ecol-unicon

INNOVATIVE SOLUTIONS

HYDROZONE



design in accord with nature

HYDROZONE – MULTI-PURPOSE RETENTION TANKS

HYDROZONE are retention systems with the option to integrate technological modules inside. The available module options (equipment elements) meet the needs for retention and use of rainwater and snowmelt. The stored rainwater is a natural source of soft water, which is ideal for municipal purposes in cities and municipalities, industry and commercial facilities, as well as for housing.

HYDROZONE tanks are an innovative approach to the problem of retention and rainwater systems. They reduce the costs associated with lost retention charges and retain water on site, thus meeting the objectives of European directives and the current Water Law.

HYDROZONE
retencja w zgodzie z naturą

SMART bumerang management system



settling tank



separator



tank

APPLICATION

- residential developments
- commercial and industrial facilities
- towns and municipalities
- Motorway services and gas stations

ADVANTAGES

- modular construction: quick to assemble and adapt to the shape of the plot
- pre-treatment, i.e. a suspended solids settling tank and an oil/water separator installed in separate manholes directly upstream of the tank
- perfect solution for heavily urbanised areas
- the possibility of using the land above the tank for recreational purposes
- reduction of charges for lost retention (according to the Water Law)

HYDROZONE tanks have been analysed in terms of the product's impact on the environment, people and the surrounding area. The results of the study allowed HYDROZONE tanks to be awarded an ECOKARTA, which clearly states that the inclusion of the device in the design contributes to the environmental certification of buildings. The information contained in ECOKARTA is helpful, among other things, for obtaining LEED, BREEAM certificates.

TYPES

HYDROZONE BENEFIT

This is HYDROZONE is the most technically advanced solution, featuring a system of pretreatment devices and a water storage tank with not only a water storage capacity, but also the possibility to use the stored water as required, e.g. for watering green areas, washing streets or watering fountains. This solution makes the investment even more environmentally friendly.

HYDROZONE CLEAN

The CLEAN version consists of pretreatment devices (i.e. an oil/water separator and a suspended solids settling tank) and a retention tank. When designing, it is also necessary to take into account the function of outflow regulation.

HYDROZONE BASIC

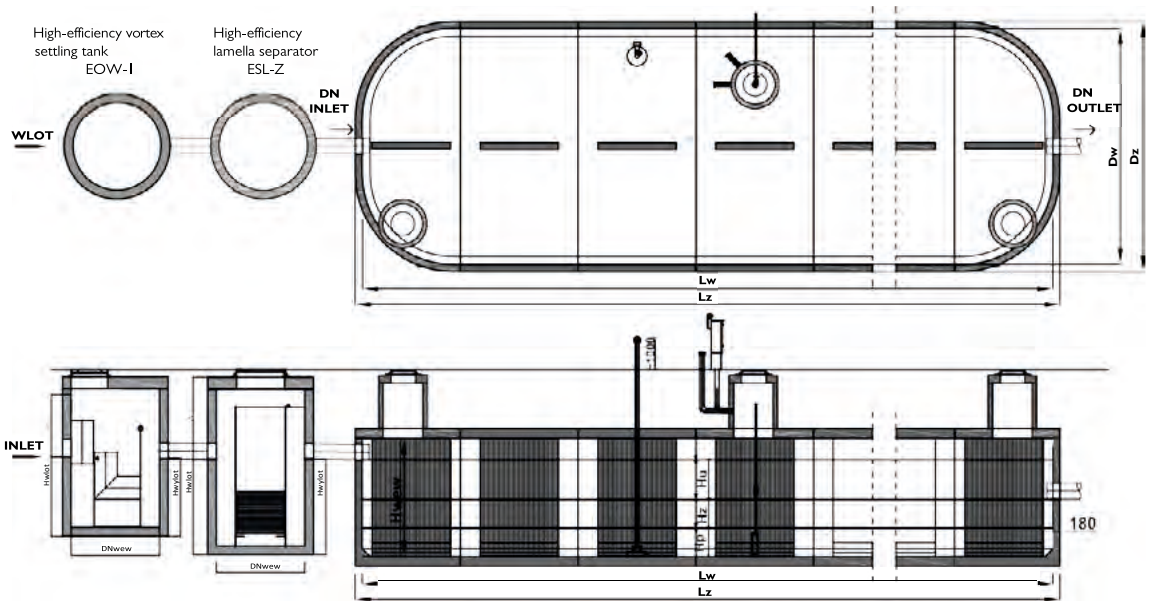
Tanks whose primary function is to temporarily hold and gradually discharge rainwater. Their purpose is to prevent flooding or waterlogging. When designing a BASIC tank, consideration should be given to the need to regulate the outflow by means of a regulator or pump, or to use infiltration holes.

CONSTRUCTION:

HYDROZONE is an integral combination of treatment equipment (i.e. an oil/water separator and suspended solids settling tank) and reinforced concrete tanks - type Clean.

In the BENEFIT version, the retention tank is equipped with functional modules to make use of rainwater.

Rainwater is primarily directed to the EOW-1 vortex settling tank, where suspended solids with a density greater than 1 kg/dm3 are retained. The vortex settling tanks use centrifugal force in addition to gravitational force. The vortex motion of the inflow wastewater is induced by a directional deflector. The outlet from the vortex chamber takes place in the central part of the tank (central pipe).

