TECHNICAL REPORT

SHKOLLA 9-VJECARE "EMIN DURAKU"

Project Name:

Reconstruction of 9- Year School "EMIN DURAKU ",

Tirana Municipality

Technical reports for sanitary installations and fire protection

Programme Title: ***EU4Schools***

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Design Team: ***HT Construction (High Tech Construction) Ltd***

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I. MECHANICAL INSTALLATION WORKS

1. FIRE FIGHTING SYSTEM

1.1 Introduction

The firefighting system is being designed to handle the emergency to extinguish the fire in two ways.

Active protection:

Has to do with installing the extinguisher as internal and external hydrants, fixed gas powder foam, sprinkler, smoke and fire detectors, etc...

Passive protection:

Has to do with the materials of the building structures, which are assessed on the basis of resistance you submit against fire divisions sections, emergency exit system, smoke ventilation, etc...

In this section shall be treated only active part of the fire protection system without automatic intrusion detection part.

Fire protection system will be implemented on the basis of:

Dimensions, specifications and quality of the materials specified in the drawing instructions of Engineer representatives, local norms and standards as well as those of the countries of the European Community.
Fire fighting system comply with all mandatory requirements state that have to do with the norms / standards that are currently in force in Albania and Italian rates CNVVF/CPAI UNI 9485.
During the design process and application of the system is a good idea to contact with local authorities MKZSH to provide a testing and approval of this installation.

1.2 Fire classification

To use appropriate extinguisher agents in the process of firefighting, in view of matter that can take flake, should definitely take into consideration fire class.
On the basis of contemporary standards the extinguishing equipment’s are classified as below:

The European standard DIN EN for those extinguishers:

Class 

Used for fires originating from solid materials such as board, paper, plastic, textile, etc.

Class  Used for fires originating from liquid materials as benzene, benzene, diesel, alcohol, oils, etc.

Class  Used for fires originating from gaseous materials as methane, propane, butane GPL etc.

Class  Used for fires that originate from materials such as metal,aluminum, magnesium, sodium, etc.

Class  U sed for electrical equipment under power.

In the drawings are defined exactly which areas related to fire classes and the countries where they are located and fixed fire hydrants.

1.3 Fire extinguishing substances

Taking into account the characteristics of the building and the activities that take place, will be used in substances as follows:

- Water: (solid materials);
- Powder or halogen hydrocarbons: (electrical materials).

1.3.1 Fire extinguishing equipment

Fixed types

- Hydrants inside the building (is applied)
- Hydrants outside the building (is applied)
- Sprinkler system (are not applied)
- Portable extinguisher (foam cylinder, powder cylinder), (is applied).

1.4 General designing criteria

Fire protection of 9-year school Emin Duraku is based on Albanian standard for schools and recent europian standards.. Taking in consideartion building typology and Albanian standard for schools the system witll be compound by as follows :

Fire hydrants inside the building

Fire hydrants outside building

Portabel fire extinguishers inside building

Related with above is designed the hydraulic system based on normatives mentioned.

Fire protection system as foreseen fire brigade connection valves.

1.5 Fire Water Hydrant

School building fire protection will be water protected by elements as following :

Inside fire hydrants dn 50

Outside fire hydrants dn 80

Fire brigade connection dn 80

1.5.1 Inside fire hydrants dn50

On all floors in the building are installed internal hydrants dn 50, equipped with flexible piping; The water supply of internal hydrants is done from the line that supplies the fire protection system with the respective pump according to the standard EN12845. Hydrant supply lines are dimensioned to guarantee the simultaneous operation of 2 indoor hydrants, in the most unfavorable positions, guaranteeing a flow in each internal hydrant of 120 l / min, with a residual pressure in the hydrant of at least 3 bar. The length of the internal hydrant tubes is 20-25 ml. Hydrant tapes are placed in a visible position and equipped with the appropriate signage. The hydrant cassette has dimensions as shown in the drawing. Hydrants are manufactured based on the requirements of EN 671-1. Connecting pipes with a length of 20 -25 ml are in accordance with the standard EN 694-1. The notes on the hydrant are in accordance with 92 / 58EEC. The hydrants are placed in a visible position and equipped with the appropriate signalization.

So a quantity of water must be guaranteed to supply a hydrant (Cassette type) located in a more favorable hydraulic position with a minimum amount of water of 120 l / min for the case of a vertical column, and with two or more columns must supply minimum 1 hydrant per column, with outlet pressure of 2.5 bar and a duration of 60 min. In the case of Emin Duraku school, according to the circumstances, it is intended for two hydrants at work in case of fire risk 2x120 l / min = 240 l / min for 60 min, also the protection from the outside of the building is foreseen. The exit according to the UNI 70-DN80 standard that is left mainly in the entrance part of the building to come to the aid of fire brigades, must have a flow of 360 l / min, so the calculated flow will be a total of 600 l / min or 10 l / sec for MNZ system and water reserve 36 m.

-Min / max pressure: 2 / 4.5 (based on the Hazen Williams formula, pressure 20m, loss 10 m, working pressure 20 m)
-Protected area ≤ 1000 m²
- Autonomy ≥ 60 min

Design criteria for fire protection based on UNI norm 10779. Dimensioning criteria.
UNI norm 10779 (May 2002) specifies the minimum requirements for the design, installation and testing of fire extinguishing systems, always under pressure, intended only for the use of hydrants and naspos.
Three levels of risk are specified, based on the retention and probability of fire development. For each level of risk are specified flows, pressure, timeliness and minimum supply time required. From the table of levels of risk and minimum protection required is selected as the **object with surfaces with risk No. 1**

- **Me surfaces with risk 1**

Surfaces in which the amount of ignition of the present materials are low and show minimal risk of ignition in terms of ignition probability, flame propagation speed and possibility of fire control, by emergency teams.

• Some classes are included here

- Work activity and storage of pre-refractory materials
- Low ignition activity
- Residential building
- **Schools, colleges, academies**
- Business services

Surfaces with risk No 1 generally correspond to class A of UNI 9489 norm.

Surface with risk No. 1			
Internal protection	**2 hidrante DN45 me 120l/min**,	Or	4 naspo DN25 me 35 l/min ,
Extrenal protection	generally not required (in this case applied)		
Time of action	**30min (in this case 60 min)**		
Flow	**14.4m³/h** (28.8 m³/h)³ or 8.4 m³/h (16.8 m³/h)³ **in this case 36m³/ ore**		
Water reserve	**7.2 m³**/h (14.4 m³/h)³ or 4.2 m³/h (8.4 m³/h)³ **water reserve 36 m³**		

In order for the hydrants to have the required amount of water as well as a sufficient pressure the project has been prepared in accordance with the norms that dimension the type of hydrant to be installed in the facility. They are installed on each floor near the potential fire hazard launch and are placed in enameled and red-painted steel boxes as well as glazed on the front.
Hydrants consist of a shut-off valve, a 20-25m long rubber tube for passing water, a launcher and a sprayer. All these devices are located in the steel sheet box, which is placed inside the wall and has a level with its surface.

