

Protection against fire

Protection against fire is ensured through the adequate selection of distribution cabinets and installation materials.

Through the adequate foreseen means of protection listed in the previous items which all individually form a part of the protection against fire, in this manner, the conditions foreseen by item 3 SRPS HD 60364-4-42 have been met.

Protection against stroboscopic effects

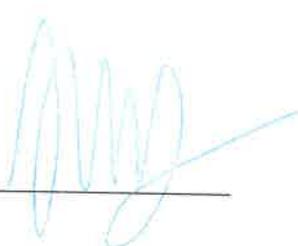
In order to neutralize the danger, the lamps for illumination with fluorescent tubes should be connected with dual-connections.

Protection against inadequate artificial illumination

Protection against inadequate artificial illumination is foreseen by the selection of the height of the illumination in accordance with SRPS U.C9.100 standard and technical recommendations JKO(DOS).

Protection against impermissible voltage drop

The design has checked the voltage drop and it is within the limits foreseen by the Technical regulations for electric installations.



VOLUME 3 – SECTION 4 – MECHANICAL ENGINEERING TECHNICAL SPECIFICATIONS

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3.4.0 PREFACE

Heating and cooling of the entire building is provided with a fan-coil installation units, with a Heat Pump, as a source of heat energy. In the summer period Heat Pump provides cold water, for cooling, and in the transient and winter period, hot water for heating demands. The Heat Pump is located on the roof terrace and with the Thermal Substation, in the basement II of the building, is connected with insulated pipelines.

Building is equipped with ventilation and air conditioning systems. Rooms with a larger number of people are equipped with a system of air conditioning, i.e. Heat Recuperators, with an integrated Heat Pump, which prepares the fresh air to the room temperature, necessary for a comfortable stay of people in room. In order to save energy, when weather conditions allow this, the Heat Recuperator is equipped with free-cooling and free-heating options.

The pipelines from the Heat Pump to the heat exchanger, located in the Thermal Substation, is filled with a water/glycol mixture, in order to avoid the discharge of the installation during the winter period and prevent the water freezing in the installation, when the Heat Pump is out of service, at the outside temperatures below 0 °C.

In the winter period, hot water is provided through the connection to District Heating of Public Utility Company “JKP Beogradske elektrane”.

The supplied Graphic Documentation (Drawings) shows the concept, i.e. The position of equipment on layouts and the installation pipes distribution, with an estimated capacity. Before starting the works, for the purpose of execution of works, it is necessary to create a Design for Construction (PZI) compliant with all other professions.

Mechanical works include the following sections:

- Heating and Cooling installation
- Ventilation and Air Conditioning
- Passenger elevators
- Thermal substation

The Contractor, prior to the works commencement, shall carefully study the design and object itself and make all necessary adjustments to all mechanical installations.

Materials that do not comply with the technical specifications, rules and standards must not be installed and shall be removed from the site at the Contractor's cost.

3.4.1 HEATING AND COOLING INSTALLATION

3.4.1.1 Dismounting Works on Existing Heating Installation

All existing equipment and pipe installation needs to be dismantled. The waste material from de-installation (dismantling): metal, plastic, building waste, must be disposed on an appropriate place. If no de-mounted material is needed, Contractor is obliged to transport it to the landfill and taxes for depositing the waste.

3.4.1.1.1 Dismantling of steel pipelines

Dismantling of steel pipelines. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, will be paid per m' of completely dismantled material.

- 3.4.1.1.1.1 Dimension Ø 21.3x2.00 mm
- 3.4.1.1.1.2 Dimension Ø 26.9x2.00 mm
- 3.4.1.1.1.3 Dimension Ø 33.7x2.00 mm
- 3.4.1.1.1.4 Dimension Ø 42.4x2.00 mm
- 3.4.1.1.1.5 Dimension Ø 48.3x2.00 mm
- 3.4.1.1.1.6 Dimension Ø 60.3x2.00 mm

3.4.1.1.2 Dismantling of wrought iron radiator (19 tons)

Dismantling of wrought iron radiator (19 tons). Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, will be paid per piece, of completely dismantled material.

- 3.4.1.1.2.1 Height - 1100 mm - 3 columns (total sections - 498)
- 3.4.1.1.2.2 Height - 750 mm - 3 columns (total sections - 108)
- 3.4.1.1.2.3 Height - 650 mm - 3 columns (total sections - 1,446)
- 3.4.1.1.2.4 Height - 450 mm - 4 columns (total sections - 46)
- 3.4.1.1.2.5 Heating Registers - 3 columns - height – 1.2 m

3.4.1.1.3 Dismantling of air handling units

Dismantling of air handling units. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, will be paid per piece, of completely dismantled material.

- 3.4.1.1.3.1 Attic level - AHU 900 m³/h
- 3.4.1.1.3.2 Attic level - exhaust ventilator 900 m³/h
- 3.4.1.1.3.3 Basement 2 - AHU 1.500 m³/h

3.4.1.1.4 Dismantling of ventilation ducts

Dismantling of ventilation ducts. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works will be paid per kg, of completely dismantled material.

3.4.1.1.5 Dismantling of diesel generator unit

Dismantling of diesel generator unit. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works will be paid per piece, of completely dismantled material.

3.4.1.1.6 Dismantling of pipe exhaust of diesel generator unit

Dismantling of pipe exhaust of diesel generator unit. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works will be paid per m', of completely dismantled material.

3.4.1.1.7 Dismantling of expansion vessel - 50kg

Dismantling of expansion vessel. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, will be paid per piece, of completely dismantled material.

3.4.1.2 Heating and Cooling Fan-Coil Installation Works

3.4.1.2.1 Fan Coil devices

Supply, delivery and installation of "Fan Coil" devices. The fan coils are connected to two-pipe system and unit's needs to mounting directly on the floor. The fan convectors are placed in the parapet below the window. Fan coil piping are under the floor. Regulation of fan coil operation is performed from the air side. Temperature control in the rooms is carried out by individual controller with thermostat with adjustable fan speed and room temperature. Units are with air filters on air intake of the unit, efficiency class G3 according to EN779. Noise generated by the fan must not exceed 30 dB for first speed, 35dB for second and 41dB for third. . The sound pressure levels conform to European standard EN 12102. The positions of Fan Coil devices have been given on drawings: 01 - 61 H&C - SITE PLAN ÷ 10 - 61 H&C – ROOF. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed devices.

3.4.1.2.1.1 Type 1

- Cooling capacity CC=1,07 / 1,80/ 2,40 kW
- Heating capacity HC=1,84/2,70/3,48 kW
- Air flow rate 200/300/415 m³/h
- Water flow rate in cooling mode 420 l/h
- Pressure drop in cooling mode 21 kPa
- Pressure drop in heating mode 13 kPa
- Electricity supply 230/1/50 V/ph/Hz
- Total power consumption 0,034 kW
- Total current 0,16 A
- Hydraulic connection 1/2" G male
- Dimension HxLxD = 680x900x190 mm
- Weight 23,5 kg
- Sound power level 35/43/48 dBA
- Sound pressure level at a distance of 2m indoor 27/35/40 dBA

3.4.1.2.1.2 Type 2

- Cooling capacity CC=1,13 / 2,40/ 3,19 kW
- Heating capacity HC=2,05/3,40/4,07 kW
- Air flow rate 210/430/520 m³/h
- Water flow rate in cooling mode 550 l/h
- Pressure drop in cooling mode 26,6 kPa
- Pressure drop in heating mode 23,7 kPa
- Electricity supply 230/1/50 V/ph/Hz
- Total power consumption 0,046 kW
- Total current 0,23 A
- Hydraulic connection 1/2" G male
- Dimension HxLxD = 680x900x190 mm
- Weight 23,5 kg
- Sound power level 35/45/50 dBA

- Sound pressure level at a distance of 2m indoor 27/37/42 dBA

3.4.1.2.1.3 Type 3

- Cooling capacity CC=1,77 / 3,00/ 3,60 kW
- Heating capacity HC=2,40/4,30/5,30 kW
- Air flow rate 330/570/675 m³/h
- Water flow rate in cooling mode 617 l/h
- Pressure drop in cooling mode 26 kPa
- Pressure drop in heating mode 23 kPa
- Electricity supply 230/1/50 V/ph/Hz
- Total power consumption 0,080 kW
- Total current 0,40 A
- Hydraulic connection 1/2" G male
- Dimension HxLxD = 680x900x190 mm
- Weight 23,5 kg
- Sound power level 40/51/54 dBA
- Sound pressure level at a distance of 2m indoor 32/43/46 dBA

The sound pressure levels conform to European standard EN 12102. The positions of Fan Coil devices have been given on drawings: 01 - 61 H&C - SITE PLAN ÷ 10 - 61 H&C – ROOF. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed devices.

3.4.1.2.2 Three-way thermostatic valve, 1/2" with actuator

Delivery and installation of three-way thermostatic valve is made of cast brass, nickel-plated with outside thread, according to ISO 228/1, flat seal without union nut. Pipe connections are not included. Spindle made of steel with soft seal valve cone for regulating. Certificate of compliance is according to EN 10204. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed valve.

3.4.1.2.3 Flexible 1/2" connections from stainless steel

Delivery and installation of flexible 1/2" connections from stainless steel. Pair of 50 cm have been previously thermal isolated with a vapor barrier 9 mm halogen free. Mount between Fan Coil connectors and Three-way thermostatic valve. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid per piece of completely installed connection.

3.4.1.2.4 Flexible connections for condensate drain, Ø20 mm, length 30 cm

Delivery and installation of flexible connections for condensate drain, for fan-coil units. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid per piece of completely installed connection.

3.4.1.2.5 Accessories for hanging and connecting the fan coil units

Delivery and installation of accessories for hanging and connecting the fan coil units, all according to the Construction Design. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid per piece of completely installed connection.

3.4.1.2.6 Thin wall steel pipes

Delivery and installation of thin wall steel pipes and Fasteners for pressing connecting of thin wall steel pipes. Pipes are made of carbon steel, provided for connecting "press" fittings. They are used for pipe network of hot and cold water heating and cooling systems. They are made according to DIN EN 10305-3, carbon steel 1.0308,

welded, thin-walled. Fasteners for pressing connecting of thin wall steel pipe are made of carbon steel, mandatory on both sides of the sealant. Fasteners are externally and internally galvanized with a zinc protective layer thickness of 8–15 µm. The fasteners black O-ring sealing joint is made of EPDM. All fittings have SC-Contour, special solution for the detection of possible errors when connecting. Areas of application is, for heating/cooling systems, within operating range from -30 to + 110 °C. Installation must be carried out with certified workforce by the manufacturer and all fittings must have all the necessary documents attest.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipes.