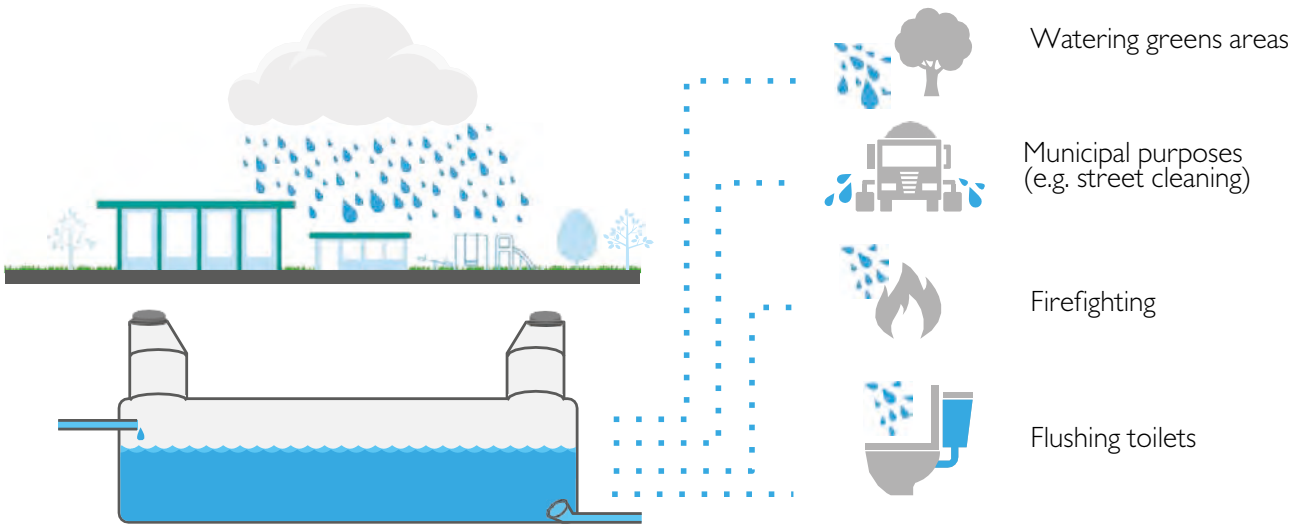


NATIONAL TECHNICAL ASSESSMENT ITB

Subsequently, the rainwater is directed to the highly efficient ESL-Z separator for oil substances. This device separates suspended solids and light liquids (oil substances) and floating matter contained in the water/wastewater entering the separator through a process of gravitational sedimentation, flotation and coalescence when flowing through a multi-strip lamella insert.

After pre-treatment, the medium is directed to a retention tank. Drainage from the tank can be carried out by gravity or by pressure. If required, the water can be discharged in a controlled manner.

In the BENEFIT version, at least one of the following functionalities is used:



Integral to HYDROZONE is the BUMERANG SMART management system, which allows retention to be monitored and operated remotely.



RAINWATER COLLECTION POINT

HYDROZONE tanks introduce a new functionality, ideally suited to the needs of property development: a practical rainwater collection point. Located on the surface, with the hydraulic equipment aesthetically concealed in the column, the point is both a functional and visual addition to the urban space. Users can easily use the water by pressing a button on the body of the unit. In addition, thanks to the Bumerang Smart monitoring system, operators can remotely view the status of the water in the tank, allowing the point to be monitored on an ongoing basis and shut down if necessary.

Although the point is available from April to November, it is adequately protected for the winter, guaranteeing its durability for many seasons.

INSTALLATION

The tank elements should be placed in a drained excavation on a suitably prepared foundation - concrete substructure or reinforced concrete foundation slab. Earthwork directly related to the excavation, subsoil preparation, foundation and backfilling of the tank should be carried out in accordance with the approved construction design, including information on the local soil and water conditions, and in accordance with the requirements of the technical specification for the project related to earthwork execution.

On the properly prepared subsoil, after checking the ordinates, the HYDROZONE body should be placed, the pipes connected, the equipment of the modules used and the cover installed. Depending on the aggressiveness of the environment, the external surfaces of the tanks may be covered with protective coatings, e.g. a waterproofing layer.

After the tank has been completely installed and the time necessary for the mortars used in the installation to set has elapsed, an exfiltration tightness test should be carried out (using the method specified in PN-B-10702:1999). During the tightness test, access to the tank should be provided from all sides. The excavation should then be carefully backfilled by compacting the soil.

OPERATION

Regular maintenance and proper operation is a prerequisite for proper operation and extending the life of the unit. Tanks should be inspected regularly, preferably during periods of higher load (autumn to spring), at least twice a year, and cleaned if necessary, without allowing them to fill up completely with sediment. Tasks necessary to maintain tanks in a condition that allows them to function properly:

- checking and/or emptying each of the chambers of water and dirt (company with a waste disposal licence)
- checking the technical condition of the concrete body (reinforced concrete), the tightness of connections between elements, technological hollows, the condition of internal coatings
- checking the technical condition of the pre-treatment facilities located upstream of the retention tank
- pressure washing with water of the internal surfaces of the body and all technological parts of the internal equipment
- tanks with suction ports - check technical condition of suction baskets and suction pipes
- tanks with feed to irrigation system - cleaning of mechanical disc filters at tank outlet
- Tanks with infiltration openings - removal of sealing material and sediment layer accumulated in infiltration openings, checking of soil absorption, replacement of geotextile and crushed aggregate in infiltration openings if necessary
- checking the correct functioning of the signalling system (sensors and indicators)
- inspection of the equipment in accordance with the equipment operating manual (pumping system, float valve, flow regulator)

HYDROZONE tanks are constructed from prefabricated reinforced concrete tanks. Detailed information is available at:
https://ecol-unicon.com/produkty/zbiorniki-betonowe/zbiorniki-modulowe-dzb/

