall be performed filling of the pipe using sand 10 cm above the pipe top (water) i.e. 30 cm (sewage). Filling shall be done manually with simultaneous pushing beneath the pipe, and tamping the final layer shall be done using manual compactor. The maximum size of a grain of sand can not exceed the granulation of 3mm. Calculation per m3 of embedded sand.				
	water	m3	1.05		
	sewer	m3	0.82		
4.	<b>BACKFILLING OF THE TRENCH</b>				
	Supply, transportation and installation of gravel in the remaining part of the trench to ground level throughout the route of the network, as well as filling test holes and expansions for hydrants and node locations and manholes. Backfill shall be carried out in layers of 30cm, with previous moistening with water, with full compaction while removing the supporting of the trench. Compaction shall be performed to the laboratory compaction of 100% by Proctor. Calculation per m3 of embedded sand.				
	water	m3	3.30		
	sewer	m3	0.92		
5.	<b>TRANSPORTATION OF EXCESS MATERIAL FROM THE TRENCH EXCAVATION</b>				
	Transportation of excess material from the excavation of trench to the landfill at a distance up to 8 km. The calculation includes transportation, unloading and rough planning of materials in the landfill. The calculation is per m3 of soil transported.	m3	14.66		

<b>EARTHWORKS:</b>				
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### III CONCRETE WORKS

No.	Item description	Unit	Quantity	Unit rate	Total
1.	<b>EXECUTION OF INSPECTION STAIRWAYS</b>				
	The item includes procurement, transportation, unloading at the temporary landfill on construction site, local loading, transport along the route and erection of prefabricated circular inspection stairways made of prefabricated reinforced concrete rings and conical elements f 1000, fully in accordance with the accompanying drawings and regulations for this type of work. The junction between the elements shall be made using special waterproof putty which shall be processed on the inside and the outside. The existing reinforced concrete lining for the manhole and the manhole cover shall be retained. The unit price includes all necessary works and materials. The calculation is per m' of built-in inspection stairways.	m'	1.10		
2.	<b>MANUAL CONCRETING OF THE LINING</b>				
	Basis concreting under inspection stairways and floors, shall be done using reinforced concrete MB 15 with a thickness of 10 cm with a double reinforcement Q 188 to the prepared surface of compacted gravel d = 10cm. The calculation per piece of concreted base (lining), including the work, formwork and material, of plate dimensions 1.60 x 1.60 x 0.10.	pcs	1		
3.	<b>MANUAL EXECUTION OF FLOOR SLABS</b>				
	Construction of reinforced concrete floor slabs for inspection manholes f 1000 MB30 waterproof V4 thickness d = 20 cm with double reinforcement Q 325. The calculation includes required work, formwork and material. The calculation is per piece of floor slab, of slab dimensions 1.40 x 1.40 x 0.20.	pcs	1		
4.	<b>EXECUTION OF HALF ROUND GUTTER</b>				

No.	Item description	Unit	Quantity	Unit rate	Total
	Execution of half round gutters in manholes. The calculation includes all the necessary work and material, half round gutter is of the semicircular cross section of the pipe profile; perform the processing of half round gutter with cement mortar to black gloss. The calculation is per piece of half round gutter.	pcs	1		
5.	TREATMENT OF PASSAGES THROUGH MANHOLES				
	When mounting the pipeline, it is necessary to process the openings in the wall of the manhole for pulling in the pipe. At the junction between the pipe and the inspection stairways a rubber ring shall be set up and sealed with a watertight composition (Aqua stop or the like). The calculation is per piece of penetration.	pcs	2		
6.	INSTALLATION OF CONCRETE UNLOADING SLAB				
	Supply, transportation and installation of reinforced concrete ring - unloading slab for stiffening of the manhole cover of inspection hole. Calculation per piece of ring.	pcs	1		
7.	EXECUTION OF WATERMETER SHAFT				
	The item includes execution of water meter manhole made of concrete or radial brick. The price includes the manhole cover, as well.	PCS	1		