- 3.4.1.2.6.1 Dimension - DN25 - Ø28x1.5mm
- 3.4.1.2.6.2 Dimension - DN32 - Ø35x1.5mm
- 3.4.1.2.6.3 Dimension - DN40 - Ø42x1.5mm
- 3.4.1.2.6.4 Dimension - DN50 - Ø54x1.5mm
- 3.4.1.2.6.5 Dimension DN60 - Ø64x2mm
- 3.4.1.2.6.6 Dimension DN65 - Ø76.1x2mm
- 3.4.1.2.6.7 Dimension DN80 - Ø88.9x2mm
- 3.4.1.2.6.8 Dimension DN100 - Ø108x2mm

3.4.1.2.7 Insulation for thin wall steel pipes

Delivery and installation of insulation for pipe network made of thin wall steel pipe and auxiliary materials for insulation of pipes such as glue, tapes, etc. Isolation is made of elastomeric foam and supplied in coils, with insulation thickness of 13 mm, halogen free. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed insulation.

- 3.4.1.2.7.1 Dimension - DN25 - Ø28x1.5mm
- 3.4.1.2.7.2 Dimension - DN32 - Ø35x1.5mm
- 3.4.1.2.7.3 Dimension - DN40 - Ø42x1.5mm
- 3.4.1.2.7.4 Dimension - DN50 - Ø54x1.5mm
- 3.4.1.2.7.5 Dimension - DN50 - Ø54x2mm
- 3.4.1.2.7.6 Dimension - DN60 - Ø64x2mm
- 3.4.1.2.7.7 Dimension - DN65 - Ø76.1x2mm
- 3.4.1.2.7.8 Dimension - DN80 - Ø88.9x2mm
- 3.4.1.2.7.9 Dimension - DN100 - Ø108x2mm

3.4.1.2.8 Cabinets of steel sheet

Delivery and installation of cabinets are made of steel sheet. Galvanized, front door and frame powder coated, white (RAL9003). Adjustable installation depth (110 - 140mm), cabinet height (705 - 775mm), fastening rail for distributor holding devices as well as front screen with removable pipe rail tracks. Cabinet door with bolt. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed cabinet.

- 3.4.1.2.8.1 Box concealed 750mm (for manifolds with 2.3 and 4 laps)
- 3.4.1.2.8.2 Box concealed 900 mm (for manifolds with 5 laps)
- 3.4.1.2.8.3 Box concealed 1050 mm (for manifolds with 6 and 7 laps)

3.4.1.2.9 Distributors for cooling and heating systems

Delivery and installation of distributors 1 1/2" are made of stainless steel, with flat seal, union nut G2, inlet/outlet: Rp-thread, left or right connection, with shut-off valves 3/4 ", centre distance 80 mm, T piece, a pot and a venting valve for filling and emptying. The positions of Distributors for cooling and heating systems have been given on drawings. Price includes the supply of materials and labour needed for completion of specified

works, including all unforeseen activities which may occur during works. Paid per piece of completely installed distributor.

- 3.4.1.2.9.1 Distributor for 2 laps
- 3.4.1.2.9.2 Distributor for 3 laps
- 3.4.1.2.9.3 Distributor for 4 laps
- 3.4.1.2.9.4 Distributor for 5 laps
- 3.4.1.2.9.5 Distributor for 6 laps
- 3.4.1.2.9.6 Distributor for 7 laps

3.4.1.2.10 Multi-layer PE-Xc/Al/PE-HD aluminium reinforced pipes

Delivery and installation of multi-layer PE-Xc/Al/PE-HD aluminium reinforced pipes and connecting fasteners for multi-layer PE-Xc/Al/PE-HD aluminium reinforced pipes. Pipes are designed for connecting with "press" fittings. They are used for pipe network of hot and cold water in air conditioning systems. They are made according to DIN EN 4751-3, PE piping. The outer layer is PE-HD, with a circular insulation of 6 mm thickness ($\lambda = 0,040\text{W/mK}$) and protective blue PE foil. Delivery in coils of 50 m and 25 m.

- Nominal pipe sizes [mm]: 14x2; 16x2; 18x2; 20x2,3; 25x2,8; 32x3,2; 40x3,5; 50x4,0; 63x4,5
- Insulation value (DIN 52613 / ISO 8497) 0,040 W/mK at +40 °C; 0,036 W/mK at +10 °C
- Medium length expansion [mm/mK]: 0,03
- Pipe roughness [mm]: 0,0015
- Oxygen barrier: Aluminium
- Outer diameter of the protective tube [mm]: 21, 25, 28, 34

Installation must be carried out with certified workforce by the manufacturer and all fittings must have all the necessary documents attest. Connecting fasteners are made from PPSU and bronze. All connecting elements have SC-Contour, a special solution for detecting possible connecting errors. Areas of application is for heating/cooling systems, with operating range from -30 to + 110 °C. Installation must be carried out with certified workforce by the manufacturer and all fittings must have all the necessary documents attest. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipes.

3.4.1.2.10.1 Dimension - Ø16x2.0mm

3.4.1.2.10.2 Dimension - Ø20x2.3mm

3.4.1.2.11 Multi-layer PE-Xc cross-linked polyethylene pipes

Delivery and installation of multi-layer PE-Xc (cross-linked polyethylene) pipes Ø17x2.0, for surface heating and cooling, Oxygen-proof according to DIN4726, polyethylene base pipe according to DIN EN ISO 15875, installation temperature higher than +5 °C, bending radius of more than 6xd (outer diameter). Installation must be carried out with certified workforce by the manufacturer and all fittings must have all the necessary documents attest. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipes.

3.4.1.2.12 Floor heating pipes base

Delivery and installation of floor heating pipes base is for individual pipe laying with heat and footfall insulation provided solid wrap of tear-resistant material and stamped grid for laying pipes. Installation must be carried out with certified workforce by the manufacturer and all fittings must have all the necessary documents attest. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m² of completely installed base.

3.4.1.2.13 Edge insulation strip

Delivery and installation of edge insulation strip for radiant heating and cooling, made from PE foam, perforated, self-adhesive, 150/10 mm. Price includes the supply of materials and labour needed for completion

of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed strip.

3.4.1.2.14 Profile for expansion joints

Delivery and installation of profile for expansion joints - joint protector, complete with type pipe protection at the place of expansion joints. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed joint.

3.4.1.2.15 Concrete additives for underfloor heating

Concrete additives for underfloor heating (0.14 kg/m² for cement screed) in accordance with DIN 18560, which improve its bending strength, compressive strength and reduce formation of air voids. This ensures good thermal conductivity and capacity anticipated load. Additive for the production of cement screeds is in acc. with DIN 18560/DIN EN 13813 in connection with underfloor heating is in acc. with DIN EN 1264-4. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of used additive.

3.4.1.2.16 Set of distributors and collectors for underfloor heating

Delivery and installation set of distributors and collectors for underfloor heating from stainless steel with flow meter and regulators for every branch, a tap for filling and emptying, galvanized girders/soundproofed with connecting nut DN 25 and connectors for receiving pipes ¾ eurocone. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed set.

3.4.1.2.16.1 Set and return manifold 1', 2 laps

3.4.1.2.16.2 Set and return manifold 1', 3 laps

3.4.1.2.17 Clamping coupling ¾" euro-cone

Clamping coupling ¾" euro-cone, product holender coupling 17x2mm. All according to the Construction Design. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed connection.

3.4.1.2.18 Ball valves with cap

Delivery and installation of ball valves with cap. Working temperatures to 110 °C, working pressure to 1.6 MPa. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed valve.

3.4.1.2.18.1 Dimension - 1" – DN 25

3.4.1.2.18.2 Dimension - 2" – DN 50

3.4.1.2.19 Air-water reversible Heat pumps

Supply and installation of air-water reversible Heat pumps with EVI compressor and possibility of operation in heating mode from -25 °C to +40 °C as well as in cooling mode coupled two in a cascade of 102.00 per kW of cooling to 204 kW and 99.5 kW total 199 kW heating. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid per pieces of completely installed heat pump.

- Cooling capacity 102 kW
- Power input for cooling mode 26,6 kW
- EER 3,83
- Water flow rate plant side 17587 l/h
- Pressure drops plant side 22 kPa
- Heating capacity 99,5 kW

- Power input for heating mode 21,1 kW
- COP 4,72
- Water flow rate plant side 17179 l/h
- Pressure drops plant side 21 kPa
- Power supply 400/3/50 V/ph/Hz
- Compressor type: scroll with vapour injection (EVI)
- N° compressors/N° refrigerant circuits: 2/1
- Plant side heat exchanger type: finned coil
- Fans type: axial
- N° fans: 4
- Hydraulic fittings: 2" M
- Hydraulic fittings heat recovery (VD): 1" 1/4 M
- Weight 941 kg
- Maximum power input 45,8 kW
- Sound power level 81 dB(A)
- Sound pressure level at a distance of 1m 62 dB(A)
- Sound pressure level at a distance of 5m 54 dB(A)
- Sound pressure level at a distance of 10m 49 dB(A)
- Dimensions: 1130x3130x1980 mm

The sound pressure level is measured according to ISO 3744 standard and is referred to a distance of 1/5/10 meters from the external surface of the unit. Executed works, as described in this section, will be paid per pieces of completely installed heat pump.

3.4.1.2.20 Engagement of the auto crane

Engagement of the auto crane needed for this type of vertical transport with the preparation of the traffic management report and the occupation of the public area as well as obtaining the approval of the competent authorities. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid per hour of used auto crane.

3.4.1.2.21 Heat Pumps substructure

Creating a substructure for Heat Pumps on-site from the corresponding U 100 profiles. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of used U 100 profiles.

3.4.1.2.22 Charging Primary Heat pumps circuit

Charging the installation of the primary Heat pumps circuit with a glycol for temperatures up to -25 °C. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per litre of used glycol.

3.4.1.2.23 Drilling of brick walls for installation of pipes

Drilling of brick walls of d=50 to 100 cm for installation of pipes for heating and cooling system. Price includes the supply of materials and labour needed for completion of specified works. Paid per piece of drilled hole.

- 3.4.1.2.23.1 Ø 50 mm in brick walls d=50 cm
- 3.4.1.2.23.2 Ø 50 to 100 mm in brick walls d=50 cm
- 3.4.1.2.23.3 Up to Ø 50 mm in brick walls d=100 cm
- 3.4.1.2.23.4 Ø 50 to 100 mm in brick walls d=100 cm
- 3.4.1.2.23.5 Holes 100 x 250 mm in brick walls d=50 cm
- 3.4.1.2.23.6 Holes 100 x 250 mm in brick walls d=100 cm

3.4.1.2.24 Drilling of brick vaults

Drilling of vaulted brick ceiling structure (between all floors) for installation of pipes for heating and cooling system. Price includes the supply of materials and labour needed for completion of specified works. Paid per piece of drilled hole.

- 3.4.1.2.24.1 Ø 50 to 100 mm in structure d=100 cm
- 3.4.1.2.24.2 Holes 100 x 250 mm in structure d=100 cm

3.4.1.2.25 Cutting of brick walls d=50 cm for copper pipes installation

Cutting of openings 100/250 mm in brick walls d=50 cm for installation of copper pipes for heating and cooling system. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of cut opening.

