TECHNICAL DESCRIPTION

Investor:	THE CITY OF NOVI PAZAR
Building:	HEATING INSTALLATION RECONSTRUCTION IN "STEFAN NEMANJA" PRIMARY SCHOOL NOVI PAZAR
Type of project:	EXECUTION PROJECT/DETAILED DESIGN
Design part:	6 – DESIGN OF MECHANICAL INSTALLATIONS
Work site:	NOVI PAZAR

CURRENT SITUATION

"Stefan Nemanja" Primary School in Novi Pazar has a central heating installation built in 1980. Horizontal piping network is laid in concrete channels in the floors of the building. Parts of the piping network have already started to fail, which were repaired by patching the pipes and breaking stone and ceramic floor tile work.

The boiler room has 10-year-old light fuel oil boilers. There were already some leaks in certain parts of the boilers within the previous 3 years.

The design provides closed system of hot-water central heating with radiators. The heating fluid is hot water 90/70 ^{0}C. The system supply is directly from the boiler room.

RADIATORS

The original design of heating installation are prescribed and later built-in cast iron radiators "TERMIK-2" height of 500 mm and 600 type 160 .

This project includes installation of two additional panel radiator type 600/22 length 1600 mm radiator on the east side.

NEWLY DESIGNED SOLUTION

This project proposes the replacement of all the pipes that are in the floors. It also implements the replacement of pipes in toilets for children at all 3 levels. Existing vertical parts of piping passing through the floors of toilets are outdated and will be replaced by new piping in the classrooms next to the toilets.

Steel seamless, pressure tested, pipes according to EN 10216-1 from material P235 TR1 will be built-in.

The piping will be laid out under the ground floor ceiling, alongside walls and pillars, as the most suitable. The design solution keeps existing splitting of the network into 3 branches to the east side, west side and a sports hall with other rooms in that wing.

The pipe network is calculated for the current load. The parts of the existing piping verticals that are located above the floor and whose dimensions are larger than necessary will be replaced with new pipes. This is due to the raising of a new piping to the height under the ceiling of the ground floor. Connections for submerged radiators will be made from new pipes to achive better system regulation and for aesthetic reasons.

The pipes shall be laid visibly. The pipes shall be red led coated prior to mounting and coated with primer after mounting. Undamaged parts of piping will be painted after installation with protective

paint once, locations of welds and damaged parts will be painted twice. Visible parts of piping will be painted in radiator color shade according to the investor's choice.

Piping in the boiler room from DN 50 to DN 100 shall be insulated by mineral wool coated with Al sheets. Smaller pipes shall be painted.

The existing network of pipes that is being replaced shall be cut off straight from the floor level and closed by inserting concrete and aligning.

Existing piping on the floors are not treated in this project except the pipes in the toilets. Pipes in the toilets will be completly removed and replaced by new piping verticals passing through classrooms.

SUBSTATION

The design provides for complete dismounting of all equipment in the substation.

Thermal insulation shall be removed from the collectors. New DN 100 connections shall be added to the collectors. All connections shall be facing up, two connections DN 80 and 3 connections DN 50. The displacement of connections for thermometers and pressure gauges is also provided by the design. Collectors shall be lowered to the height of 30 – 50 cm above the floor and affixed to supports.

The design provides the replacement of existing pumps with new ones.

The design requires the installation of new elements for automatic control. The control electronics will regulate the supply water temperature depending on the outdoor temperature.

BOILER ROOM

This design provides the installation of 2 new boilers.

For a correct selection of boilers, boiler power determination was made based on the data from the main building design, which was the basis for the object construction. The 'U' heat transmission coefficient was calculated for the layers on the shell of the building. Accurate surface areas of all windows, doors, floors, walls and roofs were also calculated. Calculations of transmission losses and ventilation losses were made based on these calculations. The ensuing result was that these losses approximate to 455 kW.