<b>CONCRETE WORKS:</b>				
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#### IV ASSEMBLY WORKS

1.	Supply and installation of HDPE PE-100 Ø25x1.9mm (HDPE) water supply pipes with fittings and sealant. Installing the pipes in the ground.	m'	8.00		
2.	Supply, transportation and installation of PVC sewer pipes with the required number of fittings and sealant.				
	Ø160mm for installation in the ground type SN8	m	3.00		

No.	Item description	Unit	Quantity	Unit rate	Total
3.	Supply, transportation and installation of heavy, flat cast iron manhole covers, Ø625mm, with holes, with frame, for loads of 400kN. LG cover shall be installed on a provided level of the cover. Cover shall be stiffened using cement mortar, concrete and concrete pads app. 0.30m <sup>3</sup> of MB20. The calculation per piece of embedded covers.	pcs	1.00		

<b>ASSEMBLY WORKS:</b>				
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## INTERNAL WATER PIPELINE AND SEWER

### I ASSEMBLY WORKS

1.	Supply, transportation and installation of tubes for the passage of the pipe sewage system and water supply through the wall. Tubes are made of galvanized steel water pipes. Pipes must comply with standard SRPS.C.B5.225. Calculation per piece. The length of tube is 50cm. Diameter of the tube is:				
	DN50	pcs	1		
	DN200	pcs	1		
2.	Supply, transportation and installation of PPR (PN20) water pipes with fittings and sealant. Installation of pipes shall be hidden in the wall or visible depending on the design solution. Pipes must comply with quality system ISO 9001-2000 and DIN 8077 and DIN8078. Calculation per meter of pipe mounted depending on the diameter.				
	Ø20x2,8mm	m	3		
3.	Supply, transport and installation of permeable flat brass valves with a branch for network discharge. The valve must match SRPS.M.C.5.261. Paid per piece of assembled valve.				
	DN15	pcs	1		
4.	Supply and installation of PVC sewer pipe with the required number of fittings and sealant. For installation in the facility.				
	Ø110mm	m	1.00		
	Ø40mm	m	2.00		

No.	Item description	Unit	Quantity	Unit rate	Total
5.	Supply, transportation and installation of floor drain with cast iron grate and vertical connection to the sewer.				
	Ø110mm	pcs	1		
6.	Supply, transportation and installation of enameled sink for mounting in the substation on the recessed cantilevers with PVC siphon. Together with faucet for cold water and the nozzle for assembly of rubber hose DN20.				
		pcs	1		

<b>ASSEMBLY WORKS:</b>				
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## II INSTALLATIONS TESTING

1.	Testing of mounted water supply network to water-tightness according to the regulations and instructions of the supervisory engineer.	m	3		
2.	Rinsing and disinfection of water supply system with the use of chlorine. The dose of chlorine to be signed by the person authorized for sanitary services, which as a whole is responsible for the disinfection. After disinfection, the network should be rinsed with potable water. The required quantity of water for testing shall be provided by the Contractor. Calculated and paid per running meter of the pipeline.	m	3		
3.	After executed disinfection, carry out testing of water samples from the new installed water supply network in the Hygienic Institute - to sound state for drinking. Payment shall be made after delivered confirmation of drinking water correctness.	pcs	2		
4.	Hydraulic testing of the sewage network to water-tightness.	m	3		

<b>INSTALLATIONS TESTING:</b>				
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## III PRE-FINAL WORKS

No.	Item description	Unit	Quantity	Unit rate	Total
1.	Drilling holes and demolishing walls for the passage of water and sewage installations and repairing them after completion of installation. The item involves tiny building holes that are not covered by the design AG.	lump	1		
2.	Finishing work on clearing facility after the works executed.	lump	1		
3.	Elaboration of As-built design	lump	1		

<b>PRE-FINAL WORKS:</b>				
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<b>S U M M A R Y</b>				
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**EXTERNAL WATER PIPELINE AND SEWER**