Figure 3 : Firefighting Hydrant

Wall-mounted Firefighting Hydrant DN 50

Fluid	Water	
Fluid temperature	0 until + 50	ºC
Hydrant		
Dimensions		
- Frame	560 x 360 x	mm
- Hydrant valve	1 ½"	DN 40
- Pipe outlet	1 ½"	DN 40
- Outlet nose	12	mm
- Material		Cast iron
- Frame	Galvanized steel	Polyester red color RAL 3000
- Frame	Aluminum grey	Anodized
- In front view	Glass	Without color

1.5.2 Outside fire hydrants dn80

External hydrants dn 80 are located near the entrance of the building. The external hydrant has two connection points dn 65 and dn 50 mm according to the norm and a minimum flow of 300 l / min and a static pressure of not less than 3 bar.
The line pipeline is made of stainless steel 80 and spheroidal cast iron fittings as shown in the project and reference materials attached to this material.
In the calculations of the system is taken at the same time 1 external hydrant connection with the fire brigades with a total flow of 360 l / min.

Connection to motor pump DN 80 with outlet nozzles dn 65mm and dn 50mm

Fludi i punës	Ujë	
Temperatura e fluidit	0 deri në + 50	ºC
Hidrant i shuarjes së zjarrit		

Dimensionet		
- Kasa	600 x 500 x 300	mm
- Valvulat	3”	DN 70
- Dalja e tubit	3”	DN 80
Materiali		Gize
- Kasa	Llamarinë çeliku	Ngjyrë e kuqe poliester, RAL 3000
- Korniza	Alumin gri	I anodizuar
- Pamja ballore	Xham	Pa ngjyrë

1.5.3 Connection for fire truck

The external hydrant supply network will be equipped with the connection device to the specialized fire protection brigades.

The link must include at least:

- 2 connections for connection in accordance with UNI 808, with a diameter not less than DN80, protected from the entry of foreign bodies in them;
- shut-off valve which allows intervention in its components without the need to empty the plant;
- non-return valve;
- Safety valve tuned to 1.2 MPa (12 bar) for overpressure control by the pump

Firefighting brigade connection DN 65

Fluid	Water	
Fluid temperature	0 until + 50	ºC
Hydrant		
Dimensions		
- Frame	600 x 500 x	mm
- Hydrant valve	2 ½”	DN 65
- Pipe outlet	2 ½”	DN 65
- Material		Cast iron
- Frame	Galvanized steel	Polyester red color RAL 3000
- Frame	Aluminum grey	Anodized
- In front view	Glass	Without color

1.6 Fire Pumps Unit

The pumping group of the fire protection plant will be placed in the relevant technical environment and will be in accordance with the norm EN 12845. This group will consist of:
• 1 pilot pump (60 l / min, 7 bar);
• 1 electric service pump (600 l / min, 7.5bar) as well
• 1 service motor pump (600 l / min, 7.5 bar)

The pilot pump will maintain the pressure system by withstanding small pressure losses, preventing the main pump from entering operation again and preventing false alarms. The pilot pump will be checked automatically. In case of fire, with the pressure drop in the fire protection network below a certain level, the electronic controller will automatically activate the electric service pump as well as transmit a fire signal to the visual alarms. If the electric service pump does not start for any reason, the motor pump starts operating with the pressure falling below a predetermined level. Its functions are the same as the functions of the service electric pump, but it serves as a reserve in case of malfunction of the service electric pump or lack of electricity.
The pump chamber must be kept at a temperature above the following values:
- 4 ° C for electric pumps
- 10 ° C for pumps with diesel engine.

The oil reserve for the diesel motor pump must be sufficient for 4 hours of uninterrupted operation of the fully pumped motor pump.
The pump set is calculated to keep the internal and external hydrant system running at the same time for a period of 30 min.
Fire pumps must be assembled in a single pumping station and must be assembled in accordance with the requirements of the project.

This pump set consists of two service fire pumps one with diesel motor and one with electric motor and an electric test pump (Jocky Pump), complete with control panel and their accessories. The construction of the pumps will be vertical in which the pressure is realized constructively with centrifugal action.

The pumping station is equipped with a control panel which controls each pump and where their equipment commands in specific ways, such as starting, stopping the pump while carrying out the necessary monitoring and signaling, thus determining the status and conditions of the pumping station.
Before leaving the factory each pump must be hydraulically tested by this factory for a period of at least 5 minutes. The pressure test will not be performed less than 16 bar. There should be no leakage during pressing and a copy of the test should accompany the group during delivery.
The water source that pumps should have and the network available should be adequate in quality and quantity. These characteristics must be determined before selecting pumps as they provide the permissible technical data for the quality of the water they are pumping. When calculating the pump prevalence (required pressure) the height of the building, the outlet pressure of the most favored hydrant as well as the local longitudinal and local losses must be taken into account.

Each pump must be equipped with a safety valve and a shut-off valve if there is a lack of pressure in its suction. This valve is placed in the delivery section in front of the delivery control valve. It is a preventive valve in case of lack of water in the network to prevent overheating of the pumps while working in vacuum. Provisions should also be made for the discharge of water into wells. The minimum dimension of the discharge valves will be 3/4 ".
The fire pump, electric motors and the control panel must be protected against interruption of service in cases of explosions, fires, earthquakes, storms, freezing, vandalism and other similar cases. Care should also be taken to ventilate the pump room.

Fire pumps must be installed in special parts of the building which must be suitable for occasional maintenance and services. Depending on the selected scheme they can be installed in the basement of the building.
In addition, they must be placed and fastened to metal supports which are attached to the base of the building. These metal supports should not be attached to the walls or foundations of the building. The pumps are connected with rubber washers, as well as cushions of sand or wood or wooden rails to eliminate noise during operation.
Pumping component parts and technical data:
Diesel fuel pumps, air cooling, direct fuel injection.

Materials

Base frame	Steel galvanized
Joint tubings	Painted steel
Wear rings	Bronze (CuSn5Pb20)

Electric pump

Fluid:Water pure Flow:	36 m^3/h

Power	22 kW
Rated current	39.9 A
Winding:	3~400V/50Hz
Speed:	2900 1/min
Pressure:	75 m or 750 kPa
Fluid Temperature:	(-10 to + 120°C)
Head:	(max. 10 bar)
Degree of protection	IP 54
Insulation class	F

Diesel pump

Fluid:Water pure Flow:	36 m³/h
Power	26.5 kW
Cooling method	Air
Air volume flow cooling	711 m3/h
Gross volume	26 lit

Jockey pump

Nominal power	1.1 kW
Rated current	2.7 A
Gross volume	20 lit
Fitting dimensions	
Flange connection:	DN 65 / PN10

Concrete flooring technical environment should be equipped with drainage system to cope with the removal of water that comes out of critical equipment such as pumps, hydrants, etc... All installation work must be carried out in a perfect way and in accordance with the technical requirements in the project. Before the installation of the pumps, the contractor shall present for approval with the necessary technical data catalog, certificate of quality, origin of the goods, as well as a guarantee of 3 years. Pumping installation scheme is given in the technical drawings.