3.4.1.2.26 Flushing of pipes with cold water

Flushing of complete fan-coil installation and floor heating installation, with cold water, until thoroughly cleaned of any residues. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.1.2.27 Cold hydraulic pressure test

Cold hydraulic pressure test of fan-coil installation and floor heating installation (hydraulic test) p=working pressure+2.0 bar, lasting min. 6 h with monitoring, then min. 24 h more, according to JUS M. E6.012 and design specifications. Before testing, perform flushing of pipes and check for leaking. Written and signed protocol of testing must be provided. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.1.2.28 Hot water hydraulic test

Testing of completely installed heating network for the building. The testing must be made pursuant the local applicable regulations and includes: filling of installations with water, checking of leaking at atmospheric pressure, closing of installation and putting under tested pressure (working pressure increased by 30-50%). Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works.

- manual adjustment of valves to values from hydraulic calculation. Measured per piece of valve;
- manual adjustment of valves in heating substation to values from hydraulic calculation. Measured per piece of valve;
- measuring and flow regulation of circulation rounds with ultrasonic flow-meter. Measured per piece of circulation rounds.

Paid as a lump sum.

3.4.1.2.29 Handing over of installations

Handing over of tested installations, with signed protocol. Price includes the labour needed for completion of specified works. Paid as a lump sum.

3.4.1.2.30 Finishing works

Finishing works for item Installation works include:

- Necessary measurements and adjustments. All testing defined by RS regulations.
- Marking of the installation (labels, symbols and positions).
- Operating instructions in Serbian and English language in three copies. One copy must be framed and hung on the wall in the heating substation.
- Site clean-up to enable the start of operation of installations.
- Handing over of complete documentation about equipment and works necessary for technical inspection, and obtaining of working permission.
- Handing over of the installation to final user, delivery of handover protocol.
- Handing over of built design in three hard copies (with design details).
- Staff training for use of installed equipment.

Price includes all required material and labour needed for completion of specified works. Paid as a lump sum.

3.4.1.2.31 Copies of "as built" drawings and documents

Based on survey of executed construction works and performed installations, as built technical documentation will be prepared in accordance with Law on Construction and Planning 2014. Executed works, as described in this section, will be paid on a lump sum basis, for the completely prepared set off as built technical documentation.

3.4.1.2.32 Copies of user manuals for installed equipment

Delivery of user manuals for all installed equipment, in English and Serbian language. Paid as a lump sum.

3.4.1.3 Server room, UPS room - Air-Conditioning Installation, Gas Fire Extinguishing System

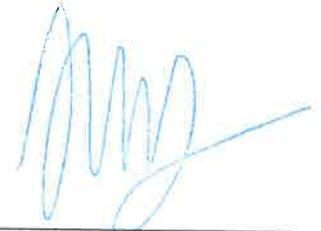
3.4.1.3.1 Chiller Unit

Supply of Chiller Unit cooled with outside air, for outdoor mounting, low noise type, with free-cooling module, plate evaporator, buffer tank and two circulation pumps.

- Cooling capacity max: $Q_{hl}=72.1$ kW
- Water temperature on evaporator: 15/10°C
- Cooling medium: water/ethylenglycol 65/35%
- Outside air temperature: 35°C
- Refrigerant: R410A
- Compressor type - Scroll
- Number of compressor: 2
- Quantity of refrigerant circuits: 1
- Quantity of regulation steps: 2
- Dimensions: 2800 x 1350 x (h)1945mm
- Power supply: 400V-3ph-50Hz
- Unit power consumption $P_a=23.9$ kW
- Free-cooling capacity @air inlet (Air entering temperature 10°C): $Q_{hl}=22$ kW
- Free-cooling capacity @air inlet (Air entering temperature 1°C): $Q_{hl}=72$ kW
- Free cooling module consists of: heat exchanger, three way motor controlled proportional valve and temperature sensor.

Additional equipment:

- Buffer Tank, 300l
- Hydraulic Kit 2 (2 circulation pumps)
- Expansion vessel Flexcon 8l



- Rubber anti vibration mounts
- Water pressure gauge
- Digital Extension Board C7000
- Free cooling module
- Liquid receiver (21 l)
- HP/LP-gauges
- Compressor soft start
- Phase control
- Outdoor temperature sensor

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.2 Installation and commissioning of Chiller Unit

Installation and commissioning of Chiller Unit which include:

- Raising the Units on the roof and positioning at the earlier prepared construction.
- Electrical connection of Unit
- Connection to the pipe installation
- Control of elements of protection and regulation automation
- Setting the operating parameters to processor device
- Commissioning the test facility and monitoring of operating parameters
- Issuing guarantees.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.3 Air-conditioning Unit for Server room – Type 1

Supply of precision air conditioning unit, with one chilled water circuit for internal installation, recirculating air operation, air direction "Down-flow", air inlet into the A/C unit from top, cooling and dehumidification operation, equipped with motorized shut off damper when unit is on stand-by.

- Cooling capacity (total): 49.9kW
- Cooling capacity (sensible): 49.9 kW
- Medium inlet/outlet temperature: 10/15°C
- Cooling medium: water/ethylenglycol 65/35%
- Air flow: 12.700 m³/h
- Return air temperature: 26°C
- Return air humidity: 50%
- Dimensions: 1400 x 890 x (h)2495mm
- Additional equipment:
- Steam Humidifier 8kg/h
- Water detection system incl. sensor and solenoid-valve
- Damper for top mounting with adapter plate; size 2
- Fan section with discharge to front
- 3-way CW valve
- Advanced Control-System - protocol: Modbus RTU
- Digital Extension Board
- Shutdown by external fire alarm with reset at controller

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.4 Air-conditioning Unit for Server room – Type 2

Supply of precision air conditioning unit, with one chilled water circuit for internal installation, recirculating air operation, air direction "Downflow", air inlet into the A/C unit from top, equipped with motorized shut off damper when unit is on stand-by.

- Cooling capacity (total): 49.9kW
- Cooling capacity (sensible): 49.9 kW
- Medium inlet/outlet temperature: 10/15°C
- Cooling medium: water/ethylenglycol 65/35%
- Air flow: 12.700 m³/h
- Return air temperature: 26°C
- Return air humidity: 50%
- Dimensions: 1400 x 890 x (h)2495mm
- Additional equipment:
- Steam Humidifier 8kg/h
- Water detection system incl. sensor and solenoid-valve
- Damper for top mounting with adapter plate; size 2
- Fan section with discharge to front
- 3-way CW valve
- Advanced Control-System - protocol: Modbus RTU
- Digital Extension Board
- Shutdown by external fire alarm with reset at controller

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.5 Installation and commissioning of Air-conditioning Units Type 1 and Type 2

Installation and commissioning of Air Conditioning Unit which include:

- Raising the Units on the Fourth floor and positioning at the earlier prepared construction.
- Electrical connection of Unit
- Connection to the pipe installation
- Control of elements of protection and regulation automation
- Setting the operating parameters to processor device
- Commissioning the test facility and monitoring of operating parameters
- Issuing guarantees.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.6 Dehumidifier Unit for Server room

Supply, installation and commissioning Dehumidifier Unit operates on the principle of a heat pump, equipped with robust galvanized steel frame, operate in combination with radiant cooling systems, rotate compressor type, condensers and evaporators are made of copper pipes and aluminium fins.

- Moisture removed: 48,5 l/24h
- Room temperature: 26 °C
- Relative humidity: 65 %
- Cold water inlet temp.: 15 °C
- Total power input: 700 W
- Max power input: 830 W
- Max input current: 5,0 A
- Peak current: 20,7 A
- Water flow: 500 l/h

- Pressure drop: 17 kPa
- Air flow: 600 m³/h
- Available static pressure: 60 Pa
- Sound pressure: 42 dB(A)
- Temperature operating range: 15-35 °C
- Humidity operating range: 40-99 %
- Power supply V/Ph/Hz 230/1/50

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.7 Precision Air-conditioning Unit for Server room

Supply of precision air conditioning unit, for indoor use with recirculating operation, air suction from top, discharge through front panel with grille for supply air with horizontal adjustable air blades - bottom plate.

- Cooling capacity (total): 7.3 kW
- Cooling capacity (sensible): 7.3 kW
- Medium inlet/outlet temperature: 10/15°C
- Cooling medium: water/ethylenglycol 65/35%
- Air flow: 2.000 m³/h
- Return air temperature: 24°C
- Return air humidity: 50%
- Dimension: 600 x 600 x (h)1850mm
- Additional equipment:
- Discharge through front incl. closed bottom plate
- Steam Humidifier 2 kg/h
- Advanced Control-System - protocol: Modbus RTU
- Digital Extension Board
- HTTP/ SNMP data protocol in separate box
- Water detection system incl. sensor and solenoid-valve

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.8 Installation and commissioning of Air-conditioning Unit for Server room

Installation and commissioning of precision air conditioning units which include:

- Raising the Units on the Fourth floor and positioning at the earlier prepared construction.
- Electrical connection of Unit
- Connection to the pipe installation
- Control of elements of protection and regulation automation
- Setting the operating parameters to processor device
- Commissioning the test facility and monitoring of operating parameters
- Issuing guarantees

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.9 Free-cooling air-conditioning unit with IP54 protection

Supply, installation and commissioning Free-cooling air-conditioning unit with IP54 protection, for indoor use, G4 filtration of external air, air suction from back side, discharge through front side. Installation and commissioning of Free-cooling unit. Unit needs to meet the current regulations and standards, the European Guidelines for Machines and the German safety regulations, CE certified, manufactured in a company certified according to DIN ISO 9001 / EN 29001.

Additional equipment:

- User keypad 3 digits
- Air intake protection grille with metallic pre-filter
- Serial adapter for BMS/Gateway connection
- Overpressure damper for discharge air opening

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.1.3.10 Ball valves

Delivery and mounting of ball valves. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed valve.

3.4.1.3.10.1 Dimension - DN 80

3.4.1.3.10.2 Dimension - DN 50

3.4.1.3.10.3 Dimension - DN 25

3.4.1.3.11 Strainers

Delivery and mounting of strainers. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed strainer.

3.4.1.3.11.1 Dimension - DN 100

3.4.1.3.11.2 Dimension - DN 50

3.4.1.3.11.3 Dimension - DN 25

3.4.1.3.12 Non return valves DN 80

Delivery and mounting of non-return valves. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed valves.

3.4.1.3.13 Expansion vessel V=80 litter

Delivery and mounting of Expansion vessel. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed vessel.

3.4.1.3.14 Safety valves of dimension DN 25

Delivery and mounting of safety valves. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed valve.

3.4.1.3.15 Thin wall steel pipe

Delivery and installation of thin wall steel pipe made of carbon steel, provided for connecting "press" fittings. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipe.