This design provides for the replacement of existing outdated 2 x 500kW light fuel oil boilers. Instead of the old boilers, two new hot water boilers of rated power of 350 kW, maximum operating pressure up to 4 bar and with a maximum water temperature up to 90°C, designed, manufactured and tested in accordance with EN 303-5 are planned for replacement. The boiler should have enabled possibility of power adjustment in the range from 100 kW to 350 kW. Boilers will be fired by pellets.

The design is anticipated installation of boilers type Termomont Bioterm 350 or boilers with equivalent characteristics, which are given in the table below:

Nominal power	350 kW
Rated output	105-355 kW
Weight (kg)	1550 kg

Water outlet/inlet	NO 100 NP6
Safety valve (inch, zoll)	2”
Flue duct (ø) (on the cyclone/fan)	Ø210mm
Flue gas temperature (at nominal power)	170^0C
Storage unit (on door/beside boiler)	500 kg
Pellet consumption at min. power*	24 kg/h
Pellet consumption at max power*	80 kg/h
Water volume	1200 l
Electric supply	3×380 V 50 Hz
Chimney (min. cross-section diameter)	Ø300
Chimney height	6-7 m

Note: * It is based on the calorific value of wood pellets 15000 kJ/kg

The system can be adjusted to burn wood chips (Bioterm chips). Energy source quality: wood pellets must be of the highest quality (A1) in terms of purity, absence of dust and calorific value (beech pellets are recommended). System autonomy entails wood pellet storage and dosage systems.

The boiler should have an automatic cleaning system via an auger at the bottom of the furnace. The auger transports the ash to the cyclone separator ash box. Cyclone separators are mounted on the flue end of the boiler, their purpose being to separate hard particles from flue gases, thereby also meeting strict ecological criteria. Fans must be fitted on cyclone separators (as integral parts of the boiler). The operation of the fan shall be controlled via frequency converter.

The boiler burner should have an automated fire tube cleaning system. The burner fire tube is made of high quality firebrick to provide resistance to high temperatures.

The boiler is provided with safety equipment according to requirements of EN 12828. The scope of delivery of the boiler should include:

- boiler with elevator (which throws a big-bag with pellets).
- 500 kg container which receives the pellets from the elevator. The container can be fitted next to the boiler or in the boiler door.
- burner with ceramic coating and cast bottom.
- automatic cleaning system of the burner.
- automatic cleaning system of the boiler with the coil at the bottom of the firebox for ash removal
- external boiler ashtray.
- cyclone with a fan at the boiler flue outlet. The purpose of the cyclone is to separate the heavy particles.
- control unit for the each boiler (electronic control of all boiler functions)

The design foresees the installation of shunt with three-way motor valve DN 50.

The design provides new circulation pumps in circuits of heat generators: the boiler - separator - manifold - boiler.

AUTOMATIC CONTROL COMPONENTS

Operation of boilers is regulated by Control unit supplied with each boiler. Boiler Control unit regulates the fan operation in the boiler, the work conveyor for feeding fuel to the burner, burner operation, operation of the auger wich transports the ash. Boiler Control unit is regulated the boiler operation by measuring the temperature of water in the boiler and flue gas temperatures and based on that determining the regime of inserting fuel. The same control unit regulates the operation of the cyclone dust collectors.

This project is solved shunt and regulation for 3 heating circuits. Three way mixing valves DN 50 or 2 "are foreseen to protect the shunt - 2 pieces. For 2 heating circuits to the east and west side regulation is provided by the three way mixing valve DN 50 or 2 " for each, and for heating circuit for the sports hall is predicted three way mixing valve DN 40 or 6/4 ".

For temperature control in two circulation circuits of heat generators: boiler - separator - manifold – boiler, basic control module Hoval TTE is used with one module for temperature control in the first heating circuit Hoval TTE-HK / WW (boiler circuit 1) and one expansion module Hoval TTE-FE / HK for temperature control in the second heating circuit (boiler circuit 2). Each heating circuit has its own three way mixing valve DN 50 motor-driven in order to shunt.