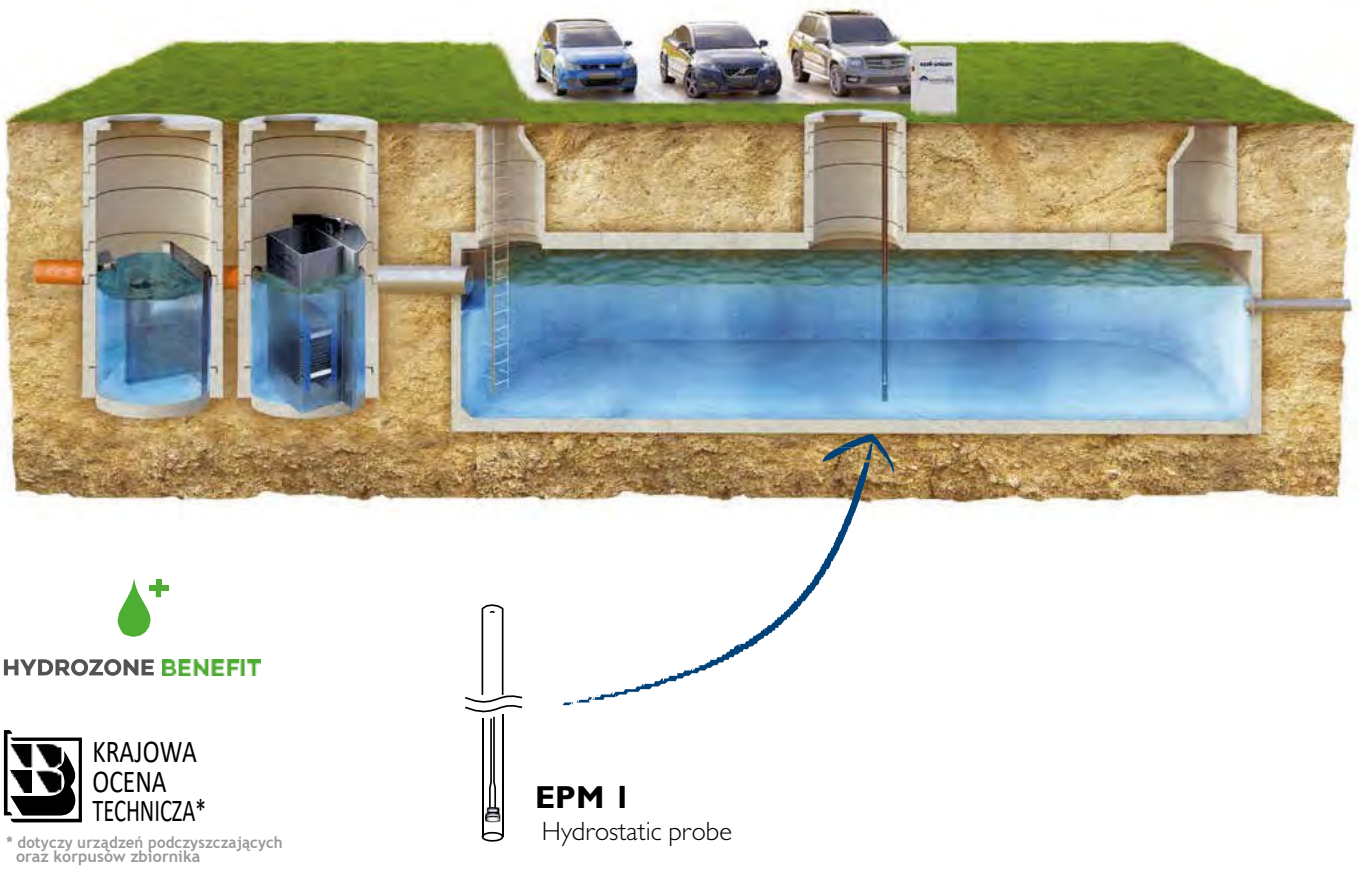


retention tank – Piaseczno



HYDROZONE – Gorzów Wielkopolski

MEASURING MODULE
Tank level measurement



HYDROZONE BENEFIT

KRAJOWA OCENA TECHNICZA*

* dotyczy urządzeń podczyszczających oraz korpusów zbiornika

EPM 1
Hydrostatic probe

No.	Type	Sensor	Installation
1	EPM1	Hydrostatic probe	Retention chamber
2	EPM2	Radar probe	Retention chamber

Description:

The EPM tank fill level measurement is the basis for the modules that use the stored rainwater in the retention chamber. EPM measurement is linked to the monitoring and management system BUMERANG SMART.