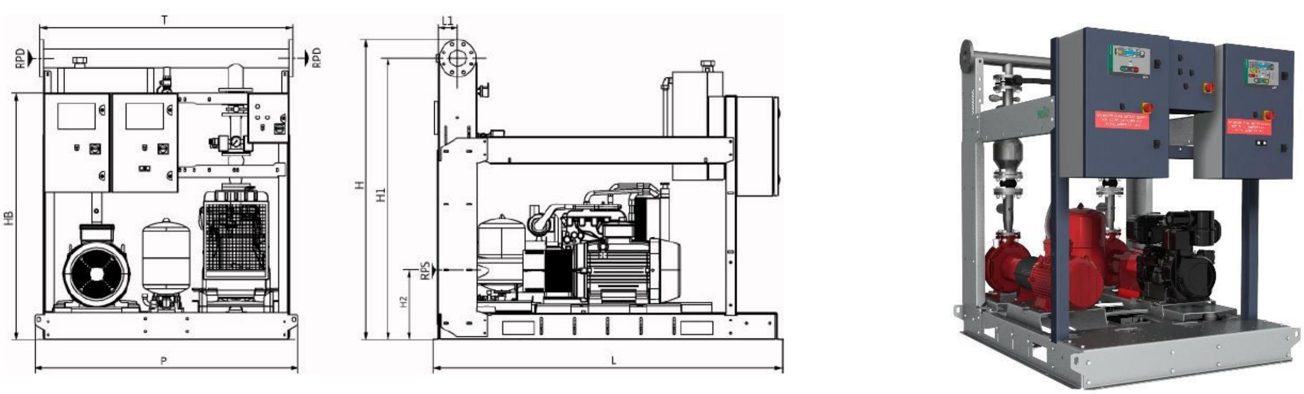


Figure 1 : Firefighting Pump

1.7 Fire Water Tank

Requirements for water storage for fire protection are based on the consideration that in a possible time we can face the risk of fire. The amount of water required is equal to the requirements for continuous water to extinguish the fire as well as the time available to eliminate it. This amount determines the necessary water tank available for fire protection for an autonomy of more than 30 minutes according to the degree of, in this case 60 min.

The water tank for the fire is designed with reinforced concrete structure located below the technical environment in the position shown in the attached drawings.

Water storage It is planned to build a concrete depot located in the technical building and will serve as both a fire extinguishing plant and a sanitary water supply plant. The capacity of the water storage is provided in accordance with the dimensions and definitions made in the drawing, including connections, mode of water supply, connecting pipes, overflow, mechanical gauges, etc., as well as all requirements to ensure normal operation.

The water tank will be composed as follows: -

Water supply pipelines, in which shut-off valves will be placed connected to mechanical and electrical galvanizers that control the level of filling;

- Distribution pipes for three plants, sanitary water supply plant, technical water supply plant and water supply system of fire protection system for hydrants. In these pipes will be installed shut-off valves with all the accessories that require the respective pump stations;
- Exhaust pipe (troppo pieno);
- Drain pipe to be installed at the bottom of the tank. It must be equipped with a control valve;
- Level indicators in each supply for each tank. The diameters and lengths of the above pipes will depend on the volume of water.

All connections and internal network are dimensioned as shown in the drawing. All pipes in this case will be made of galvanized steel

The unusable water reserve of the MNZ plant is guaranteed by the water storage with a volume of 65 m. The accepted volume for the fire is 36 m³ which will be used for 60 min time until the fire brigades come to the rescue, this is determined by the function of the building, its extent, etc.

1.8 Piping System

The diameters and lengths of the hydrant network pipes are calculated using the same methodology as those of the water supply. The internal network will be made of seamless steel pipes.

Steel pipes must be installed above ground. When water presents corrosive elements or when the pipes are in permanent immersion, the steel pipes of the suction section should be galvanized on the inside or painted before their installation.

The minimum radius of the pipe bends should be three times the diameter of the pipe. Pipelines must be anchored and secured to minimize damage and vibration. Supports must also ensure a normal thermal expansion of the pipes. Corrosion protection must be provided in all cases.
After the completion of the pipeline installation works, they must be subjected to a pressure 1.5 times higher than the working one for a period of 4 hours. Any leaks found will be repaired by repeating the above test again.
All internal piping must have an internal circular section and a uniform spacer and all internal and external surfaces must be free of defects and scratches.
The pipelines will be locked along their entire length preventing any longitudinal pre-tensioning and bending.
The distances and the way of joining are given in the project and technical specifications

1.9 Portable Shutters Fixed cylinders

Portable fire extinguishers, with powder 6kg and 9kg, class 43A-233BC as well as carbon dioxide fire extinguishers of class B-8C (for technical facilities) will be placed in the positions defined in the project. The number of portable vents and their position in the building are determined in such a way that the ease of access to the hydrant can be guaranteed.

The number and dimensions of the cylinders for fire extinguishing is determined in accordance with the norms / existing standards. They have maintained the controlled at least every two years, had the Government of licensed.

Types of cylinders used for extinguishing fires and their use in accordance with the fire source material, are presented in the table here below:

	Classes:	A	B	C	D
Name of the cylinder (fire extinguisher) anti fire					
Powder extinguisher	PG	✓	✓	✓	
Powder extinguishers (for fires caused by metals)	PM				✓
Fixed powder (special powder)	P		✓	✓	
Dioxide extinguisher carbon (CO2)	K		✓		
Foam extinguisher	S	✓	✓		

Figure 5: Fire extinguishers according to fire protection classes

2. WATER (COLD & HOT SANITARY) SUPPLY SYSTEM

2.1 Calculation of water quantity

The amount of water for consumption for students and school staff is determined based on the amount of student / day water and the importance of the facility being supplied.
Norms for school buildings are divided according to the following categories.
The amount of water stored for consumption is calculated equal to the daily amount of consumption. The total volume of stored water that has been calculated is the sum of all consumers.

Type of Building	Minimum storage for cold and hot water
Pupil (primary schools)	15 liter for students
Pupil (secondary schools)	20 liter for students
Pupil (hight schools)	25 liter for stuents

2.2 Water Storage Tank

The water reserve is deposited in the concrete tank located below the environment - technical in the position shown in the attached drawings. All fittings valves where water passes must be made of galvanized steel / cast iron or plastic material and certified for drinking water from the European community.