For temperature control in three heating circuits - west side, east side and the sports hall the basic control module Hoval TTE is used with one module for temperature control in the first heating circuit Hoval TTE-HK / WW (west side) and two expansion modules Hoval TTE-FE / HK temperature control in the second and third heating circuit (east side and sports hall). Each heating circuit has its own three way mixing valve DN 50 and DN 40 motor-driven. Control of the flow water temperature is done in relation to the outdoor temperature.

<u>Control Module Hoval TTE</u>
Control module with display, designed for:

- access to and handling of all control modules that are connected to the system bus (basic module and expansion modules);
- color screen of 4.3 inches with a black high-gloss coating;
- linking the Hoval bus system via the RJ45 jack or plug (max. 0.75 mm2);
- design with flat surface and free-style installation
- installation Hoval wall cabinet;
- Scope of delivery:
  – TopTronic E control module in black;
  – clamp for module
  – clamp for module adapter

<u>Basic module for heating circuit Hoval TTE-HK / WW</u>
Control module for controlling the heating circuit with integrated functions for 1 heating circuit with mixer. Scope of delivery:

– TopTronic E module for heating circuit with 2 pcs. prefabricated pathways for rail;
– 2 x immersion sensor TF / 2P / 5 / 6T, L = 5 m
– 1 x contact sensor ALF / 2P / 4 / T, L = 4.0 m;
– basic connection set:
– power input connector;
– outlet for 230 V output (direct circuit pump, pump mixing circuit)
– outlet for 2 x 230 V output (mixer)
– outlet for optocoupler input (flow temperature sensor)
– 2 x socket for sensor
– 0-10V input jack

– rails with mounting accessories.

Expansion module, the heating circuit Hoval TTE-FE HK

Expansion module for extension of input and output signals. Connects to the basic module of the heat generator or the heating circuit module for adding with the regulation function for 1 heating circuit with mixer. Scope of delivery:

– TopTronic E expansion module;
– rails with mounting accessories;
– ribbon cable for connecting to the bus;
– power cable;
– 1 x contact sensor ALF / 2P / 4 / T, L = 4.0 m;
– basic connection set:
– Socket outlet 230 V (direct circuit pump, pump mixing circuit)
– socket for 2 x 230 V output (mixer)
– jack optocoupler input (starting temperature sensor)
– 2 x socket for sensor
– 0-10V input jack

Large wall box Hoval WG-510 BM and medium-sized wall boxes Hoval WG-360 BM

Wall boxes are designed for easy expansion of the control system because they are already prepared for the installation of various modules and to connect its sensors and actuators. Free choice of installation on site that you need to look at the entries up or down. Made from steel, which is coated in red (RAL 3000).

Threaded three way mixing valve Hoval B3G460 (2 “) / Hoval B3G460 (6/4 “)

To work with motor drive NR ... housing, shaft, cap and inner parts are made of brass, sealing ring without requiring any maintenance. Mounted optionally on the left or the right.

Type:	B3G460 - 2"	B3G460 - 6/4"
Thread connections:	Rp 2"	Rp 6/4"
Max. working pressure:	10 bar	10 bar
Max. working temperature:	110 °C	110 °C
kvs	40,0	26,0

Servomotor NR 230-20B

For threaded three-way mixing valves Hoval B3G460 (2”) / Hoval B3G460 (6/4“). Power supply 230V / 50 Hz, el. power of 3.5 W, torque 10 Nm, run time of 140 s, three point control, manual / automatic positioning, scale positions 0-10. With mounting accessories.

OTHERS

For the purposes of the boiler power determination, the new budget of heat needs is done for shell of the building. The calculation is part of this project.

In the construction part of the project the storage for pellets is provided. Pallets with pellets will be lowered on the ramp in front of the storage with the auto crane. The purchase of hand pallet fork truck is provided, which will be used for dispose of pallets in the storage. During the heating season hand pallet fork truck will be used for transport the pallets at a time in the boiler room. The boiler will be manually filled into the baskets next to the boiler. From the baskets, the system will independently supply fuel to the combustion in the boiler.

Other necessary information can be found in the calculation and graphic part of the design and in the Priced Bill of Quantities.