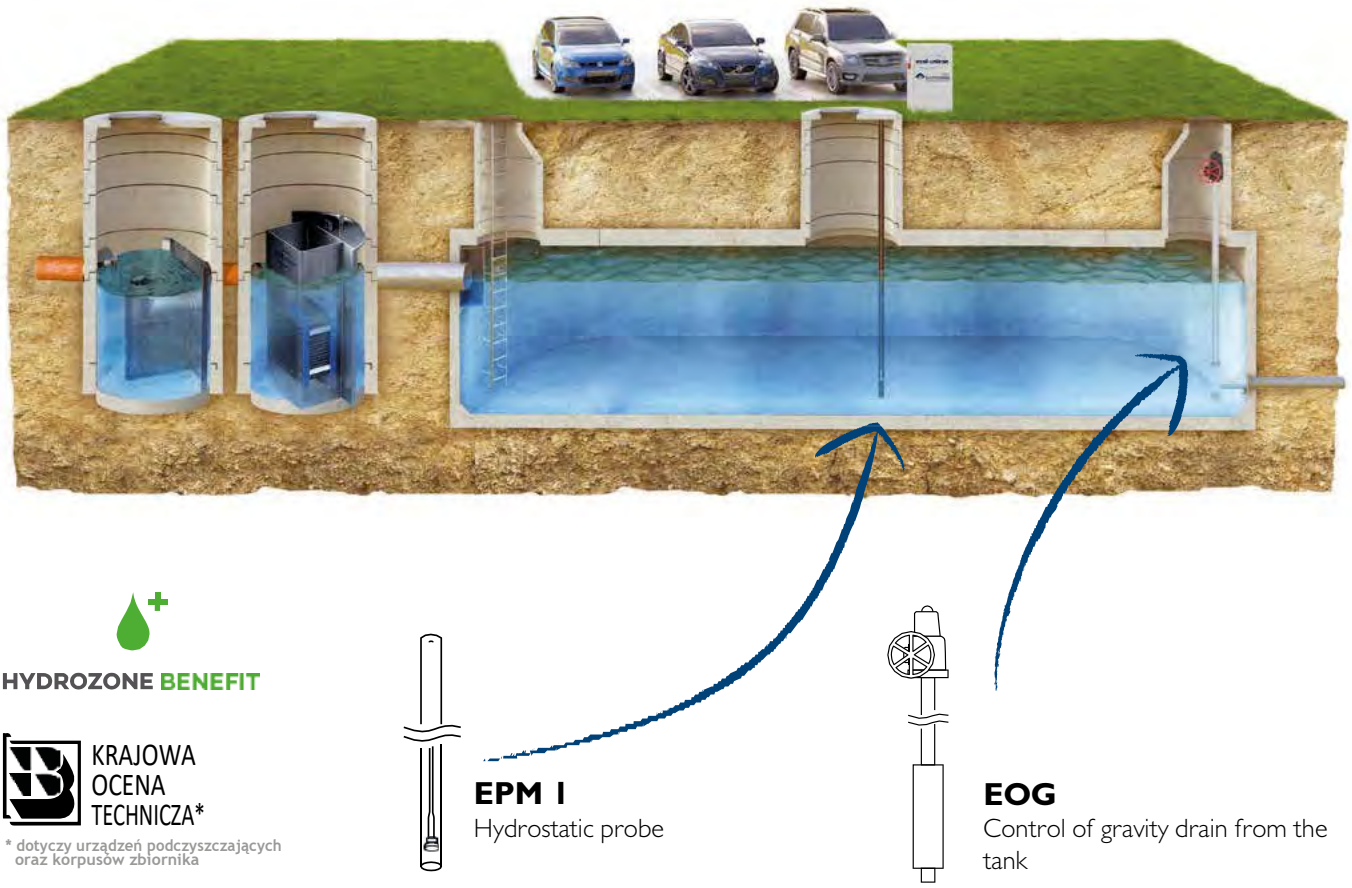
On the basis of the data from the EPM measuring system and the weather forecast, the algorithm for control and use of in-situ retention water will be implemented. The system continuously analyses the status of individual facilities and, on the basis of the implemented algorithms, automatically activates appropriate system measures. In the case of forecast rainfall exceeding the current retention capacity of the tanks or the capacity of the normal drainage system, a procedure for lowering the level of the retention tank will be initiated.

In addition, the current status of the monitored facilities is displayed and appropriate alarms are generated in case of adverse events.

Level measurement in the tank is carried out using a hydrostatic probe as standard (with optional use of a radar probe) mounted directly in the storage tank. Level measurement with the probe is carried out using the correlation between the height of the liquid head and the induced hydrostatic pressure. In addition to the probe, the measurement system includes a set of mounting elements necessary for mounting the probe in the retention tank.

DISSCHARGE MODULE

Emptying of the tank



HYDROZONE BENEFIT

KRAJOWA OCENA TECHNICZA*

* dotyczy urządzeń podczyszczających oraz korpusów zbiornika

EPM 1
Hydrostatic probe

EOG
Control of gravity drain from the tank

Gravity drainage:

No.	Type	DN discharge pipe [mm]*	Drain control
1	EOG	160	Automatic drain shut-off with drive
2	EOG	200	Automatic drain shut-off with drive
3	EOG	300	Automatic drain shut-off with drive
4	EOG	400	Automatic drain shut-off with drive
5	EOG	500	Automatic drain shut-off with drive

* other diameters available on request

Pressure drainage:

No.	Type	Q [l/s]*	H [m]*	DN piping [mm]*	Pump operation
1	EOP	5	6	50	1+1
2	EOP	10	6	80	1+1
3	EOP	20	6	100	1+1
4	EOP	30	6	100	2+0
5	EOP	40	6	100	2+0
6	EOP	50	6	125	2+0

* possibility to select a pumping system with customised parameters on request

Description:

Due to layout of the sewer network, the outflow from the retention part of the tanks can be carried out:

- by gravity via a discharge pipe or,
- under pressure via a pumping system with appropriate operating parameters.

In the case of tanks where rainwater and snowmelt are stored, it is important to retain the medium in the retention section. From the user's perspective, it is important that such a process is carried out automatically.

Depending on the type of drainage from the tank, it is possible to use a system of:

- EOG – control of gravity discharge from the tank
- EOP - control of pressure drainage from the tank

Automatically operated gate valves are used in the EOG system depending on the diameter of the drain. The hydraulic fittings are mounted directly in the retention chamber of the tank. Access to the gate valve is provided from ground level (enabling operation and maintenance).

The EOP system uses pumping systems. This system consists of submersible pumps mounted on a coupling foot and hydraulic-mechanical fittings consisting of discharge pipes and fittings (non-return valves, gate valves). The diameter of the discharge pipes is selected according to the flow rate and the pump operation scheme.