The volume of water reserve for the school is estimated at 28000 liters having a total of 1400 students. Starting from the table above we have these calculations 1400 students x 20 ltra / per student = 28000 liters per day consumption of sanitary water. The water tank is calculated and dimensioned to provide the pressure and amount of water needed in the building. Specifications pressure, quantity, capacity, etc.) are determined by the designer based on the diagram of daily use by consumers. The volume of the water depot will be calculated depending on the project scheme and autonomy.

Water depot It is planned to build a concrete depot located in the technical building and will serve as both a fire extinguishing plant and a sanitary water supply plant.
The capacity of the water depot is provided in accordance with the dimensions and definitions made in the drawing, including connections, mode of water supply, connecting pipes, overflow, mechanical gauges, etc., as well as all requirements to ensure normal operation.
The water tank will be composed as follows:

- Water supply pipelines, in which shut-off valves will be placed connected to mechanical and electrical galvanizers that control the level of filling;
- Distribution pipes for three plants, sanitary water supply plant, technical water supply plant and water supply system of fire protection system for hydrants. In these pipes will be installed shut-off valves with all the accessories that require the respective pump stations;
- Exhaust pipe (troppo pieno);
- Drain pipe to be installed at the bottom of the tank. It must be equipped with a control valve;
- Level indicators in each supply for each tank.

The diameters and lengths of the above pipes will depend on the volume of water. All connections and internal network are dimensioned as shown in the drawing. All pipes in this case will be made of galvanized steel.

All work related to the installation and placement of the water tank in the facility, must be done according to the technical requirements of the supervisor and the project. A catalog with its technical data, the certificate of quality, the origin of the material, the minimum warranty of 1 year and the test certificate made by the manufacturer, will be given to the supervisor for review before approval for installation.

2. 3 Water Quality

The water that will be stored and then distributed in the network must be analyzed for chemical and bacteriological elements before the commissioning of tanks and pumps according to the norms for drinking water. To enable its bacteriological and physical safety, a sediment filter is placed before entering the tank.
If it is unsuitable from the analysis, it should be treated with a filtration system determined by the relevant specialist.

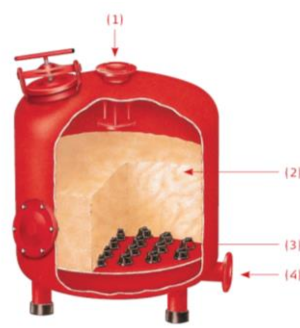
2.3.1 Sand Filter

General features:
Sand Filter Filtering is known as Deep Filtering. Sand filters work by forcing the amount of water to pass through a thick layer of sand particles. The degree of filtration depends on the effective dimensions, the filter bed and the speed of water movement. Water enters the filter and penetrates the filter bed. When particles of unwanted materials come in contact with the filter bed they are absorbed by it. The clean water passes through the filter nozzles and then to the filter outlet. The filter is cleaned following the opposite path. Materials precipitated in the filter bed as a result of the movement of water in the opposite direction come out of the cleaning valve. Self-cleaning of the filter is done automatically depending on the pressure difference and / or depending on the time. The filter provides a high level of filtration. The filter tank is coated with a phosphate-treated polyester anti-corrosion coating and tested at a pressure of 16 b

Technical data:

- Maximum Working Pressure: 2-7 bar;
- Material: Vetrorezine
- Complete with time programmed valve.

- Connections: 1 1/2 "
- Volume 200 lt
- Flow: 6 - 10 m³ / h
- Electrical connection: 12V
- Maximum Working Pressure: 2-7 bar;
- Material: Vetrorezine
- Complete with time programmed valve.



2. 4 Water Distribution

The water distribution system inside the building will be constructed of PP-r polypropylene pipes (SDR9) according to the dimensions shown in the drawings. Up to the respective collector that will be constructed of polypropylene. From valves, the supply of each sanitary appliance is made with multi-layer PeX-Al pipeline according to the dimensions shown in the drawings. The water distribution system inside the building will be constructed of PP-r polypropylene pipes (SDR9) according to the dimensions shown in the drawings.

2. 4.1 Water Flow Calculation

The calculation of the amount of water is done based on the duration of the peak and the amount of water of each group / sanitary line. Their value depends on:

nominal input of the group / sanitary line; number of sanitary groups / lines; user type; frequency of use; peak duration etc. that make it possible to calculate them according to the simultaneity of use:
Equivalent method 1 equivalent (UC) is equal to Qnom of 0.1 l / s.
Table of nominal and minimum inflows and their calculation in equivalent:

Appliance type	Q_{nom}	Q_{min}	LU
	l/s	*l/s*	
Wash basin	*0.1*	*0.1*	*1*
Wc flush valve	*1*	*1*	*10*
Slab urinal	*0.3*	*0.15*	*3*
Kitchen sink (no familiar)	*0.8*	*0.8*	*8*