- 3.4.1.3.15.1 Dimension - Ø42x1.5 mm
- 3.4.1.3.15.2 Dimension - Ø54x1.5 mm
- 3.4.1.3.15.3 Dimension - Ø76.1x2 mm
- 3.4.1.3.15.4 Dimension - Ø88.9x2 mm

3.4.1.3.16 Fasteners for cold pressing

Delivery and installation of fasteners for cold pressing connecting of thin wall steel pipe made of carbon steel, mandatory on both sides of the sealant. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed fastener.

- 3.4.1.3.16.1 Elbow – Dimension Ø42 mm
- 3.4.1.3.16.2 Elbow – Dimension Ø76.1 mm
- 3.4.1.3.16.3 Elbow – Dimension Ø88.9 mm
- 3.4.1.3.16.4 Nipple – Dimension Ø42 mm
- 3.4.1.3.16.5 Nipple – Dimension Ø54 mm
- 3.4.1.3.16.6 Reducer – Dimension Ø54 / 42 mm
- 3.4.1.3.16.7 Reducer – Dimension Ø76.1 / 54 mm
- 3.4.1.3.16.8 Reducer – Dimension Ø42-5/4"
- 3.4.1.3.16.9 Reducer – Dimension Ø76.1 / 2"
- 3.4.1.3.16.10 Reducer – Dimension Ø88.9 / 3"
- 3.4.1.3.16.11 Tee – Dimension Ø54 / 42 / 54 mm

3.4.1.3.17 Insulation for pipe network

Delivery and installation of insulation for pipe network made of thin wall steel pipe. Isolation is made of elastomeric foam and supplied in coils, with insulation thickness of 13 mm, halogen free.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed insulation.

- 3.4.1.3.17.1 Dimension - Ø42x13 mm
- 3.4.1.3.17.2 Dimension - Ø54x13 mm
- 3.4.1.3.17.3 Dimension - Ø76.1x13 mm
- 3.4.1.3.17.4 Dimension - Ø88.9x13 mm

3.4.1.3.18 Set of distributors and collectors

Delivery and installation set of distributors and collectors with two connections DN80 and one connection DN50 from stainless steel, insulated with $\delta=20\text{mm}$ isolation made of elastomeric foam, halogen free. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed set.

3.4.1.3.19 Plastic pipes and fittings for condensate drain Ø32 mm

Supply delivery and installation of plastic pipes and fittings for condensate drain. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipe.

3.4.1.3.20 Steel substructure for chillers on the roof

Supply delivery and installation of construction steel substructure for chillers on the roof. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of used steel profiles.

3.4.1.3.21 Steel substructure for air-conditioning units

Supply delivery and installation of construction steel substructure for air-conditioning unit. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of completely used steel profiles.

3.4.1.3.22 Engagement of the auto crane

Engagement of the auto crane, to lift units on roof that corresponds for this type of vertical transport with the preparation of the traffic report and the occupation of the public area as well as obtaining the approval of the competent authorities. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per hour of used auto crane.

3.4.1.3.23 106 Litre Container

Delivery and installation 106 l Container with 2" Valve, Container Label, PED System Compliance Tag, Container Bracket. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed set.

3.4.1.3.24 Gas Novec 1230

Delivery and installation Gas Novec 1230. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of completely used Gas.

3.4.1.3.25 Discharge Hose - 50 mm discharge hose

Delivery and installation Discharge Hose - 50 mm discharge hose. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed hose.

3.4.1.3.26 Supervisory Pressure Switch - special (close on fail) - 25bar

Delivery and installation Supervisory Pressure Switch - special (close on fail) - 25bar. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed switch.

3.4.1.3.27 Solenoid Actuator

Delivery and installation Solenoid Actuator. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed actuator.

3.4.1.3.28 Manual Actuator

Delivery and installation Manual Actuator. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed actuator.

3.4.1.3.29 Discharge pressure switch

Delivery and installation Discharge Pressure Switch with Adapter - Male adapter (1/4" BSPT x 1/4" BSPP), Flexible pilot hose. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed switch.

3.4.1.3.30 Nozzle

Delivery and installation Nozzle with brass, 360 degrees, 1 1/2", BSPP female. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed nozzle.

3.4.1.3.31 Door caution plate (no lock off), Manual Release Caution Plate

Delivery and installation Door caution plate (no lock off), Manual Release Caution Plate. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed door.

3.4.1.3.32 Steel weldless pipes (seamless pipe)

Delivery and installation Steel weldless pipes (seamless pipe) according to API51 GradB ASTM A 106 NP42, DN40-DN50. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipe.

3.4.1.3.33 Fittings for Steel weldless pipes (seamless pipe)

Delivery and installation fittings for Steel weldless pipes (seamless pipe) according to API51 GradB ASTM A 106 NP42, DN40-DN50. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed fitting.

3.4.1.3.34 Primary and finishing coat

Primary and finishing coat. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of used colour.

3.4.1.3.35 Fire alarm panel

Delivery and installation of Fire alarm panel. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed panel.

3.4.1.3.36 Extinguishing module

Delivery and installation of extinguishing module. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed module.

3.4.1.3.37 Batteries 12V/17Ah

Delivery and installation of Batteries 12V/17Ah. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed battery.

3.4.1.3.38 Fire detector

Delivery and installation of Fire detector. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed detector.

3.4.1.3.39 Manual call point, conventional, activating

Delivery and installation of Manual call point, conventional, activating. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed item.

3.4.1.3.40 Manual call point, conventional, blocking

Delivery and installation of Manual call point, conventional, blocking. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed item.

3.4.1.3.41 Signal panel reading GAS

Delivery and installation of Signal panel reading GAS. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed panel.

3.4.1.3.42 Flashlight siren indoor/outdoor conventional, red

Delivery and installation of Flashlight siren indoor/outdoor conventional, red. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed siren.

3.4.1.3.43 Electrical cabinet

Delivery and installation of Electrical cabinet with switches for controlling ventilation, etc. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed cabinet.

3.4.1.3.44 Cable JH(St)H 2x2x0.8mm

Delivery and installation of Cable JH(St)H 2x2x0.8mm. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed cable.

3.4.1.3.45 Cable NHXHX 3x1.5mm²

Delivery and installation of NHXHX 3x1.5mm². Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed cable.

3.4.1.3.46 Cable NHXHX 2x1.5mm² FE 180/E30

Delivery and installation of Cable NHXHX 2x1.5mm² FE 180/E30. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed cable.

3.4.1.3.47 Cable JE-H (St) H 2x2x0.8mm FE 180/E30

Delivery and installation of Cable JE-H (St) H 2x2x0.8mm FE 180/E30. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed cable.

3.4.1.3.48 Halogen free pipe

Delivery and installation of Halogen free pipe. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipe.

3.4.1.3.49 Corrugated hose Ø18 halogen free

Delivery and installation of Corrugated hose Ø18 halogen free. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed hose.

3.4.1.3.50 Fastening clip

Delivery and installation of Fastening clip. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed clip.

3.4.1.3.51 Ventilation systems (air extraction) for the Server room and UPS room

Delivery and installation of the two ventilation systems (air extraction) for the server room and UPS room. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.1.3.52 Flushing of pipes with cold water in Server room

Flushing of complete cooling installation for Server and UPS room, with cold water, until thoroughly cleaned of any residues. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.1.3.53 Cold hydraulic pressure test for Server room

Cold hydraulic pressure test of complete cooling installation for Server and UPS room (hydraulic test) $p = \text{working pressure} + 2.0 \text{ bar}$, lasting min. 6 h with monitoring, then min. 24 h more, according to JUS M. E6.012 and design specifications. Before testing, perform flushing of pipes and check for leaking. Written and signed protocol of testing must be provided. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.1.3.54 Handing over of installations from Server room

Handing over of tested complete air-conditioning and Gas Fire extinguishing system installations, for Server and UPS room, to the Investor, with signed protocol. Price includes the labour needed for completion of specified works. Paid as a lump sum.

3.4.1.3.55 Finishing works for Server room

Finishing works for item Server room and UPS room include:

- Necessary measurements and adjustments. All testing defined by RS regulations.
- Marking of the installation (labels, symbols and positions).
- Operating instructions in Serbian and English language in three copies. One copy must be framed and hung on the wall in the heating substation.
- Site clean-up to enable the start of operation of installations.
- Handing over of complete documentation about equipment and works necessary for technical inspection, and obtaining of working permission.
- Handing over of the installation to final user, delivery of handover protocol.
- Handing over of built design in three hard copies (with design details).
- Staff training for use of installed equipment.

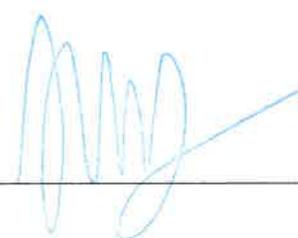
Price includes all required material and labour needed for completion of specified works. Paid as a lump sum.

3.4.1.3.56 Copies of "as built" drawings and documents for Server room

Based on survey of executed construction works and performed installations, as built technical documentation will be prepared in accordance with Law on Construction and Planning 2014. Executed works, as described in this section, will be paid on a lump sum basis, for the completely prepared set off as built technical documentation.

3.4.1.3.57 Copies of user manuals for installed equipment in Server room

Delivery of user manuals for all installed equipment, in English and Serbian language. Paid as a lump sum.



3.4.2 VENTILATION AND AIR CONDITIONING

Some rooms in the building are equipped with ventilation and air conditioning systems. Rooms with a larger number of people are equipped with a system of air conditioning, i.e. Heat Recuperators, with an integrated Heat Pump, which prepares the fresh air to the room temperature, necessary for a comfortable stay of people in room. In order to save energy, when weather conditions allow this, the Heat Recuperator is equipped with free-cooling and free-heating options. The prepared air is inserted into the space via ceiling diffusers or two-row grilles. The diffuser connections are equipped with motor dampers to be controlled by remote control.

Ventilation of auxiliary rooms and sanitary facilities, is provided with a special ventilation system.

The supplied Graphic Documentation (Drawings) shows the the position of equipment on a layout and the installation ducts distribution, with an estimated capacity. Before starting the works, for the start of works, it is necessary to create a Design for execution (PZI) compliant with technical specifications and the Design.

3.4.2.1 Heat Recovery Unit

Heat recovery unit is absorbed with following characteristics: Frame is made from extruded aluminium alloy bars, connected by 3-way reinforced nylon joints, sandwich panels are 23 mm thickness, galvanized steel inner skin and pre-coated outer skin. The filter sections in both directions are in the quality of efficiency F7CF. Centrifugal fans with direct drive are forward curved blades. Two-step recovery: the first step is to air-to-air cross-flow aluminium plate exchanger and the second step is air-to-air heat pump system with R410A composed of electric driven compressor, evaporating and condensing reversible finned coils, electronic expansion valve, liquid receiver, 4-way reversible valve, low and high pressure switch, bi-flow Freon filter and liquid indicator. Heat recovery unit contains three-way valve with actuator, adjusting damper with actuator, purifying system for building management system. The positions of Heat recovery unit have been given on drawings: 11 - 62 V&AC - BASEMENT I. ÷ 17 - 62 V&AC - ATTIC. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed unit.