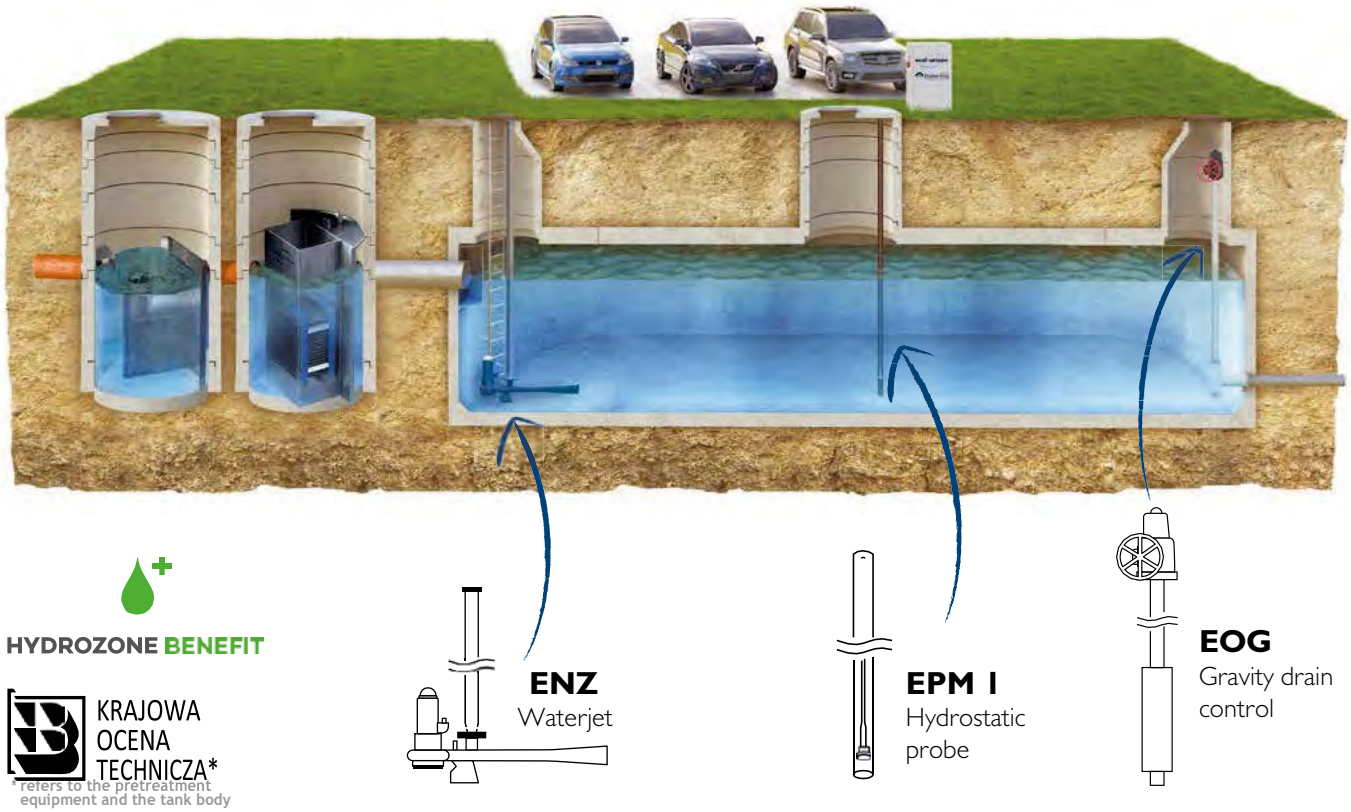
The table lists pressure drainage systems for the specified hydraulic parameters. In the event that the design parameters differ from those listed in the table, it is also possible to select pumping stations for other parameters and to take individual user requirements into account.

Connections between fittings and pipelines are made in such a way that they can be dismantled at a later date. The ability to automatically control the operation of the pumps and to signal fault conditions is provided by a power supply and control device. To ensure proper operation of the pumping system, system operating parameters such as e.g. water level, flow, pressure, voltage, current and operating time are monitored, as well as signalling the pumping system's operating status.

Based on the data from the EPM measurement system (measurement of the tank fill level) and the weather forecast, a tank emptying control algorithm will be implemented. If the forecast rainfall exceeds the current storage capacity of the tanks or the capacity of the usual drainage system, a procedure for lowering the fill level of the tank will be initiated (opening the automatic closure in the case of the EOG system or switching on the pumps in the case of the EOP system). The process of efficient emptying of the tank is made possible by the EPM tank measurement system and the BUMERANG SMART monitoring and management system.

WATER REFRESHMENT MODULE

Refreshing the water held in the retention tank



HYDROZONE BENEFIT

KRAJOWA OCENA TECHNICZA*

* refers to the pretreatment equipment and the tank body

No.	Type	L tank [m]	Internal width of the tank [m]	Internal height of the tank [m]	Motor output P2 [kW]
1	ENZ-2-1	10	6	3	2,2
2	ENZ-3-1		8		3
3	ENZ-4-1	20	6	3	4
4	ENZ-3-2		8		6
5	ENZ-3-2	30	6	3	6
6	ENZ-4-2		8		8
7	ENZ-4-2	40	6	3	8
8	ENZ-4-3		8		12
9	ENZ-4-3	50	6	3	12
10	ENZ-4-4		8		16

* water refreshing system for tanks with other parameters available on request

Description:

Aeration nozzles can be used to refresh (aerate) the medium, kept in the retention chamber for an extended period of time. By creating a strong stream of a mixture of liquid and air bubbles, the jets create particularly favourable conditions for oxygen transfer and prevent sedimentation.

The waterjet consists of a feed pump, a main column with control and monitoring devices and an outlet pipe.

The base of the injector is fixed to the bottom and the pump is lowered along guides into the operating position. A manhole cover is located above the pump.