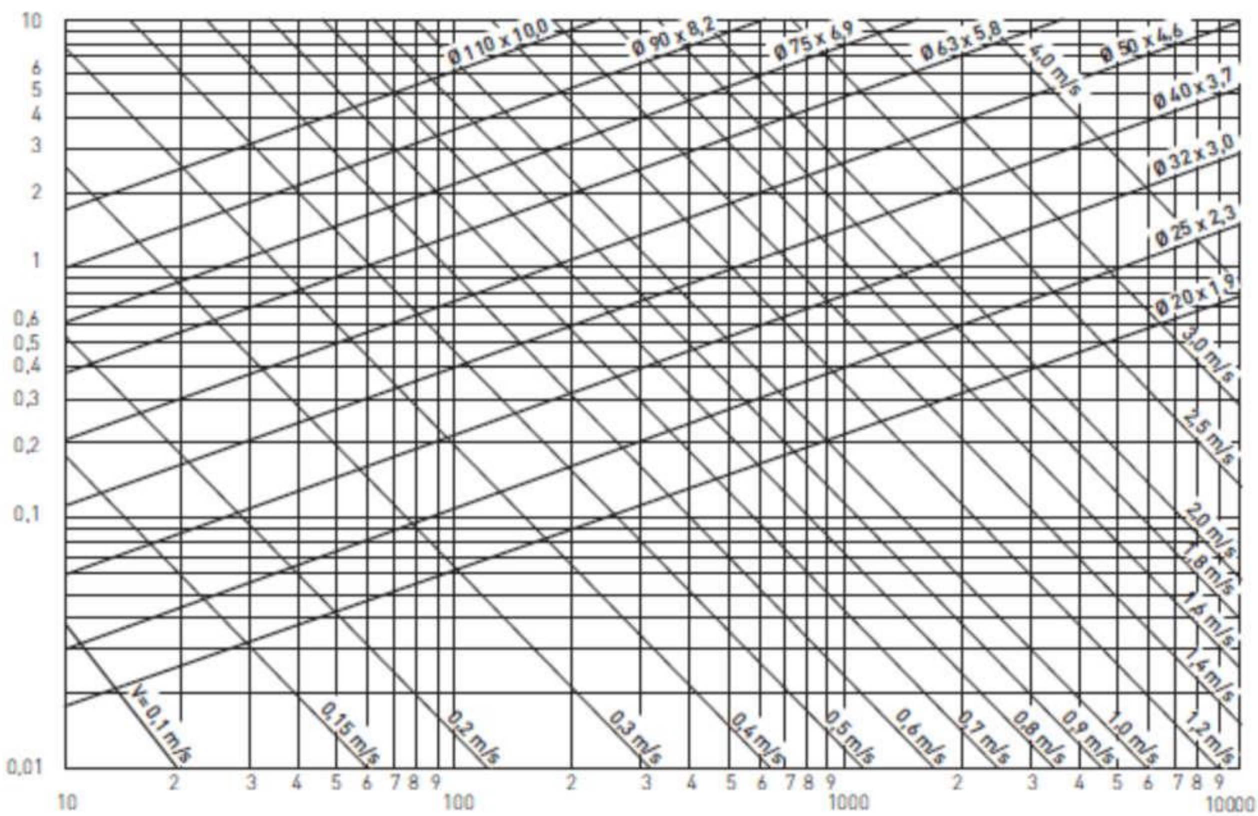
The calculations of the water supply system are made on the basis of the simultaneity of the use of sanitary equipment for service facilities, where the method used is that of the sum of the equivalents of all sanitary appliances as follows:
The calculation of the dimension of the pipes are done taking into account the allowed values of speed and the respective material used.
Calculated velocities of water in pipes should not exceed the following values:

Piping	Flow Velocity
nominal dimension (mm)	(m/s)
dn 20	0.9
dn 25	1.2
dn 32	1.3
dn 40	1.6
dn 50	1.9
dn 75	2.0
dn 90	2.0
dn 100	2.0

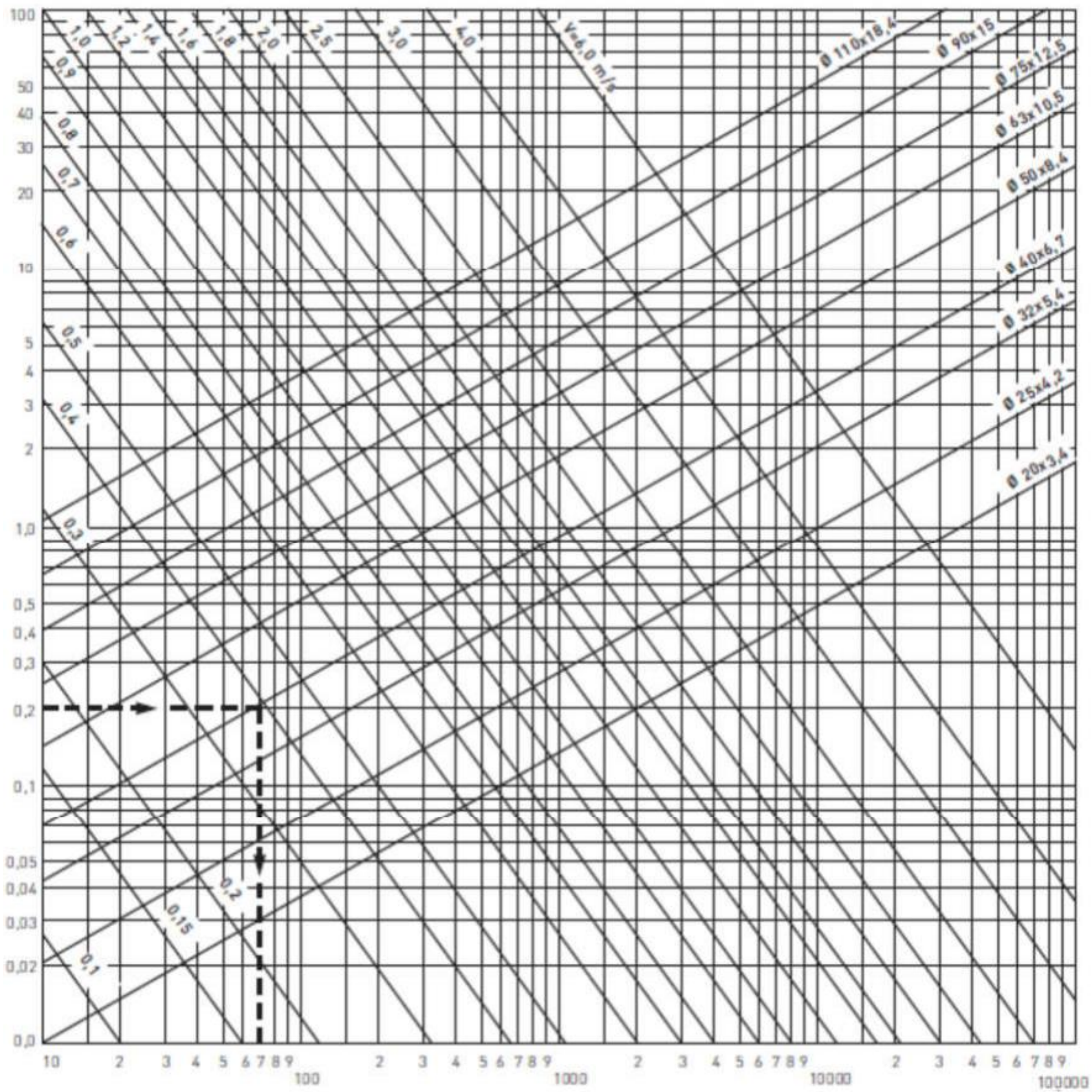
Hot water will be produced by local electric heaters, for each sanitary group as shown in the respective drawings. All water pipes are laid with a slope in the direction of flow of 5/1000.