3.4.2.1.1 Heat recuperator - type 1

- Nominal air flow 1000 m³/h
- Supply external static pressure 295 Pa
- Return external static pressure 240 Pa
- Sound pressure level calculated at 1m far from: ducted air outlet/ air inlet/ compressor box: 62/49/54 dB(A)
- Power supply: 230/1/50 V/ph/Hz
- Full load amperage: 13,2 A
- Heating capacities
- Static recovery efficiency: 50%
- Total heating capacity: 9410 W
- Heat pump capacity: 5010 W
- Unit COP: 9,2
- Cooling capacities
- Static recovery efficiency: 50%
- Total cooling capacity: 5840 W
- Cooling capacity: 4890 W
- Unit EER: 4,2
- Dimensions: 1840x410x1440 mm
- Weight: 185 kg

3.4.2.1.2 Heat recuperator - type 2

- Nominal air flow 1500 m³/h
- Supply external static pressure 290 Pa
- Return external static pressure 230 Pa
- Sound pressure level calculated at 1m far from: ducted air outlet/ air inlet/ compressor box: 67/54/57 dB(A)
- Power supply: 230/1/50 V/ph/Hz
- Full load amperage: 20,2 A
- Heating capacities
- Static recovery efficiency: 50%
- Total heating capacity: 14390 W
- Heat pump capacity: 7690 W
- Unit COP: 8,6
- Cooling capacities
- Static recovery efficiency: 50%
- Total cooling capacity: 8720 W
- Cooling capacity: 7270 W
- Unit EER: 3,9
- Dimensions: 1840x500x1440 mm
- Weight: 228 kg

3.4.2.1.3 Heat recuperator - type 3

- Nominal air flow 2300 m³/h
- Supply external static pressure 365 Pa
- Return external static pressure 305 Pa
- Sound pressure level calculated at 1m far from: ducted air outlet/ air inlet/ compressor box: 65/51/59 dB(A)
- Power supply: 400/3/50 V/ph/Hz
- Full load amperage: 10,0 A
- Heating capacities
- Static recovery efficiency: 50%
- Total heating capacity: 21190 W
- Heat pump capacity: 11090 W
- Unit COP: 8,9
- Cooling capacities
- Static recovery efficiency: 50%
- Total cooling capacity: 12830 W
- Cooling capacity: 10580 W
- Unit EER: 3,9
- Dimensions: 2040x550x1690 mm
- Weight: 267 kg

3.4.2.2 Pre-Insulated Ducts

Supply and installation of pre-insulated ducts and accessories for joining, hanging and suspension for ducts. Pre-insulated ducts, of aluminium / polyurethane sandwich, with thickness of panel 21 mm and thickness of aluminium (both sides) 80 microns. "ISO 9001:2000 Quality Certificate for Production and Training; ISO 14001:2004 Quality Certificate for Environmental Management Systems". Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m² of completely installed duct.

3.4.2.3 Insulated Flexible Aluminium Pipe

Delivery and installation of insulated flexible aluminium pipe Ø 160 mm. Insulated flexible aluminium pipe Ø 160 mm. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed pipe.

3.4.2.4 Galvanized Steel Plenum

Delivery and installation of the galvanized steel plenum with thickness of 0,6 mm. Galvanized steel plenum with thickness of 0.6 mm. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed plenum.

- 3.4.2.4.1 Dimension plenum 200x500x250 mm
- 3.4.2.4.2 Dimension plenum 600x600x250 mm
- 3.4.2.4.3 Dimension plenum 500x500x250 mm
- 3.4.2.4.4 Dimension plenum 1800x200x250 mm

3.4.2.5 Swirl Diffuser with Square Diffuser Face

Delivery and installation of swirl diffuser with square diffuser face. Swirl diffuser in air conditioning systems create a swirl to supply air to rooms. The resulting airflow induces high levels of room air, thereby rapidly reducing the airflow velocity and the temperature difference between supply air and room air. Ceiling swirl diffusers allow for large volume flow rates. The result is a mixed flow ventilation in comfort zones, with good overall room ventilation, creating only very little turbulence in the occupied zone. Diffuser face with fixed air control blades for horizontal swirling supply air discharge creating high induction levels. Supply air and extract air variants for comfort zones. Diffuser face is in galvanized sheet steel. The surfaces are pre-treated and powder coated white (RAL 9010). The plenum box is also of galvanized sheet steel, the lip seal of black rubber. Swirl diffuser meet the hygiene conformity requirements specified by the standards and regulations listed below.

- European standard
 - EN 13779 (09/2007)
- German standards
 - VDI 6022, part 1 (07/2011)
 - VDI 3803 (02/2010)
- Austrian standards
 - ÖNORM H 6021 (09/2003)
- Swiss SWKI regulations
 - VA104-01 (04/2006)

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed diffuser.

3.4.2.6 Air Grille with Two Rows of Adjustable Horizontal/Vertical Profiled Blades

Delivery and installation air grille with two rows of adjustable horizontal/vertical profiled blades dimension BxH=200x500mm. Air grille with two rows of adjustable horizontal/vertical profiled blades. Ventilation grilles with adjustable blades allow for adapting the discharge direction to the local conditions. The result is a mixed flow ventilation in comfort zones and industrial zones, with good overall room ventilation. Induction slows the airflow down, i.e. The airflow velocity decreases as the distance from the grille increases. The distance at which

the airflow velocity reaches a certain defined value, e.g. 0.2 m/s, is called throw distance. In cooling mode, it is necessary to take account of the jet deviation towards the occupied zone, which increases as the supply air to room air temperature difference increases and the discharge velocity decreases. In heating mode, the supply air jet deviates towards the ceiling. This has no negative effect on the airflow velocity in the occupied zone, but it may affect the complete ventilation of the room. Border and blades powder-coated (RAL 9010). Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed grille.

3.4.2.7 Weather-Resistant Louvers

Delivery and installation weather-resistant louvers. Dimension BxH=500x500 mm. Weather-resistant louver's give good protection against the direct ingress of rain, leaves and mosquitoes. Frames and blades made of extruded aluminium sections, natural anodized. Wire mesh screen made of galvanized steel. RAL 9010. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed louver.

3.4.2.8 Dampers for the Adjustment of Volume Flow Rates

Delivery and installation circular control dampers to adjust air volume flow rates. Dimension Ø 160 mm. Circular control dampers to adjust air volume flow rates in air-conditioning and ventilation systems. The damper is designed without a seal and with a circumferential gap between the case and blade tip of approximately 3 mm. The manual control knob with integral position indication can be rotated to provide adjustment between 0 and 90° in 2° increments using a positive locking click stop system. No adjustment tools required. The required setting angle as a function of pressure difference and volume flow rate is indicated on a diagram label affixed to the outside of the casing also the resulting sound power level can be read from the diagram. Casing and damper blade of galvanized sheet steel. Optionally, surface powder-coated (colour RAL 7001) or of stainless steel 1.4301. Adjustment device and bearings of plastic PPE, with fire protection rating (UL 94V-0). Matching to ducts according to DIN 24 145 and 24 146. Leakage air flow according to Class II, VDI 3803 and DIN V 24 194, Part 2. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed damper.

3.4.2.9 Actuator for Volume Flow Rates Dampers

Delivery and installation of actuators for volume flow rates dampers. Characteristic for volume flow control units is a closed control circuit for controlling the volume flow, i.e. measuring/comparing locations. The volume flow is measured by measuring a differential pressure (differential pressure). For this purpose, the volumetric flow controller contains a differential pressure sensor. The effective pressure is converted by the integrated differential pressure transmitter into a voltage signal. The actual volume flow value is available as a voltage signal. Due to the factory adjustment, 10 V DC always corresponds to the nominal volume flow (V_{nom}). The volume flow set-point is set by a higher-level controller (e.g. room temperature controller, air quality controller, building control technology) or by switching contacts. The variable volume flow control takes place between V_{min} and V_{max} . The over-control of the room temperature control by forced switching, for example shut-off, is possible. The controller compares the volume flow set-point with the actual value and controls the control deviation according to the internal actuator. Volume flow parameters V_{min} and V_{max} are set at potentiometers. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed actuator.

3.4.2.10 Slot Diffuser with One Different Number of Rows of Blades

Delivery and installation slot diffuser. Slot length $L=1800$. Number of rows 2. Slot diffuser with one different number of rows of blades, with 35 mm wide face. Diffuser face, slide-in flange and end caps consist of extruded aluminium sections, natural anodized finish E6-C-0, anodized to Euro standard (E6-C-31 to C-35) or powder-coated in RAL colours. The air control blades are produced in black plastic (polystyrene) as standard, similar to RAL 9005, or on request in white (similar to RAL 9010); the air control blades are optionally available in sheet

steel in black (similar to RAL 9005) or white (similar to RAL 9002). The plenum box consists of galvanized sheet steel, lining in mineral wool faced on one side with scrim, sealing lip in rubber. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed diffuser.

3.4.2.11 Ventilation of Toilets – Axial Fan and PV Valve

Supply and installation of axial fan, $V=150 \text{ m}^3/\text{h}$, and disk valves $\text{Ø}100 \text{ mm}$, for extracting air from sanitary facilities, with connection for circular duct (diameter 100 mm and 150 mm), flexible connections and back draft shutter. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed sets.

3.4.2.12 PVC Circular Ducts for Air Exhaust from Sanitary Blocks Description

Supply and installation of PVC circular ducts for air exhaust from sanitary blocks, with fittings, connecting and leak-proof material, with hanging supports, according to design details. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m' of completely installed ducts.

3.4.2.12.1 Dimension - $\text{Ø}200 \text{ mm}$

3.4.2.12.2 Dimension - $\text{Ø}150 \text{ mm}$

3.4.2.12.3 Dimension - $\text{Ø}100 \text{ mm}$

3.4.2.13 Adjustment and Measuring of Parameters on Air Gratings

Ventilation and Air conditioning adjustment/setting of regulation valves to previously calculated flow rates. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of adjusted valve.

3.4.2.14 Handing over of Installations for Ventilation and Air conditioning

Handing over of tested installations, with signed protocol. Price includes the labour needed for completion of specified works. Paid as a lump sum.

3.4.2.15 Finishing Works for Ventilation and Air conditioning

Finishing works for Ventilation and Air conditioning include:

- Necessary measurements and adjustments. All testing defined by RS regulations.
- Marking of the installation (labels, symbols and positions).
- Operating instructions in Serbian and English language in three copies. One copy must be framed and hung on the wall in the heating substation.
- Site clean-up to enable the start of operation of installations.
- Handing over of complete documentation about equipment and works necessary for technical inspection, and obtaining of working permission.
- Handing over of the installation to final user, delivery of handover protocol.
- Handing over of built design in three hard copies (with design details).
- Staff training for use of installed equipment.