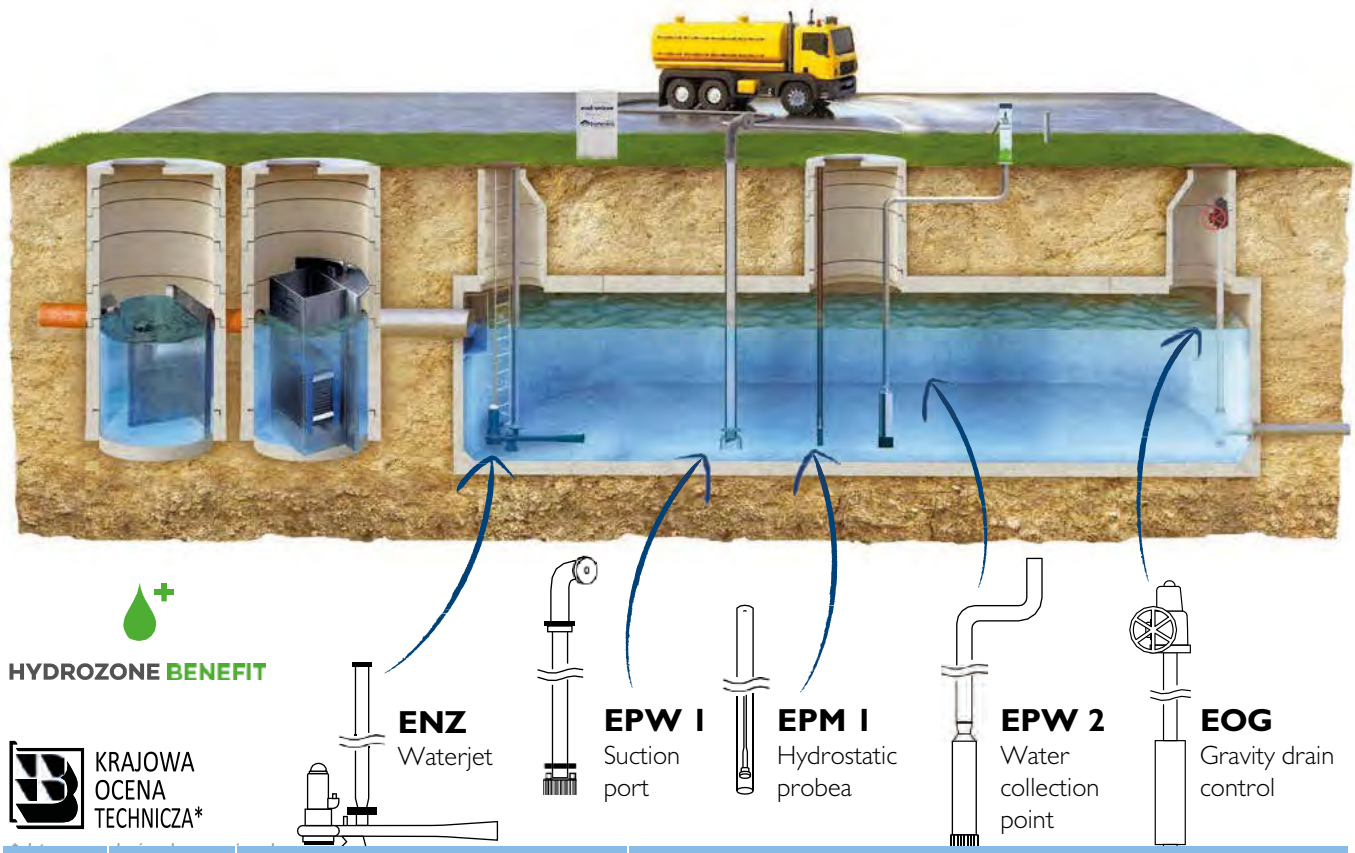
Moisture sensor is built into the motor compartment of the pump, together with thermal sensors on each phase of the motor winding, the so-called safety circuit 1-2, which is led out in the pump cable.

To ensure longevity and low maintenance costs, the system (with the exception of the feed pump and fittings) must be made entirely of corrosion-resistant material - stainless steel and resin composite components.

The number of waterjets is designed taking into account the dimensions of the retention chamber.

MUNICIPAL MODULE

Water use for municipal purposes



No.	Type	Type of intake	Material
1	EPW1	suction part DN100*	stainless steel 1.4301
2	EPW2	water collection point	stainless steel 1.4301

* other diameters available on request

Description:

Rainwater can be used for municipal purposes such as washing streets and car parks, flushing sewer collectors. There are two systems of water intake designed according to the needs:

- EPW1 – water intake via suction port
- EPW2 - water collection point

System EPW1:

The suction line, located in the tank, is made of stainless steel with a nominal diameter of 100 mm. The lower end of each suction line is fitted with a suction basket. The basket is fitted with a non-return valve and a non-return valve unlocking handle to allow water to be drained from the suction line when the intake is complete. The upper part of the suction line is led out over the terrain and ends in a horizontal section of pipe fitted with a coupling and a fireman's coupling cover.

This solution allows water to be taken up by sewer trucks.

System EPW2:

The water collection point is a convenient and accessible solution for residents. It allows water to be drawn from the concrete tank.

The water collection point is located on the ground surface, on a prepared substrate. Hydraulic fittings are concealed in the column, which contributes positively to the visual aspect.

The principle of the water collection point is very simple. To activate the point, press the button located on the housing of the point. This causes water flow through the faucet below.

The control of water loss from the tank can be implemented through the Bumerang Smart monitoring system. This system provides operators with the ability to remotely and continuously monitor the amount of water in the tank, as well as the ability to temporarily disable the ability to take water if necessary.

The water point is available during the spring and autumn period (April to May). For the winter period, water is drained from the point and taken out of service.

The water point is 1 m high. It is made of stainless steel 1.4301.