Shpejtësitë maksimale të Lejuara (Vmaks)	
Tub Plastik (PP-R, PE-Xa)	
Diametri Dj [mm]	Shpejtësia Vm [m/sek]
deri 25	1.4
32	1.5
40	1.8
50	2.2
63	2.4
75	2.6
90 e sipër	2.8

Graph of diameter determination and hydraulic losses of pipes PN 10 bar



Graph of diameter determination and hydraulic losses of pipes PN 20 bar



Determining the necessary pressure at the entrance of the school is done taking into account the following factors:
HN = f (HGJ, hw, hWM, hP)
Where: HN = required pressure at the inlet of the building

HGJ = geometric height of the most unfavorable device from the point of connection of the hydrosanitary system with the distribution network
hw = longitudinal and local hydraulic losses (with 15% of longitudinal losses) of water pressure from the connection point to the most unfavorable device.
hWM = total hydraulic losses in the main water meter and in the apparatus individual of the most disadvantaged consumer (device) hWM <2.5 m.
hP = 5. 15 m, working pressure of the most unfavorable device.
Based on the above design steps of the drinking water supply system, it turns out that the hydraulic parameters of the system (required flow and required pressure at the connection point) have the following values:

Q = 22 m^3 / h
P (H) = 75 bar (≈ 75 m)

2.5 Uji I ngrohte sanitar

The sanitary hot water will be realized from electricity and in our case electric boilers will be installed in each sanitary node according to the needs of the customer.
Electric boiler (heat exchanger

Figure 8: Electric Vertical Boiler cap. 80 lit.

The producer of sanitary hot water has been selected to provide supply throughout the day. Its size is calculated according to the needs for sanitary water and its characteristics must be clearly defined in the quality certificate issued by the manufacturer. The main technical characteristics are presented below:

Electric Boiler kap.12 / 80 lit
Type: Thermally insulated vertical boiler with removable stainless steel exchangers;
Protection: Cathodic protection system, simple magnesium anode;
Capacity: 12 - 80 liters, Pmax 8 bar, Tmax 95 0C;
Working conditions: Pmax 8 bar, Tmax 95 0C.

2. 6 Pumping Station

The building is provided with water 24 hours a day, without interruption, through reservoirs and a pump system with the appropriate characteristics according to the presented project.
The pumping group is with two pumps with variable speed that work according to the customer's request, the electric motor must be of the inverter type with working characteristics Q = 5.3 l / s or 19 m ³ / hour and H = 6 5 meter. Installation, connection and commissioning of the pump group must be in accordance with the technical specifications of the manufacturer.
All parts of the pump must be certified for drinking water.
The diameters and lengths of the pumping station pipes are calculated using the same methodology as those of the water supply. The internal network will be prepared from the warmest galvanized seamless steel pipes according to EN 10255.
The water pumping group is the most important part of the system. It is designed to operate with pumps and zingato reservoirs, the parameters of which are calculated in accordance with the daily diagrams of water needs and network configuration.
In their function are calculated the pressure, flow, pump powers as well as other technical specifications presented in the drawing. The system is designed envisaging a pumping station, which must be installed in accordance with the requirements of the project.
The pumps are equipped with suction and dispensing collectors that are made of stainless steel. They also include flowmeters, manometers, shut-off valves, non-return as well as electrical control and control panels, as well as pre-heated prostates.

The power of the water pump is determined by the relevant formula as follows:
N = Q x H / 102 x n
Where: Q = water flow to be pumped in l / sec
H = Height of water delivery
n = pump efficiency which must be more than 65% and given by the pump manufacturer.
Variable Speed Pump Group Technical Data (Inverter)

Fluid:	Water, pure
Fluid temperature (max. 60 °C):	20 °C
Flow rate:	2x 22 m³/h
Total head:	75 m
Motor-Rated power (P2):	2x4 kW
-Mains power:	3~380V/50Hz
Overall degree of protection:	IP 54

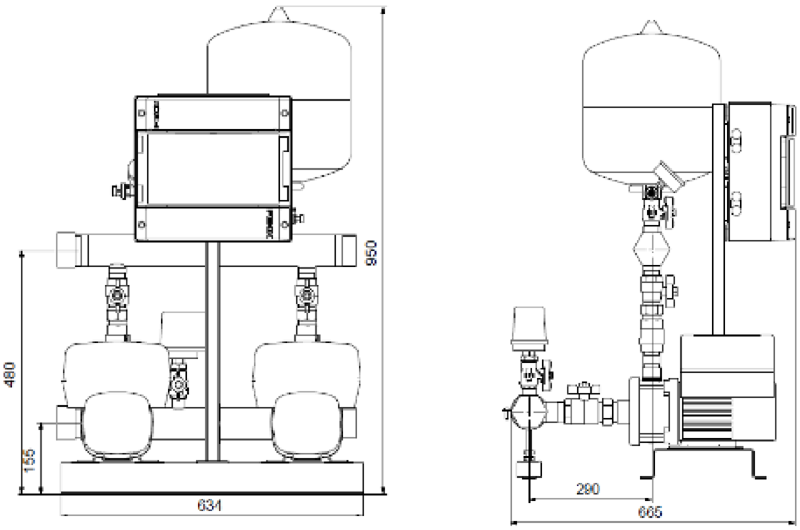


Figure 7: Technical Data for Sanitary Water Pumps

2.7 Autoclave

Autoclave is a device which is mounted near the sanitary water pump, which serves to increase the water pressure in buildings

Water pressure can vary throughout the day depending on consumption, the presence of any leaks in piping and pressure at the erosion point. Generally, water pressure is a little bar. A bar (1 km / cm2) can exert enough pressure to raise the water to a column height of about 10 meters. Water flow may be insufficient and unstable in high places, in such cases it is necessary to use an autoclave.

The autoclave is a pressure vessel, where the pump charges it on the basis of meeting disconnections to obtain a pressure greater than that of the water network. Once the desired pressure is reached, the pump switches off and the system keeps the autoclave charged.

The autoclave material is carbon steel, protected with a blue RAL 5015 epoxy coating, polymerized. The autoclave for the sanitary water pump is calculated with a volume of 300 liters. with dimensions (650 x 1270) mm

Booster material is pre-carbon steel, protected by a layer epoxidi blue RAL 5015, polymerized.

Technical data are presented as follows:

Max. Working pressure:	8 bar
Charging pressure:	1.5 bar
Capacity:	500 lit
Diameter:	750 mm
Head:	1450 mm
Connection:	1 ½" (DN 40)

Figure 8 : Autoclave for cold water sanitary

calculation is made from formule

V= 25 Q (p1 +1)(p2+1) / S p1-p2

V = 30 a p1+1 / S p1-p2

2.8 Pipes

The sanitary water system pipes will serve to transmit cold water from the main network and warm water from electrical storage water heater (boiler) to the sanitary equipment's.
The sanitary water system pipes have fulfilled the requirements of standards/norms. Those are selected in the design process by the engineer as the client as required.
The sanitary water system pipes are divided as follows according to the material:

- Pipes HDPE - (high density Polyethylene)
- PPR pipe (Polypropylene pipe)

Figure 10 : Pipe for sanitary installations

- **Pipes HDPE - (high density Polyethylene)**

HDPE pipes (high density Polyethylene) HD5620EA is a tube high-density molecular allocation that spread every inch the length of the tube. These pipe density degrees have the following features:

- Flexibility for large quantities of fluid;
- Sites with great resistance;
- Flexible for quick use.