Price includes all required material and labour needed for completion of specified works. Paid as a lump sum.

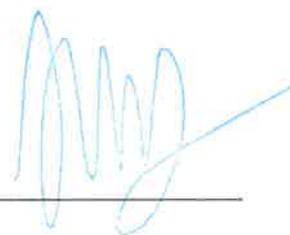
3.4.2.16 Copies of "As Built" Drawings and Documents

Based on survey of executed construction works and performed installations, as built technical documentation for Ventilation and Air conditioning will be prepared in accordance with Law on Construction and Planning

2014 and these TS. Executed works, as described in this section, will be paid on a lump sum basis, for the completely prepared as built technical documentation.

3.4.2.17 Copies of User Manuals for Installed Equipment for Ventilation and Air conditioning

Delivery of user manuals for all installed equipment, in English and Serbian language. Paid as a lump sum.



3.4.3 PASSENGER ELEVATORS

The purpose of these lifts is to transport people, between the Basement II (Basement I) and the Loft in a facility. It is to be installed inside a reinforced concrete hoist way. The drive machine is to be placed at the top of the hoist way.

Before starting the works, it is necessary to prepare Design for execution (PZI) compliant with all other professions (in particular, with architectural and construction works and electrical installations).

3.4.3.1 Procurement and Installation of L1 Passenger Elevator

Description

- Type of elevator: Passenger elevator, type I
- Number of units: 1
- Rated load capacity: $Q = 800 \text{ kg}$
- Travelling speed: $v = 1 \text{ m/s}$
- Number of stops/landings: $n = 6/6$
- Lifting height: $H=19.8 \text{ m}$

MACHINE/DRIVE SYSTEM:

- Electric motor; $N=5.4\text{KW}$, $n=119.4\text{min}^{-1}$, s
- Positioned on top of the elevator shaft (hoist way). Overhead clearance requirements at the top of the elevator shaft have been aligned with the regulations for machine rooms.
- Hoisting function ropes: $8 \times \Phi 8$
- Sheave at the top of the piston: $D=320\text{mm}$
- Elevator control:
- Simplex, aggregated in both directions with calling and registrar boxes for 6 stops, confirmation of signal received, occupancy control, including pertaining electrical installations
- Optional – device for automatic emergency travel and fire-fighting mode

Signalization:

- At the main landing, a digital indication of car position and light signal showing next travel direction;
- At other landings, light signal showing next travel direction;
- in the car, a digital indicator of the position of the car, light indicator of overload, a push button for door opening, a push button for alarm activation, emergency light.

Connection to power supply:

- Rated voltage $3 \times 380/220\text{V}$, 50Hz on the elevator's main switch in the machine room, with $3 \times 25\text{A}$ fuse switches, lighting of the elevator shaft via AC switch in the machine room and in the elevator shaft, with car light switch, earthed socket outlet with protective contact in the machine room and in the elevator shaft pit.

Electric installations:

- for dry area in the machine room and in the elevator shaft, the end and penultimate switches in the elevator shaft, station switches and high speed and low speed switches, electric safety contact, pertaining cable of the car, plastic ducts for laying of electric conductors

Car guides:

- „T“ $89 \times 62 \times 16$, including pertaining fixing equipment

Counter-weight guides:

- „T“ $70 \times 65 \times 9$, including pertaining fixing equipment

Landing doors:

- Automatic, telescope, two-panelled, 800x2100mm, with pertaining equipment.
- Panels and door frames: Inox-mirror finishing
- Door frames: Inox finishing, polished
- Structural fire design $f=90\text{min}$

Cars:

- Metal door design, installed in load-bearing steel frame with a device for gradual braking, device for equalizing the load on the ropes and electric control of tensioning:
 - Base: 1100x1700mm,
 - Height: 2200mm
 - Indoor Inox finishing
 - External surface: anti-corrosion coating
 - Floor: granite slabs
 - Lighting: indirect, in the suspended ceiling
 - Handrail on lateral end of the car, a mirror mounted above the handrail
 - Alarm and emergency lights
- Car door:
 - Automatic, telescope type, two-panelled, 1000x2100mm, including corresponding equipment
 - Panelling - Inox mirror

Elevator shaft (hoistway):

- Structure – concrete:
 - Base: (width) 1800 x 2100 mm (length):
 - Height: 28800mm
- Depth of the pit: 1500mm
- Final floor height: 3800mm

NOTE:

Connecting metal masses at the top of the elevator pit and connecting to potential equalization system in the machine room.

Connecting metal masses in the pit to the building grounded conductor installation.

SIGNS, NOTICES AND LABELS

All the signs, notices and labels must be clearly discernible, legible and understandable, made of durable material and permanently fixed. In the lift car and on the shaft doors, there is a sign stating the rated load in kg and maximum permitted number of persons. Part used for setting off the alarm is yellow, with a permanent sign saying “ALARM”, the minimum height of letters being 7 mm, or a symbol in the form of a bell.

The following signs and labels are to be placed on the roof:

- on the switch for stopping or next to it - label “STOP”
- on the service switch or next to it – label “NORMAL” and “SERVICE”
- on elements for activating the service travel command or next to them – sign of direction of the travel.

On the outer side of the command box door, the notices “DANGER OF DEATH”, “LIFT DRIVE” are to be placed.

Inside the command box there is an instruction for setting the car in motion manually and control, and for the application of the key for emergency opening of the landing door.

On the switch for car and hoist way lighting, there are plates with texts “CAR LIGHTING”, “HOISTWAY LIGHTING”.

On the over speed governor, there is a plate with the following information:

- company;
- speed of activation (m/s);
- over speed governor marking;
- technical specifications of the rope.

On the “STOP” switch in the hoistway pit or next to it, there is a label saying “OFF”.

On the drive machine, at a clearly discernible spot, there is a metal plate with the following information:

- company;
- technical specifications;
- drive machine mass;
- serial number and year of production.

LIFT TESTING

During the exploitation of the lift, should any of the following parts: load-bearing ropes, drive machine, grip device, over speed governor, navigation devices, braking devices and hoisting device be replaced, as well as if, during inspection, irregularity which may lead to dangerous drive condition is defined, the lift must not be commissioned until the technical inspection of the lift has verified that all the required conditions for its safe operation are met.

Passengers’ lifts are liable to mandatory occasional technical inspection.

Occasional technical inspection of the lift system must be performed no later than the expiration of one year after the previous technical inspection of the given lift.

An examination report is to be formulated on the performed technical inspection.

MAINTENANCE

Every lift is equipped with a manufacturer’s manual on operating the lift and its maintenance. Regular lift maintenance must be performed at least once a month. Every lift must keep a maintenance log.

DOCUMENTS ACCOMPANYING LIFT DURING TRANSPORT

During transport, i.e. delivery, a lift must be accompanied by a certificate of guarantee. The guaranteed period for proper functioning of the lift is two years. The lift is equipped with technical manual of the manufacturer.

The period for guaranteed lift servicing is ten years, starting from the day of commissioning the newly installed lift.

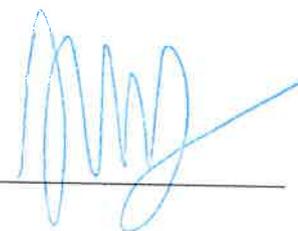
GENERAL PROVISIONS

During the guaranteed period, starting from the day when the system was properly commissioned, for every malfunction which occurs which was caused by poor quality of material, poor design or poor mounting, upon receiving a call must remove the failure and restore proper operation of the system.

Upon finishing the mounting, the lift system must undergo tests based on the Rulebook on Lift Safety (“Official Gazette of the Republic of Serbia”, No. 101/2010, dated December 29th 2010).

The Contractor shall deliver the following attestations:

- for the steel rope;
- for the electro-mechanic lock;
- for the emergency braking device;
- for the car over speed governor;



- for the insulation floor mats.

Simultaneously with commissioning the system, the user, shall provide maintenance of the system:

- daily, by means of one person in charge;
- regular maintenance, by means of a professional maintenance organization;
- regular technical inspection, by means of authorized institution.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid as a lump sum, for completely installed and tested elevator.

3.4.3.2 Procurement and Installation of L2 Passenger Elevator

Description

- Type of elevator: Passenger elevator, type I
- Number of units: 1
- Rated load capacity: $Q = 4.000 \text{ kg}$
- Travelling speed: $v = 1 \text{ m/s}$
- Number of stops/landings: $n = 5/5$
- Lifting height: $H=18.15 \text{ m}$

MACHINE/DRIVE SYSTEM:

- Electric motor;
 - $N=4.2\text{KW}$, $n=119,4\text{min}^{-1}$, s
 - Positioned on top of the elevator shaft (hoist way). Overhead clearance requirements at the top of the elevator shaft have been aligned with the regulations for machine rooms.
- Hoisting function ropes: $4 \times \Phi 8$
 - Sheave at the top of the piston: $D=320\text{mm}$
- Elevator control:
 - Simplex, aggregated in both directions with calling and registrar boxes for 5 stops, confirmation of signal received, occupancy control, including pertaining electrical installations.
 - Optional – device for automatic emergency travel and fire-fighting mode.
- Signalization:
 - At the main landing, a digital indication of car position and light signal showing next travel direction;
 - At other landings, light signal showing next travel direction;
 - in the car, a digital indicator of the position of the car, light indicator of overload, a push button for door opening, a push button for alarm activation, emergency light.
- Connection to power supply:

Rated voltage $3 \times 380/220\text{V}$, 50Hz on the elevator's main switch in the machine room, with $3 \times 25\text{A}$ fuse switches, lighting of the elevator shaft via AC switch in the machine room and in the elevator shaft, with car light switch, earthed socket outlet with protective contact in the machine room and in the elevator shaft pit.

- Electric installations:

For dry area in the machine room and in the elevator shaft, the end and penultimate switches in the elevator shaft, station switches and high speed and low speed switches, electric safety contact, pertaining cable of the car, plastic ducts for laying of electric conductors

- Car guides:

„T“ $89 \times 62 \times 16$, including pertaining fixing equipment

- Counter-weight guides:

„T“70x65x9, including pertaining fixing equipment

- Landing doors:

Automatic, telescope, two-panelled, 800x2100mm, with pertaining equipment.

Semi-automatic 700/2000 indoor Inox metal finishing, mounted in load-bearing steel frame with a device for gradual braking, device for equalizing the load on the ropes and electric control of tensioning

- Cars:

- Base: 800x1300mm,
- Height: 2200mm
- Indoor: Inox finishing
- External surface: anti-corrosion coating
- Floor: granite slabs
- Lighting: indirect, in the suspended ceiling
- Handrail on lateral end in the car, a mirror mounted above the handrail
- Alarm and emergency lights

- Car door:

Automatic, folding car door (BUS-type), two-panelled, 700x2000mm, including corresponding equipment.
Panelling - Inox mirror

- Structure – concrete:

- Base: (width) 950 x 2100 mm (length):
- Height: 26050mm
- Depth of the pit: 1500mm
- Final floor height: 3700mm

NOTE:

Connecting metal masses at the top of the hoist way and connecting to potential equalization system in the machine room.