<b>I</b>	<b>SURVEYING WORKS</b>				
<b>II</b>	<b>EARTHWORKS</b>				
<b>III</b>	<b>CONCRETE WORKS</b>				
<b>IV</b>	<b>ASSEMBLY WORKS</b>				

**INTERNAL WATER PIPELINE AND SEWER**

<b>I</b>	<b>ASSEMBLY WORKS</b>				
<b>II</b>	<b>TESTING INSTALLATIONS</b>				
<b>III</b>	<b>PRE-FINAL WORKS</b>				

<b>OVERALL</b>				
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**Authorised designer:**

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No.	Item description	Unit	quantity	Unit rate	ukupno
<b>I CONSTRUCTION WORKS</b>					
1	Surveying of the route of cable line. Calculation per running meter.	m	80		
2	Mechanical demolition-cutting of plain concrete sidewalks, parking lots and pavement, d = 15 cm, coated with asphalt, for cable trench dimensions:				
	0,4x40 m	m2	16		
3	Manual loading of broken concrete in the truck and unloading at the landfill.	m3	2.4		
4	Manual excavation of channels in the soil category III for cable trench dug in soil burdened with other installations for trench dimensions:				
	0,5 x 0,8 x 55 m	m3	22		
	0,5 x 1,1 x 15 m	m3	8.25		
5	Manual loading of soil left over from excavation with removal and unloading at the landfill.	m3	14.4		
6	Manual filling of sand on the bottom of the cable trench, complete with the delivery of sand in layers of 2x10cm trenches dimensions				
	0,4 x 70 m	m2	28		
7	Laying of solid PVC pipes Ø50mm with cap at the bottom of the cable trench with leveling.	m	14		
8	Spreading and placing NN cable sheathed with PVC mass type PP00 4x6mm2 through cable trenching.	m	80		
9	Laying of PVC tapes	m	80		
10	Manual filling of soil left over from excavation to the cable channel in layers of 30cm, with compacting soil using compactor weighing 10kg to the required compaction, trench dimensions				
	0,5 x 0,6 x 30 m	m3	9		
11	Manual filling up, with spreading and compacting of gravel in cable channel with the delivery of gravel for trench dimensions:				
	0,5 x 0,6 x 25 m	m3	7.5		
	0,5 x 0,9 x 15 m	m3	6.75		
12	Pavement, sidewalk and parking lot concrete laying, using d = 15 cm reinforced concrete MB-15, mechanically prepared in a mixer and manual installation with the processing of concrete surfaces including complete delivery of materials.				

No.	Item description	Unit	quantity	Unit rate	ukupno
	0,6x40 m	m2	24		
13	Execution of asphalt coating in a layer d=3cm	m2	9		

<b>TOTAL CONSTRUCTION WORKS:</b>					
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## II DISTRIBUTION CABINET RO TP

1	Metal housing of distribution cabinet of industrial performance, provided for mounting on a wall, a minimum degree of protection IP54, with mounting plate, lock, base and complete accessories for connection and installation. The approximate dimensions of the housing (WxHxL): 800x600x400mm. Introduction of cables from below.	pcs	1		
-	Comb switch 0-1, 4p, 20A	pcs	1		
-	Differential power protective device 25/0,5A	pcs	1		
-	Luminaire for 230V distribution box with switch on it.	pcs	1		
-	Socket single-phase 230VAC, 16A, Aluminum alloy for mounting on a door or side panel of the cabinet.	pcs	1		
-	Socket three phase 400V, 16A, Aluminum alloy for mounting on a door or side panel of the cabinet.	pcs	1		
	Signal light of the presence of supply voltage, fi 22mm, red	pcs	3		
-	Signal light, fi 22mm, red	pcs	2		
-	Signal light, fi 22mm, green	pcs	2		
-	Comb switch 1-0-2, 1p, 10A, 230VAC	pcs	3		
-	Comb switch 1-2, 1p, 10A, 230VAC	pcs	1		
-	Adjuster 230VAC/24VDC, 2.5A	pcs	1		
-	Trafo 230VAC/24VAC, 60VA	pcs	1		
-	Installation circuit breaker 6A,1p	pcs	5		
-	Installation circuit breaker 10A,1p	pcs	4		
-	Installation circuit breaker 16A,1p	pcs	1		
-	Installation circuit breaker 10A,3p	pcs	1		
-	Interface relay 1CO, 24VDC, Phoenix contact	pcs	5		
-	Interface relay 1CO, 230VAC, Phoenix contact	pcs	4		
-	Delivery and installation of small installation materials (plastic junction boxes, clamps, glands, insulating tape, plugs and the like, vessels for wiring different cross-section and colour, terminals, labels and nameplates, POK channels)	set	1		
	<b>Automation</b>				