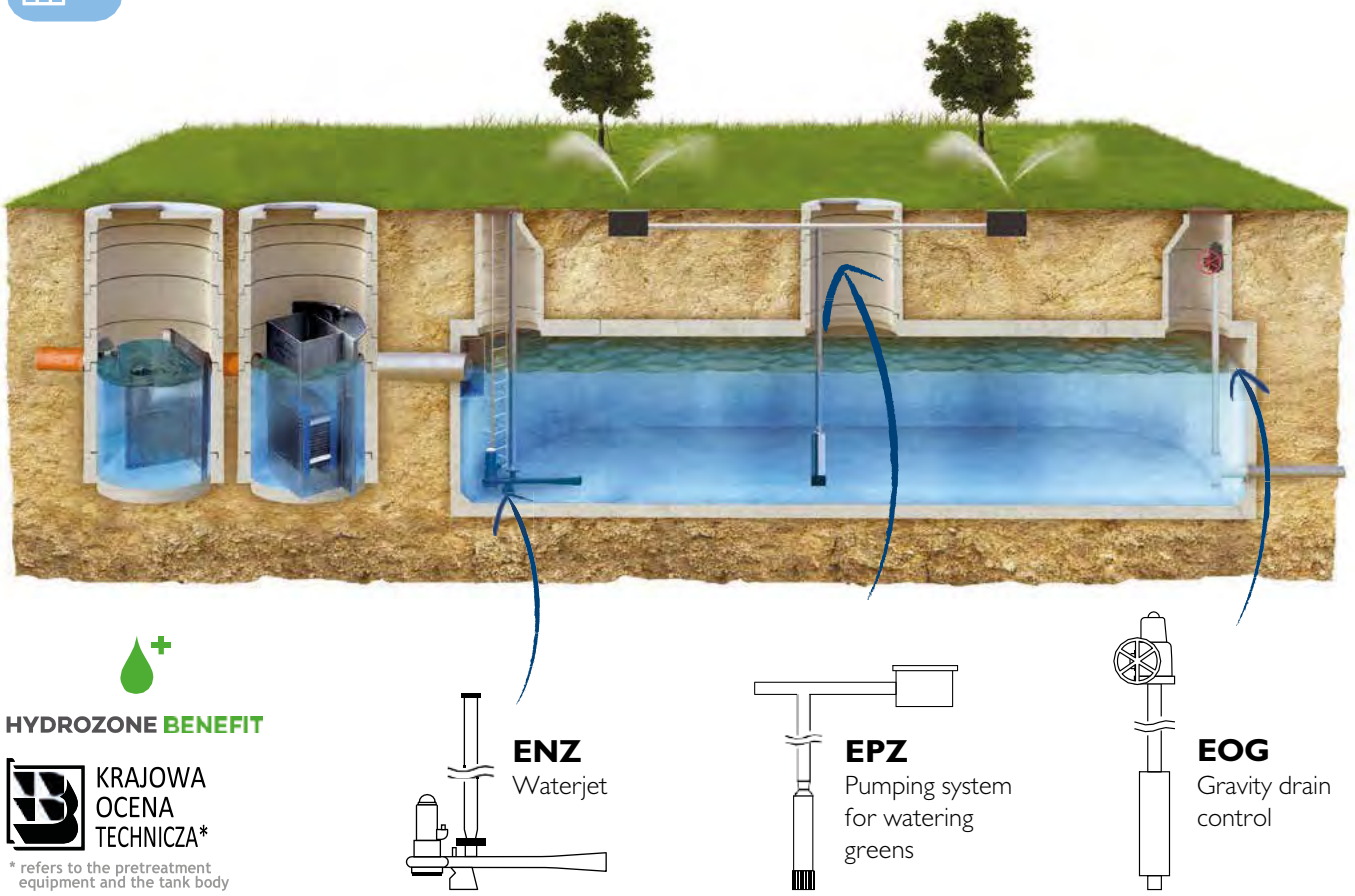
Due to the variability of rainwater parameters and the degree and type of pollution depending on the catchment area from which rainwater is collected, it is possible to use a rainwater treatment system. This is particularly important in the case of the EPW2 system, where the user is in close contact with the medium.

Due to the variability of rainwater parameters and the degree and type of pollution depending on the catchment area from which rainwater is collected, it is possible to use a rainwater treatment system. This is particularly important in the case of the EPW2 system, where user is in close contact with the medium.

The treated water is not potable water. This is indicated both in the manual of the unit and graphically directly on the water point.

WATERING MODULE

Use of water for watering greenery



HYDROZONE BENEFIT

KRAJOWA OCENA TECHNICZA*

* refers to the pretreatment equipment and the tank body

ENZ
Waterjet

EPZ
Pumping system for watering greens

EOG
Gravity drain control

No.	Type	Watered area size [m2]:	No. of watering zones
1	EPZ400	0 - 400	4
2	EPZ800	401 - 800	8
3	EPZ1200	801 -1200	12

Description:

Rainwater collected in the retention tank can be used to water greenery in gardens and parks. The watering of greenery is carried out through an automatic irrigation system using drip lines.

The irrigation system is powered by a submersible pump located directly in the retention chamber. It consists of hydraulic-mechanical equipment, consisting of a discharge pipe and shut-off and return fittings (non-return valve, gate valve). A filter system and a distributor are installed on the discharge pipeline in a separate chamber to feed the individual irrigation zones. Control of the flow and its distribution to the individual irrigation lines is carried out by means of electro-valves on each line. The control unit is used for automatic pump and irrigation system control, as well as fault signalling.

Technical parameters of the irrigation system:

- Pumping system located inside the storage tank
- Chambers with filtration and control systems
- Drip irrigation system

The watering system for green areas has the possibility of local and remote control of watering time and duration separately for each zone. The number of zones depends on the size of the area to be irrigated and the type and method of watering.

The chamber with the filtration and control system is built in behind the retention tank.

Considering the size of the area and the diversity of its zoning, it is divided into zones where the irrigation of each zone is triggered independently.

Due to the variability of rainwater parameters as well as the degree and type of pollutants depending on the catchment area from which rainwater is collected, it is possible to use a rainwater treatment system.

The treated water is not potable water. This is indicated both in the manual and graphically directly on the point of use.