Connecting metal masses in the pit to the building grounded conductor installation.

SIGNS, NOTICES AND LABELS

All the signs, notices and labels must be clearly discernible, legible and understandable, made of durable material and permanently fixed. In the lift car and on the shaft doors, there is a sign stating the rated load in kg and maximum permitted number of persons. Part used for setting off the alarm is yellow, with a permanent sign saying “ALARM”, the minimum height of letters being 7 mm, or a symbol in the form of a bell.

The following signs and labels are to be placed on the roof:

- on the switch for stopping or next to it - label “STOP”
- on the service switch or next to it – label “NORMAL” and “SERVICE”
- on elements for activating the service travel command or next to them – sign of direction of the travel.

On the outer side of the command box door, the notices “DANGER OF DEATH”, “LIFT DRIVE” are to be placed.

Inside the command box there is an instruction for setting the car in motion manually and control, and for the application of the key for emergency opening of the landing door.

On the switch for car and hoist way lighting, there are plates with texts “CAR LIGHTING”, “HOISTWAY LIGHTING”.

On the over speed governor, there is a plate with the following information:

- company;
- speed of activation (m/s);
- over speed governor marking;
- technical specifications of the rope.

On the “STOP” switch in the hoistway pit or next to it, there is a label saying “OFF”.

On the drive machine, at a clearly discernible spot, there is a metal plate with the following information:

- company;
- technical specifications;
- drive machine mass;
- serial number and year of production.

LIFT TESTING

During the exploitation of the lift, should any of the following parts: load-bearing ropes, drive machine, grip device, over speed governor, navigation devices, braking devices and hoisting device be replaced, as well as if, during inspection, irregularity which may lead to dangerous drive condition is defined, the lift must not be commissioned until the technical inspection of the lift has verified that all the required conditions for its safe operation are met.

Passengers’ lifts are liable to mandatory occasional technical inspection.

Occasional technical inspection of the lift system must be performed no later than the expiration of one year after the previous technical inspection of the given lift.

An examination report is to be formulated on the performed technical inspection.

MAINTENANCE

Every lift is equipped with a manufacturer’s manual on operating the lift and its maintenance. Regular lift maintenance must be performed at least once a month. Every lift must keep a maintenance log.

DOCUMENTS ACCOMPANYING LIFT DURING TRANSPORT

During transport, i.e. delivery, a lift must be accompanied by a certificate of guarantee. The guaranteed period for proper functioning of the lift is two years. The lift is equipped with technical manual of the manufacturer.

The period for guaranteed lift servicing is ten years, starting from the day of commissioning the newly installed lift.

GENERAL PROVISIONS

During the guaranteed period, starting from the day when the system was properly commissioned, for every malfunction which occurs which was caused by poor quality of material, poor design or poor mounting, upon receiving a call must remove the failure and restore proper operation of the system.

Upon finishing the mounting, the lift system must undergo tests based on the Rulebook on Lift Safety (“Official Gazette of the Republic of Serbia”, No. 101/2010, dated December 29th 2010).

The contractor shall deliver the following attestations:

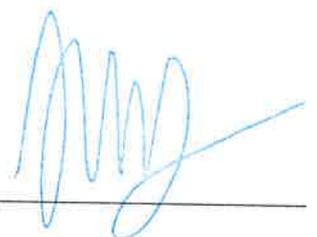
- for the steel rope;
- for the electro-mechanic lock;
- for the emergency braking device;
- for the car over speed governor;
- for the insulation floor mats.

Simultaneously with commissioning the system, the user, shall provide maintenance of the system:

- daily, by means of one person in charge;

- regular maintenance, by means of a professional maintenance organization;
- regular technical inspection, by means of authorized institution.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid on a lump sum basis, for completely installed and tested elevator.



3.4.4 THERMAL SUBSTATION

The building has an existing Thermal substation connected to the District Heating System. Based on the Technical conditions of the Public Utility Company “JKP Beogradske elektrane”, the consent was obtained on the reduction of the total heating consume. Reconstruction of the existing Thermal substation implies complete disassembly of equipment and pipelines of the secondary part of the installation. The new technical solution predicts two plate heat exchangers, one for heat exchange with a Heat Pump, the other with a District Heating System. Complete installation management in the Thermal substation is necessary to automate.

Preparation of sanitary hot water is provided through two heat sources, during the summer period, through the waste heat during the cooling of the building, i.e. using Heat Pump on the roof of the building, and in the transitional period and in the winter period, through the hot water tank with integrated heat pump and electric heaters, which are located in the Thermal substation.

The supplied Graphic Documentation (Drawings) shows the position of equipment on a layout and the installation pipes distribution, with an estimated capacity. Before starting the works, it is necessary to create a Design for execution (PZI) compliant with all other professions. Synchro plan of all installations has to be prepared prior to start works on any type of building installations.

For obtaining the Final Approval for the connection on the system of the Public Utility Company “JKP Beogradske elektrane”, it is necessary to create Design for execution (PZI), on the basis of the Technical Conditions of the “JKP Beogradske elektrane” and the newly-constructed conditions of the building, compliant with all other professions.

3.4.4.1 Dismounting Works on Existing Equipment and Installation in Thermal Substation

All existing equipment and pipe installation needs to be dismantled. The waste material from de-installation (dismantling): metal, plastic, building waste, must be disposed on an appropriate place. If de-mounted material is not needed, Contractor is obliged to transport it to the landfill and taxes for depositing the waste should be included in price. Price includes the machinery, tools and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid as lump sum.

3.4.4.1.1 Dismantling works in existing thermal substation

3.4.4.1.2 Transport to the landfill

3.4.4.2 Thermal Substation Installation Works

3.4.4.2.1 Shut-off valve

Delivery and installation of the shut-off valve complete with flanges and flange screws. Shut-off valve complying with European Directive no. 2014/68/UE.

Production standards:

- Design: EN 1171
- End connection: Flanged EN 1092-2/ISO 7005-2
- Face to face: EN 558 Series 14/DIN 3202 F4
- Test: EN 12266-1
- Marking: EN 19

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per piece of completely installed valve.

- 3.4.4.2.1.1 Dimension – DN 100/16
- 3.4.4.2.1.2 Dimension - DN 80/16
- 3.4.4.2.1.3 Dimension - DN 65/16
- 3.4.4.2.1.4 Dimension - DN 50/16
- 3.4.4.2.1.5 Dimension - DN 40/16
- 3.4.4.2.1.6 Dimension - DN 32/16
- 3.4.4.2.1.7 Dimension - DN 20/16
- 3.4.4.2.1.8 Dimension - DN 15/16

3.4.4.2.2 Ball valve

Delivery and installation ball valve 2 1/2 ", Ball valve 2 1/2 ", comply with European Directive no. 2014/68/UE.

Production standards:

- Design: EN 331/EN 1983
- End connection: EN ISO 228-1
- Face to face: DIN 3202-M3
- Test: EN 12266-1/EN 331
- Marking: EN 19

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed valve.

3.4.4.2.3 Strainer

Supply and installation of strainer. Production standards:

- Design: EN 558-1
- End connection: Flanged EN 1092-2/ISO 7005-2
- Face to face: EN 558 Series 1/DIN 3202 F1
- Test: EN 12266-1
- Marking: EN 19
- Strainer accordance with EN 12266-1:2013.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed strainer.

- 3.4.4.2.3.1 Dimension - DN 100/16
- 3.4.4.2.3.2 Dimension - DN 80/16
- 3.4.4.2.3.3 Dimension - DN 65/16
- 3.4.4.2.3.4 Dimension – DN 50/16
- 3.4.4.2.3.5 Dimension - DN 40/16
- 3.4.4.2.3.6 Dimension - DN 32/16
- 3.4.4.2.3.7 Dimension - DN 20/16
- 3.4.4.2.3.8 Dimension - DN 15/16

3.4.4.2.4 Plate heat exchanger for hot water

Delivery and installation of plate heat exchanger for hot water. Plate heat exchanger is made of shape-pressed heat plates. Gaskets between the plates separate the flow channels from each other so that the flows do not mix the task of the heat exchanger is to transfer heat from the primary to secondary flow through a heat transfer plate thus preventing the flows from mixing with each other. The plate heat exchanger with gaskets can be opened for cleaning and for replacement of plates and gaskets. The heat exchanger must be mounted in vertical position. Prepare the foundation for the heat exchanger if necessary. It is recommended that all pipes connected

to the heat exchanger are equipped with shut-off valves for maintenance purposes. A safety valve must be installed between the heat exchanger and the shut-off valves on the secondary side of the heat exchanger.

- Load: $Q = 180 \text{ kW}$
- Primary side inlet temperature $150 \text{ }^\circ\text{C}$
- Primary side outlet temperature $77 \text{ }^\circ\text{C}$
- Primary side volumetric flowrate $2,208 \text{ m}^3/\text{h}$
- Primary side fluid: Water
- Primary side fluid viscosity: $0,2915$
- Primary side fluid density: $945,27 \text{ kg/m}^3$
- Primary side fluid heat capacity: $4,25 \text{ kJ/kgK}$
- Primary side pressure drop: $2,9 \text{ kPa}$
- Secondary side inlet temperature $50 \text{ }^\circ\text{C}$
- Secondary side outlet temperature $60 \text{ }^\circ\text{C}$
- Secondary side volumetric flowrate $15,742 \text{ m}^3/\text{h}$
- Secondary side fluid: Water
- Secondary side fluid viscosity: $0,517$
- Secondary side fluid density: $985,60 \text{ kg/m}^3$
- Secondary side fluid heat capacity: $4,18 \text{ kJ/kgK}$
- Secondary side pressure drop: $18,68 \text{ kPa}$
- No. of plates: 40
- Plates material: Č.4580, Č.4576
- Plates thickness: $0,5 \text{ mm}$
- Gaskets material: EPDM
- Frame material: Č.1531(8.8)
- Max. working pressure: 25 bar
- Max. working temperature: $150 \text{ }^\circ\text{C}$
- Connection size: DN 50

Approvals:

- Pressure Equipment Directive (PED) 97/23/EC

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed exchanger.

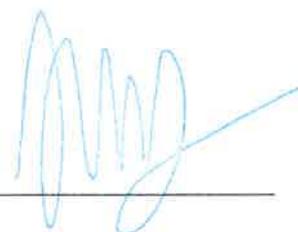
3.4.4.2.5 Plate heat exchanger for cold water

Delivery and installation of plate heat exchangers for cold water. Plate heat exchanger is made of shape-pressed heat plates. Gaskets between the plates separate the flow channels from each other so that the flows do not mix the task of the heat exchanger is to transfer heat from the primary to secondary flow through a heat transfer plate thus preventing the flows from mixing with each other. The plate heat exchanger with gaskets can be opened for cleaning and for replacement of plates and gaskets. The heat exchanger must be mounted in vertical position. Prepare the foundation for the heat exchanger if necessary. It is recommended that all pipes connected to the heat exchanger are equipped with shut-off valves for maintenance purposes. A safety valve must be installed between the heat exchanger and the shut-off valves on the secondary side of the heat exchanger.