No.	Item description	Unit	quantity	Unit rate	ukupno
2	The controller manages the operation of the boiler room equipment. PLC / controller of basic configurations: 8 freely programmable analog inputs (Pt1000, 0-10, 4 (0) -20 mA), a minimum of 4 analog outputs (0-10V), digital inputs and 10 digital outputs 8.				
-	The controller must be equipped with communication ports for communication with the calorimeter and water meters, MBUS or LON communication module.				
-	The controller should have the necessary communication ports over Ethernet for access to SCADA and Web Access for access via web browser.				
-	The controller must have a real-time clock and the ability to define the daily regimes, weekly and annual (vacation). It is necessary to support and communicate with graphic panel for local control of the system and define its parameters.				
-	This technical solution is based on using TCP / IP communications for data transmission between boiling room and command and control center (SCADA) and Internet access via standard Internet browsers to exercise all functions of remote monitoring and management.	set	1		
-	Preparation, testing and adjusting the parameters of application software for PLC.	set	1		
<b>TOTAL RO TP:</b>					

### III CABLES AND TOOLS

	Supply delivery and installation of power and signal cables. The cables are laid in perforated cable tray, PNK. Cables for power and control are laid in PNK 100mm and analog signal cables are laid in a special 50mm PNK.				
1	<b>Energy and control cables</b>				
	Power cable to distribution cabinet RO-TP type PP00-Y 4x6mm <sup>2</sup> that is embedded from IMO to RO - TP	m	90		
	PP00-Y 3x1,5mm <sup>2</sup>	m	30		
	PP/L – 2x0,75mm <sup>2</sup>	m	24		
	PP/L – 3x0,75mm <sup>2</sup>	m	12		
	PP/L – 4x0,75mm <sup>2</sup>	m	32		
2	<b>Cables for analog signals</b>	m			
	J-Y(St)Y 1x2x0,8mm <sup>2</sup>	m	45		

No.	Item description	Unit	quantity	Unit rate	ukupno
	J-Y(St)Y 2x2x0,8mm2	m	80		
3	Perforated racks PKN 100 x 50 mm from hot process galvanized steel, with a material for adjusting and galvanic coupling. Complete with necessary brackets, arches and forking elements for fixing cables and covers on areas of mechanical protection required.	m	10		
4	Perforated racks PKN 50 x 50 mm from hot process galvanized steel, with a material for adjusting and galvanic coupling. Complete with necessary brackets, arches and forking elements for fixing cables and covers on areas of mechanical protection required.	m	10		
5	Protective SAPA hoses to protect the pump power supply cables. Set 3m of hoses per pump.	pcs	2		
6	Small installation materials and minor unspecified works.	set	1		

<b>TOTAL CABLES AND TOOLS:</b>				
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<b>IV LIGHTING SYSTEM AND CONNECTORS ELECTRICAL INSTALLATIONS</b>
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1	Supply, delivery and installation of single-pole installation switch and other necessary materials. Paid for set per lamp point.	pcs	1		
2	Delivery and laying of conductors of type PP00-Y 3 x 1.5mm2 for conducting the installation and connection of the of lighting installation and execution of lamp center. The conductors are placed on the wall with clamps. The average length of the lamp center is 10m.	pcs	1		
3	Supply, delivery and installation of lamps in a substation in the protection IP 65. The lamp is for surface mounting on the ceiling. Paid per set mounted with fluorescent pipes 2x36W power.	pcs	2		