Specifications:

MFI (190°C/2.16 kg)	gr/10 min	20	ASTM D 1238 – 7 condition E
Density	gr/cm^3	0.956	ASTM D 2839 - 69
Hardness Tensions leakage	Mpa	22	ASTM D 638 - 72
Elongation and fracture tensions	%	900	ISO R527-Tipi 2 velocity D
Flexion tension	Mpa	1000	ASTM D 790 - 71
Hardness impact	KJ/m^2	10	ASTM D 256 - 73B
Hardness	Shore D	66	ASTM D 2240 - 75

- Main lines inside the building from the technical area to the sink ore toilets will be PPR Pipes:

Characteristic of PPR Pipes

- Density of PPR: 0,9 g/cm^3
- Welding temperature 146 °C
- Thermal Conductivity in 20 Degrees 0,23 W/mK
- Linear expansion coefficient 1,5 x 0,0001 K
- Elasticity in 20 degrees 670 N/mm^2
- Resistance to leak in 20 grade 22 N/mm^2
- Resistance in destruction in 20 grade 35 N/mm^2

- Thermal Insulation of Pipe PPR

All PPR pipes installed in the building shall be thermal insulated.
The specification of the thermal insulation of PPR pipe are described below.

- Thickness 6mm
- Vapor conductivity μ>3500

- Thermal conductivity (40^{o}C) 0.039 W/(mK)

Figure 11 : Thermal Insulation

Method of expansion tubes, quotes, and different layers for pipe support and coverage are given in the technical details of the project.

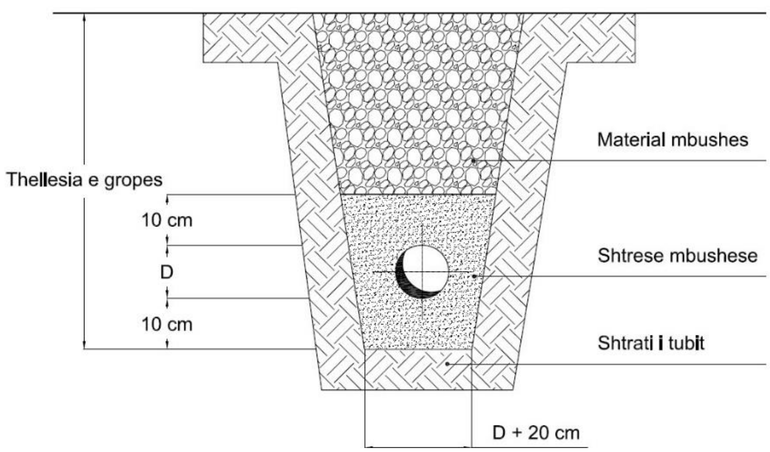


Figure 12 : Method of installation pipes

All works associated with the installation and placement of water pipes in the building should be made and according to the technical requirements of the supervisor and the project. A catalogue with technical data, quality certificates, the origin of the material, the minimum guarantee of 3 years and certificate of testing done by the manufacturer, shall be provided for review supervisor for an approval before they can be placed on the object.

2.9 Valves

The valves are special tools that shall be used regarding the flowing control in the water pipelines. With the help of the valves it can be changed the flowing quantity, or the flowing can be completely interrupted.

The valves can be of bronze, pig iron or stainless steel. They are spherical, of join type, filleting type or with flange.
The valves of joining type to the pipes are divided in: with flange and with fillets.
The valves used in a water supply line afford a pressure 1, 5 times more than the working pressure. They should face a minimal pressure of 10 bars.
The valves should provide a perfect resistance to the corrosion, resistance to chemical agents, lightweight, easily repairing and transport, duration over 25 years and resistance to the mechanical attacks.

In special cases, are designed also one-way valves? These are placed in the sucking pipe or in the distribution one. Their installation is foreseen also in the main building entrance.
All the works related to their installation and placing in site shall be according to the technical requirements of the design.
A valve sample, which shall be used supported by the quality, origin, testing, and warranty certificate, is to be given before placing in site.

2.9.1 Angular valve with straight fittings

Angle valve with straight fittings serves for connection of sanitary cold/hot water supply line with manifolds. They should offer perfect joint, high resistance against corrosion and chemical agents, light weight life duration over 25 year and resistance to mechanical shock.

2.9.2 Mini-valves

Stainless steel mini-valves serves to connect sanitary equipment to the sanitary water supply system.

2.9.3 Ant vibration joint

Anti-vibration junction is composed by synthetic mixed tires adding and special parts. Those aims to eliminate vibrations and noises along hydraulic lines, to compensate pipes expansions and to eliminate hydraulic knock etc.

2..9.4 Mechanical and electrical float

- Material : Red bronze

-Application mode: Horizontally and vertically

-Temperature: 65 °C

-Work pressure: 6.0 bar

-Connection: R 1 1/2

DN mm	B mm	C mm	D mm	Weight kg
40	108	1490	380	21

-Material : polyethylene with PVC cable

-Cable dimensions : 3,5,10 m

-Current : ÷ 20 A

-Voltage: 250 V

-Depth: 10 m

2.9.5 Flow Meter

The flow meter is positioned in the main water supply lines and is used to measure the amount of water consumed by the facility and has a simple installation.

- Dimensions: 12x8x4 cm

- Connections: 220 VAC

SECTION 3. SEWAGE AND STORM WATER SYSTEM

3.1 Discharge calculation

Discharge system is all by gravity. Discharge system layout is basen on architecture design. Inside discharge pipes and collectors, horizonatally or vertically positioned need to have access for control and maintencance. Discharge pipes and collectors flow rate is based in sanitary ware technical data and nominal values of EN 12056-2. Flow rate is calculated taking in account, value of dicharge of each sanitary ware, dicharge units number and frequency factor as shown at formula below:

$Q_{ll} = 0.7 \times \sqrt{Nt}$

Where:

Q_{ll} Waste water flow rate (l/s)

K Frequency factor

N_{as} Sum of discharge units

Discharge units of appliances are represented in following table:

Appliance	Minimum flow rate (l/s)
Wc	2.0
Lavaman, Bide	0.3
Pllake dushi, Pilete dyshemeje,	1.0

Nominal diameter of discharge and slope are shown in following table:

Karakteristikat e aparateve sanitare:

Appliance	Min nominal diameter	Min slope gradient %
Wc	*Dn 90*	*1*
Lavaman, Bide	*Dn 40*	*1*
Pllake dushi, Pilete dyshemeje,	*dn 50*	*1*

Typical frequency factor:

Usage of appliances	K
Residential and offices	0.5
Hospitals, schools, restorants, hotels ect.	0.7
Public toilets	1.0
Lab and special use	1.2

All technical details are shown on drawing layouts.