- - Load: $Q = 200 \text{ kW}$
- - Primary side inlet temperature $5 \text{ }^\circ\text{C}$
- - Primary side outlet temperature $10 \text{ }^\circ\text{C}$
- - Secondary side inlet temperature $12 \text{ }^\circ\text{C}$
- - Secondary side outlet temperature $7 \text{ }^\circ\text{C}$

Approvals:

- Pressure Equipment Directive (PED) 97/23/EC



Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed exchanger.

3.4.4.2.6 Lift type check valve with flanges

Delivery and installation of lift type check valve with flanges, counter flanges and flange connection. Lift type check valve with flanges let to fluid in the facility required downstream and ceases the flow in case of reverse flow. It has cast iron body, stainless steel disc and graphite seal. The body is coated with wet epoxy paint as standard. It can be coated with fusion-bonded epoxy if required.

Production standards:

- Design EN 12334
- End connection Flanged EN 1092-2/ISO 7005-2
- Face to face EN 558/DIN 3202
- Test EN 12266-1
- Marking EN 19

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed valve.

3.4.4.2.6.1 Dimension - DN 65/16

3.4.4.2.6.2 Dimension - DN 80/16

3.4.4.2.6.3 Dimension - DN 100/16

3.4.4.2.7 Balancing valve

Delivery and installation of balancing valve 2 1/2". Balancing valves are hydraulic devices used for accurately regulating the flow rate of the thermal medium supplying the terminal emitters of a system.

Materials:

- Body: grey cast iron EN-GJL-250
- Cover: grey cast iron EN-GJL-250
- Control stem: brass EN 12164 CW614N
- Obturator: PPS
- Seal seat: grey cast iron EN-GJL-250
- Hydraulic seals: EPDM
- Obturator seal: EPDM
- Knob: DN 65 PA
- Pressure test ports: brass body with EPDM seal elements
- Medium: water and non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC
- Maximum percentage of glycol: 50%
- Maximum working pressure: 16 bar
- Working temperature range: -10–140 °C
- Connections:
- Main: DN 65; PN 16 - EN 1092-2
- Valve body pressure test ports: 1/4" F (ISO 228-1)

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed valve.

3.4.4.2.8 Pressure gauges

Delivery and mounting of pressure gauges Ø 160 mm. Pressure gauge assembled and manufactured in according to norm EN 8317.1. Price includes the supply of materials and labour needed for completion of

specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed pressure gauge.

3.4.4.2.8.1 Pressure gauges from 0-10 bar

3.4.4.2.8.2 Pressure gauges from 0-16 bar

3.4.4.2.9 Thermometer in MS protection tube

Delivery and installation of thermometers in MS protection tube. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed thermometer.

3.4.4.2.9.1 Temperature from 0-200 °C

3.4.4.2.9.2 Temperature from 0-130 °C

3.4.4.2.10 Collector and distributor

Supply and installation of collector and distributor in the secondary part of the substation, dimension Ø 160x1500 mm. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed collector.

3.4.4.2.11 Circulation pump

Delivery and installation of circulation pumps for heating and cooling flanges and flanged connections producers Pump. Single-stage, centrifugal, in-line, single-head pump. The pump is fitted with an IEC-flanged three-phase MGE motor with frequency converter and PI-controller integrated in the motor terminal box.

- Speed: $n=1450$ o/min.
- Power: $P=2,2$ kW.
- Circulation pump: capacity-max 33 m³/h, delivery head-max $12,9$ m
- Power Supply: $3 \times 380-480$ V; $4, 60-3, 80$ A
- the terminal box holds terminals for the connection of:
 - Pump start/stop (potential-free contact)
 - external remote set point setting via analog signal, $0 - 5$ V, $0 - 10$ V, $0(4) - 20$ mA
 - 5 V voltage supply for set point potentiometer, $I_{max} = 5$ mA
 - sensor, $0 - 5$ V, $0 - 10$ V, $0(4) - 20$ mA
 - 24 V voltage supply for sensor, $I_{max} = 40$ mA
 - input for forced control to MIN or MAX (potential-free contact)
 - potential-free fault signal relay with changeover contact
 - RS485 GENIbus
- Liquid:
 - Liquid temperature range: $273...363$ K
- Technical:
 - Speed for pump data: 1400 rpm
 - Rated flow: 33 m³/h
 - Rated head: $12,9$ m
 - Actual impeller diameter: 210 mm
 - Curve tolerance: ISO 9906 Annex A
- Materials:
 - Pump housing: Cast iron EN-JL1040 DIN W.-Nr. A48-40 B ASTM
 - Impeller: Cast iron EN-JL1030 DIN W.-Nr. A48-30 B ASTM
- Installation:
 - Maximum ambient temperature: 313 K

- Maximum operating pressure: 1600 kPa
- Flange standard: DIN
- Pipe connection: DN 65
- Pressure stage: PN 16
- Flange size for motor: FF215
- Electrical data:
 - Motor type: 100LB
 - Efficiency class: 1
 - Number of poles: 4
 - Rated power - P2: 2.2 kW
 - Mains frequency: 50 Hz
 - Rated voltage: 3 x 380-480 V
 - Rated current: 4,60-3,80 A
 - Cos phi - power factor: 0,94-0,90
 - Rated speed: 180-1740 rpm
 - Enclosure class (IEC 34-5): IP55
 - Insulation class (IEC 85): F
- Others;
 - Net weight: 84.9 kg
 - Gross weight: 91.7 kg
 - Shipping volume: 0.218 m³

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed pump.

3.4.4.2.12 Steel pipes

Delivery and installation of steel pipes and additional material. Pipes are using for construction works on complete piping installation on Thermal substation No 15 - No100, according to SRPS C.B5.221 or DIN 2440. Additional material for the manufacture and installation, technical gases, welding wire and similar, 50% of the previous item.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per kg of installed pipe.

3.4.4.2.13 Steel tubes cleaning and coating

Steel tubes cleaning and coating. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.4.2.14 Thermal insulation – hot water

Thermal insulation with glass wool 50 mm thickness and coated with aluminium sheet 0.5 mm.

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m² of completely installed insulation.

3.4.4.2.15 Thermal insulation – cold water

Delivery and installation of insulation for pipe network made of thin wall steel pipe – cold water. Isolation is made of elastomeric foam and supplied in coils, with insulation thickness of 13 mm, halogen free. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per m² of completely installed insulation.

3.4.4.2.16 Complete automation of the thermal substation

Complete automation of the thermal substation. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.4.2.17 Heat energy flow-meter

Delivery and installation of heat energy flowmeter for 20 m³/h. Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed flow-meter.

3.4.4.2.18 Domestic water heat pumps with a build-in hot 300 l water tank

Supply and installation of Domestic water heat pumps with a build-in hot 300 l water tank, equipped with rotary compressor, electronic expansion valve, heat transmitter, axial ventilator, additional electric heater, magnesium anodes.

- Heat output - 1800 W
- Max. heat output - 3600 W
- Output of the electric heater - 1800 W
- C.O.P. A20/W15-W45 4.5 4.5
- C.O.P. (EN16147) 3.0 3.3
- Dimensions (w × d × H) ø670×1550 ø670×1820
- Type of compressor - rotary
- Compressor consumption 475 W
- Rated current of the compressor: 2.3 A
- Refrigerant: R134a
- Electricity supply: 230 V / 1 Ph / 50 Hz
- Required fuse: 16 A
- Noise level: 48 dB(A)
- Airflow: 500 m³
- Available pressure: 60 Pa
- Diameter of air pipe: 150 mm
- Max. length of air pipe: 10 m
- Dimensions of water connections: 3/4"
- Min. / Max. water pressure: 0.15 MPa / 0.6 MPa
- Safety Mg. Anode 2x
- Surface heat exchanger 1.5 m²

The sound pressure levels conform to European standard EN 12102

Manufactured according to standard EN 16147 (heat pumps with electrically driven compressors) and EN 13203-2:2006 (test preparation for the measurement of daily fuel consumption);

Price includes the supply of materials and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid per pieces of completely installed heat pump.

3.4.4.2.19 Flushing of pipes with cold water in the building

Flushing of complete installation with cold water, until thoroughly cleaned of any residues. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.4.2.20 Cold hydraulic pressure test of heating installations

Cold hydraulic pressure test of heating installation (hydraulic test) p=working pressure+2.0 bar, lasting min. 6 h with monitoring, then min. 24 h more, according to JUS M.E6.012 and design specifications. Before testing,

perform flushing of pipes and check for leaking. Written and signed protocol of testing must be provided. Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Paid as a lump sum.

3.4.4.2.21 Hot water hydraulic test of heating installations

Testing of completely installed heating network for the building. The testing must be made pursuant the local applicable regulations and includes: filling of installations with water, checking of leaking at atmospheric pressure, closing of installation and putting under tested pressure (working pressure increased by 30-50%). Price includes all required material and equipment and labour needed for completion of specified works, including all unforeseen activities which may occur during works. Executed works, as described in this section, will be paid as follows:

- Manual adjustment of valves to values from hydraulic calculation. Measured per piece of valve;
- Manual adjustment of valves in heating substation to values from hydraulic calculation. Measured per piece of valve;
- Measuring and flow regulation of circulation rounds with ultrasonic flow-meter. Measured per piece of circulation rounds.

Paid as a lump sum.

3.4.4.2.22 Handing over of heating installations

Handing over of tested installations, with signed protocol. Price includes the labour needed for completion of specified works. Paid as a lump sum.

3.4.4.2.23 Finishing works – heating installations

Finishing works include:

- Necessary measurements and adjustments. All testing defined by RS regulations.
- Marking of the installation (labels, symbols and positions).
- Operating instructions in Serbian and English language in three copies. One copy must be framed and hung on the wall in the heating substation.
- Site clean-up to enable the start of operation of installations.
- Handing over of complete documentation about equipment and works necessary for technical inspection, and obtaining of working permission.
- Handing over of the installation to final user, delivery of handover protocol.
- Handing over of built design in three hard copies (with design details).
- Staff training for use of installed equipment.

Price includes all required material and labour needed for completion of specified works. Paid as a lump sum.

3.4.4.2.24 Copies of "as built" drawings and documents

Based on survey of executed construction works and performed installations, as built technical documentation will be prepared in accordance with Law on Construction and Planning 2014.

Paid on a lump sum basis, for the completely prepared set-off as built technical documentation.

3.4.4.2.25 Copies of user manuals for installed equipment

Delivery of user manuals for all installed equipment, in English and Serbian language. Executed works, as described in this section, will be paid as a lump sum.



VOLUME 3 – SECTION 5 – TECHNICAL SPECIFICATIONS FOR FURNITURE

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