<b>TOTAL LIGHTING SYSTEM AND CONNECTORS ELECTRICAL</b>				
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<b>V GROUNDING AND EQUIPOTENTIAL BONDING</b>
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No.	Item description	Unit	quantity	Unit rate	ukupno
1	Execution of a basic grounding of the facility of heating substations using galvanized steel tape 25x4mm FeZn that is placed in the phase of construction of foundations of the facility. The tape is connected with reinforcement of the facility by welding.	m	17		
2	Delivery of necessary materials and production of system for potential equalization using the strip Fe / Zn 20x3 mm, set with the appropriate wall mounts.	m	16		
3	Delivery and installation of crossed piecesUS N.B4.936/2 for FeZn tape.	pcs	20		
4	Connecting all metal parts of the substation to the system for equipotential bonding using trip Fe / Zn 20x3 and flexible copper braids to the ground electrode of the facility. Flange connections shall be rerouted with flexible copper conductor P / F-Y.	lump	1		
5	Supply and laying of cable P-Y 1x16mm <sup>2</sup> by clamps on the wall, foreseen for the connection RO-TP in the system for potential equalization.	m	5		

<b>TOTAL GROUNDING AND EQUIPOTENTIAL BONDING:</b>					
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	<b>SUMMARY</b>				
<b>I</b>	<b>CONSTRUCTION WORKS</b>				
<b>II</b>	<b>DISTRIBUTION CABINET RO TP</b>				
<b>III</b>	<b>CABLES AND TOOLS</b>				
<b>IV</b>	<b>LIGHTING SYSTEM AND CONNECTORS ELECTRICAL INSTALLATIONS</b>				
<b>V</b>	<b>GROUNDING AND EQUIPOTENTIAL BONDING</b>				
	<b>OVERALL:</b>				

## BILL OF QUANTITIES HEATING SUBSTATION

No.	Item description	Unit	Quantity	Unit rate	Total
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**General note:**

	This Bill of Quantities anticipates delivery of materials specified in the items and all the small unspecified material necessary for a complete production, installation, as stated in certain items, testing and proper commissioning, as well as reinstating in a proper condition - the original state of the locations damaged during the works. All the material used should be of first class quality and comply with the rules.				
	All the works must be carried out with skilled labour, entirely according to regulations governing the respective types of works.				
	The price includes all the stated material within the items, including any small unspecified materials, labour costs and all taxes and contributions for materials and labour.				
	Specified equipment and works include the following:				
	Delivery:				
	- equipment delivery, packaging, transport with the transportation insurance at the location of installation, or construction site				
	- functional testing of the equipment in the workshop of the producer or supplier				
	- obtaining technical documentation for the equipment, the manufacturer's instructions, attestations and certificates for purchased equipment and devices				
	- delivery of spare parts and fast wearing parts for two years work of supplied equipment and devices, according to a list of manufacturers of purchased equipment				
	- transport with the transportation insurance at the location of installation or the warehouse of the Purchaser, according to the terms of the Agreement and the order of the Purchaser				
	Installation:				

-	transport with the transportation insurance at the location of installation from the warehouse of the Purchaser, according to the terms of the Agreement and the order of the Purchaser				
-	warehousing and storage of equipment to installation, i.e. handover term to the purchaser, local transportation on site				
-	Detailed Design and workshop documentation with the necessary details				
-	installation with adequate skilled labour, connecting equipment and cables in cabinets and appliances, i.e. wiring at both ends				
-	delivery of all unspecified connection and installation materials, i.e. execution of all unspecified works which are necessary for bringing the equipment and works to full function and purpose				
-	testing prior to placing, during assembly and final functional testing on the mounted equipment, with the issuance of testing protocols and certificates for equipment and works				
-	measuring the transition resistance of earthing				
-	all of these tests and the works the contractor shall execute using his tools and equipment, of adequate quality and attesting documentation				
-	connects the devices and equipment to the laid and technically tested installation and puts into operation				
-	trial operation of equipment and devices and a guarantee for the equipment and performed works for at least a year, ie according to the offer				
-	bringing in the proper - original state of damage to the already completed works of other contractors				
-	site cleaning, waste collection and submission to the purchaser of surplus calculated, but not installed material				
-	instructions in writing and training the responsible representative of the purchaser for handling and maintenance of equipment				
-	works shall be carried out in accordance with applicable laws, regulations and recommendations, as well as the accompanying technical documentation				