3.2 Dimensioning

The dimensioning and projecting of all components and accessories of the discharge waste Water pipes distribution net shall perform taking in to consideration of the relevant element As bellow:

- Distribution sketch (inner derivation of sanitary apparatus + columns + collectors + pits)

- Determination of nominal discharge flow for each sanitary apparatus
- Determination of projecting discharge flow.
- Lay – out and dimensioning of the inner waste water pipe derivations
- Lay – out and dimensioning of discharging waste water columns pipe
- Lay – out and dimensioning of balancing pressure and ventilation pipe of waste water columns
- Lay – out and dimensioning of inner collectors

The sizes of pipes will be depending from calculation flow of wastewater, flow velocities and full scale of pipes. The flow velocity should be 1, 0-1, 2 m/sec and the full scale of pipes should be 0, 5- 0, 8. The lengths of pipes should be 6-10 m. Diameters and thickness should be in accordance with data of technical of drawings. All data on outside diameters, pressure, name of manufacturer, year of production, etc., should be stamped on every pipe.

3.3 Wastewater discharge pipe materials

For wastewater discharges within the premises will be used RAU plastic pipes - PP (polypropylene thermos stabilizer at high temperatures) that meet all quality requirements according to EN 1451 standard (application for testing and quality pipes). They are designed in accordance with the standard EN 12056.
These pipes should ensure perfect resistance to corrosion, resistance to chemical agents, light weight, simple opportunities repair, transportation, simple and quick installation and durability over 30 years.

Figure 18 : Wastewater Discharges Pipe Inside the Building

Drainage pipes should be placed in the entire height of the building, in the form of columns, in those toilets where extinguishers are grouped and possibly closer to those nodes that collect more polluted waters and greater pollution.

Discharge pipes associated with sanitary facilities or set of devices on each floor through delivery pipes. Binding delivery pipes with exhaust stacks must be steep three branches under an angle 45 or 60 degrees. Delivery pipes can be laid side walls or under floors keeping in mind certain conditions, for installation of internal sewerage network. The length of these tubes should not be more than 10 m. Their diameter will be a function of exit sanitary equipment is located.

Each vertical column discharge equipped with checkpoints that must be placed in every two floors starting from the bottom of the column.

Discharge pipes to be used in outdoor environments, JANTA PP pipes dizzy, with the following technical specifications:

Technical specification:
Material: HDPE (High Density Polyethylene) black and yellow
Dimensions:

- D [mm]: 150-600 q
- L [m]: 3, 6

-Max. Operating temperature [° C]: 95
-Hardness class [kN / m^2]: SN 4, SN 8

Figure 19 : Wastewater Discharges Pipe corrugate Outside the Building

3.4 Fittings of water discharge pipes

The RAU – PP fittings will be used for connection of discharge pipes with sanitation equipment and other part of sewerage system. . It will be in accordance with international quality standards EN 1451 (Quality and Test Requirements for pipes).

The fittings (connection parts) should be excellent resistant against corrosion and chemical agents, low weight, ease of maintenance for repair and transport, fast installation, long working life.

The sizes of fittings will be depending from calculation flow of wastewater, kind of sanitation equipment, flow velocities and diameter of respectively pipes. The flow velocity should be 1, 0-1, 2 m/sec and the full scale of pipes should be 0, 5-0, and 8.

Diameters and thickness should be in accordance with data of technical drawings. All data on outside diameters, lengths, pressure, name of manufacture, referred standard, year of production, etc., should be stamped on every fitting.

The diameter of fittings should be equal with diameter of discharge pipes. The smallest diameter is not recommended. If the pipes will change their diameter, the fittings should be adapted with them.

Figure 20 : Fitting for water discharge pipes

3.5 Ventilation and balancing pressure pipes

The RAU – PP ventilation pipe is extension of upper part of discharge pipe. They will be installed until 70 - 100 cm over the upper part of roofing or terrace of building.

The ventilation pipe will provide the ventilation of internal and external sewerage network. This ventilation will provide the fast leaving of vapours from discharge columns and other vapours that are not good for health of peoples.

Also, the ventilation pipe will connect the sewerage columns with atmosphere. So, they will improve the works of sanitation equipment siphons.

The diameter of ventilation pipes will be DN 75 mm and on the ventilation pipe will be installed a cover that will be improved the ventilation of discharge columns.

The ellipsoidal equipment that is installed in ventilation pipes (depending requirement of project) can improve the ventilation of discharge columns. They will provide the fast leaving of vapour from discharge columns.

3.6 Floor Drain

The floor drain pipe should be used for discharge of water from floor. They will be in accordance with international quality standards EN 1451 (Quality and Test Requirements for pipes). The type is chosen PP Floor trap horizontal with stainless steel grid.

The floor drain set should provide the fast and large flow of the water. They should be resistant against mechanic shutting, corrosion and chemical agents. They should provide water insulation, simple possibility for the repair, transport and connection.

The floor drain will be installed in the lowest part of the water collector basin. Usually, they will be installed near of centre of the floor. They cannot be installed near of the connection of the walls with floor.

The floor drain set should be connected with discharge columns by PP pipe or (The connection will be realised with a siphon type tube). Fittings, single branch with 45 degree, 60 or 90 degree, bends, single sleep-on will make the above connection, all with seals type Tee, with 45 degree or 60 degree. The connection pipes should be PP pipes (in same technical characteristic with other water sewerage pipes). The lengths of them should is 20-30 cm. Their diameters should be in function of the outlet of the floor drain. If the diameter of floor drain is different from supply pipe, should be used the reductions fittings.

3.7 Sewage and Rain manholes

All the above types of wells can be such walls with concrete prefabricated elements, or concrete poured in place.

The material from which it is produced as both frames must be cast iron lid. Wells must

meet the following technical requirements:

- load retention, external;
- The pressure of the earth;
- Water pressure.

Manholes dimensions are calculated in function of the flow are defined by the designer in the respective drawings.

Figure 21 : Sewage and Rain manholes

Also, the dimensions of the collector that discharge wastewater and rain are calculated and dimensioned in function of flow and the material is selected corrugated PE we polished outer surface and at the inner dimensions ranging from 200 - 250mm.

3.8 Storm water drainage

An important point when designing a building is the drainage of rainwater, which collects from the roofs or terraces. Rainwater will discharge from the terrace through the piles and will descend vertically through the rain pipes and discharge into the surrounding environment of the building in a free state. Roofs, balconies, terraces and other construction elements should be drained with a system consisting of slopes towards open spaces in such a way as not to create a problem for the longevity of the building and at the moment they leave the rain pipes should made possible their orientation towards the networks of the area through gutters, wells, pipelines, etc.