-	as-built design				
-	handover to the employer, participation in the technical inspection				
-	other actions and documents relating to the technical acceptance of the facility				
	Note:				
-	unit price includes the cost of delivery / installation in dinars per unit for envisaged works: RSD / piece, RSD / meter or rsd upon performed work for "complete" and "lump sum" measured works				

**BILL OF QUANTITIES**

No.	Item description	Unit	Quantity	Unit rate	Total
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**NOTE:** The prices specified in the BoQ cover procurement, delivery and installation for each item of the Bill of quantities unless otherwise described.

**I HEATERS (RADIATORS)AND EQUIPMENT**

1.	Aluminium sectional radiator type VOX product OF GLOBAL or equivalent. The price of the works includes one dismantling and remounting after processing the walls. The formation of the radiator to the required number of sections is done by the contractor on site. The radiator is delivered along with the required number of radiator sealants.				
	VOX 600	sec	21		
2.	Pipe radiator type NK LUX product of NESA KOMERC or equivalent, set with brackets and fixing elements with the following dimensions (width x height):				
	750x400 mm	pcs	1		
3.	Support elements of the radiator:				
	wall brackets RKP	pcs	10		
	support NGR	pcs	10		
	spacer ROGL	pcs	4		
4	Manual air vent tap DN15, PN 10	pcs	5		
5	Radiator cap for closing the hole on radiators and towel dryers dimensions 1/2".	pcs	6		
6	Immersion angle valve for towel dryers for two-pipe heating system type VUA-40 Product of HERZ or equivalent with four connections with thermostatic actuator made of brass, nickel plated. Radiator connection from below, flat seal with submerged pipe Ø11 center distance of pipes 40 mm. Sealing spindle using the O ring. Maximum operating temperature is 120° C. Maximum operating pressure of 10 bar.				
	DN15, PN 10, Ø11 angle model	pcs	1		

No.	Item description	Unit	Quantity	Unit rate	Total
7	Supply, delivery and installation of radiator lockshield holender valve, DN15 straight or angled, NP6.	pcs	4		
8	Delivery and installation of thermostatic radiator valve type TS-98-V product of HERZ or equivalent. Maximum operating temperature is 120° C. Maximum operating pressure of 10 bar. DN15, PN 10	pcs	4		
9	Thermostatic head type STANDARD product of HERZ or equivalent, filled with thermal oil with fastening nut M28x1,5 mm brass, nickel-plated. With "0" position for mechanical closure, the possibility of fixing the protection against frost, with restrictions and the blockade of scope of the set value. Setting range 6-30° C. Frost protection 6° C. Markings for fixing temperature the on thermostatic head 1-6.	pcs	5		
10	Copper pipes for conducting the internal pipe network of the following dimensions				
	Ø18x1 mm	m	78		
11	Works on welding electrodes, technical gases for welding, tin for soldering, production of solid and sliding supports, other expendables will be charged 20% of the previous item.	%			
12	Copper T piece of the following dimensions:				
	Ø18/Ø18/Ø18	pcs	8		
13	Copper knee with the following dimensions:				
	Ø18-90°	pcs	38		
14	Copper semi-holender for dismantling the pipeline connections with the following dimensions:				
	Ø18-1/2	pcs	12		

No.	Item description	Unit	Quantity	Unit rate	Total
15	Cabinet wall mounted, made of steel plate. Cabinets are painted white and are protected during manufacture. Cabinet door with a cover. The cabinet is of the following dimensions: Length: 1000 mm Depth 250 mm Height 650 mm	pcs	1		
16	Ultrasound flow and energy consumption meter with computer unit type ULTRA S II, the product of Techem or the like with the following characteristics: -Nominal flow rate 0,6 m <sup>3</sup> /h -Maximum flow rate 1,2 m <sup>3</sup> /h -Minimum flow rate 6 l/h -Starting flow rate 1 l/h -Operational temperature 5-130° C -Nominal width DN 15 -Nominal pressure 16 bar -Pressure drop 85 mbar Ultrasound meter is supplied with adequate power supply.	pcs	1		
17	Deaeration drain tap DN 15	pcs	2		
18	Threaded socket of the following dimensions: 1/2"	pcs	2		
19	Galvanized reducer for reducing or changing the diameter of the pipe from larger to smaller, or vice versa. It contains internal and external thread. ZN reduction 1-1/2"	pcs	2		
20	Threaded T piece with internal thread, of the following dimensions: 1/2"	pcs	2		
21	Galvanized double nipple with external thread, serves as a connection between the pipes or fitting of the inner thread. 1/2"	pcs	9		

No.	Item description	Unit	Quantity	Unit rate	Total
22	Ball valve with butterfly comprises a polished ball that rotates 90 degrees to start or stop fluid flow. These taps provide good sealing, are less sensitive to the presence of solid particles in the fluid, and offer very little resistance to the fluid flow rate.				
	1/2"	pcs	4		
23	Threaded strainer, of the manufacturer HERC or equivalent, designed for heating systems, district heating and cooling. Oblique dirt catchers (strainers), made of brass, are connected to the system with thread joint 3/4 "				
	1/2"	pcs	1		
24	Threaded connection dimensions:				
	1/2"	pcs	1		
25	Balancing oblique valve type STROMAX 4017M of the manufacturer HERZ or equivalent. Made from brass socket x socket, spindle seal via dual O-ring. Presetting is executed via flow rate stopper, digital reading, presetting at the handwheel window.				
	STROMAX 4017M 1/2"	pcs	1		
26.	Drilling holes for the passage of pipes and their repairing after performed installation. Item includes all construction work in order to reinstate the facility into the previous state.				
		pcs	10		
<b>TOTAL HEATERS (RADIATORS) AND EQUIPMENT:</b>					

<b>II SETTINGS, TESTS AND MEASUREMENTS</b>					
1.	Setting the installed radiator valves and oblique control valves on the setpoint positions of the regulation in accordance with the data provided in the design.	lump	1		
2.	Works on mechanical installation rinsing with the control of dirtiness and compiling the minutes of the executed works.	lump	1		
3.	Works on installation of central heating test to pressure and tightness in accordance with SRPS M.E6.012.	lump	1		

No.	Item description	Unit	Quantity	Unit rate	Total
<b>TOTAL SETTINGS, TESTS AND MEASUREMENTS:</b>					

<b>III</b>	<b>PRELIMINARY AND FINAL WORKS</b>				
1.	Preliminary works: introduction to the facility, measuring and setting out, transportation of materials and tools, small building works, organizing the site and over-viewing the technical documentation.	pauš	1		
2.	Final works: Trial tests, regulation, the trial operation of installation for a period of 7 days, compiling the instructions for operation and maintenance of installation in triplicate, marking the elements of installation, site clearance and handover of the works.	lump	1		
3.	Elaboration of As-built design of entire installation. 3 copies of study are handed over to the Employer.	lump	1		
<b>TOTAL PRELIMINARY AND FINAL WORKS</b>					

### SUMMARY

<b>I</b>	<b>HEATERS AND EQUIPMENT</b>				
<b>II</b>	<b>SETTINGS, TESTS AND MEASUREMENTS</b>				
<b>III</b>	<b>PRELIMINARY AND FINAL WORKS</b>				

<b>TOTAL FOR ONE HOUSE:</b>				
<b>TOTAL FOR TEN HOUSES:</b>				

Authorised Designer

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Nemanja Zivanovic, BScME  
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