FIRE-FIGHTING MODULE

Use for fire-fighting purposes



HYDROZONE BENEFIT

KRAJOWA OCENA TECHNICZA*

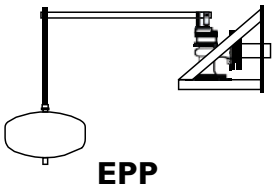
* refers to the pretreatment equipment and the tank body



EPM 1
Hydrostatic probe



EPP
Suction basket with coupling



EPP
Float valve

No.	Type	Capacity range for the fire section [m3]	Number of suction ports	DN port	Material
1	EPP1	50-150	1	100	stainless steel 1.4301
2	EPP2	150-300	2	100	stainless steel 1.4301
3	EPP3	>300	3	100	stainless steel 1.4301

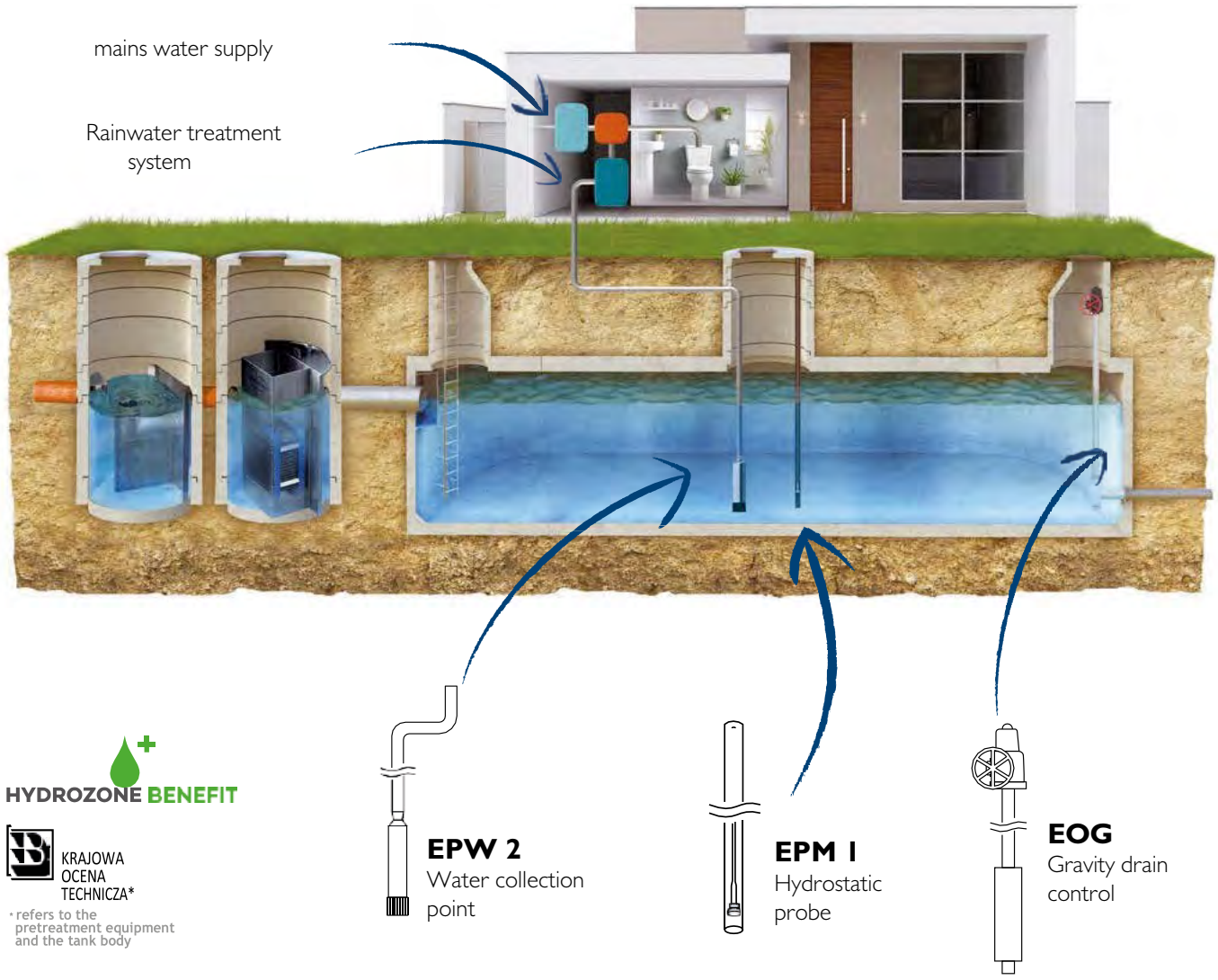
Description:

The retained rainwater can be used for firefighting purposes. The tank is additionally supplied with water from the water mains in order to ensure a sufficient, inviolable water level for firefighting purposes. The tank is equipped with stainless steel suction lines with a nominal diameter of 100 mm. The lower end of each suction line is fitted with a suction basket to protect against the suction of accidental solids which may be present in the water.

The upper part of the suction line is led out above the water intake level and ends with a horizontal section of pipe fitted with a nozzle and cover of type 110 fire extinguisher nozzle according to PN-M-51038 and PN-M-51024.
The number of suction lines is specified in PN-B- 02857:2017-04 and is dependent on the tank capacity.

FLUSHING MODULE

use of water for flushing toilets



Description:

The retained rainwater can be used for toilet flushing purposes.

Rainwater reaching the roof of the facility is collected from its surface and fed into a retention tank. After pre-treatment, rainwater is collected in a retention tank with a quality maintenance system to avoid secondary pollution. The tank is equipped with a pump to feed the refreshment system and the water treatment system. From the retention tank, the treated rainwater goes to the EU-RECLEAN R rainwater treatment system, where it is treated and disinfected in equipment including a filtration and UV lamp system. The treated water is collected in a hydrophore tank.

The treated water is not potable water. This information can be found in the manual for the unit as well as in graphic form directly at the installation.

Water treatment plant is installed inside the building in an adapted room. This facilitates access to the installation.

Due to the possible lack of rainwater, the possibility of an automatic switchover to tap water supply is included.

The flushing system for toilets is selected on an individual basis.

The diagram above shows a simplified block diagram of the installation.

Example I

Hydrozone Clean with pre-treatment system and retention chamber

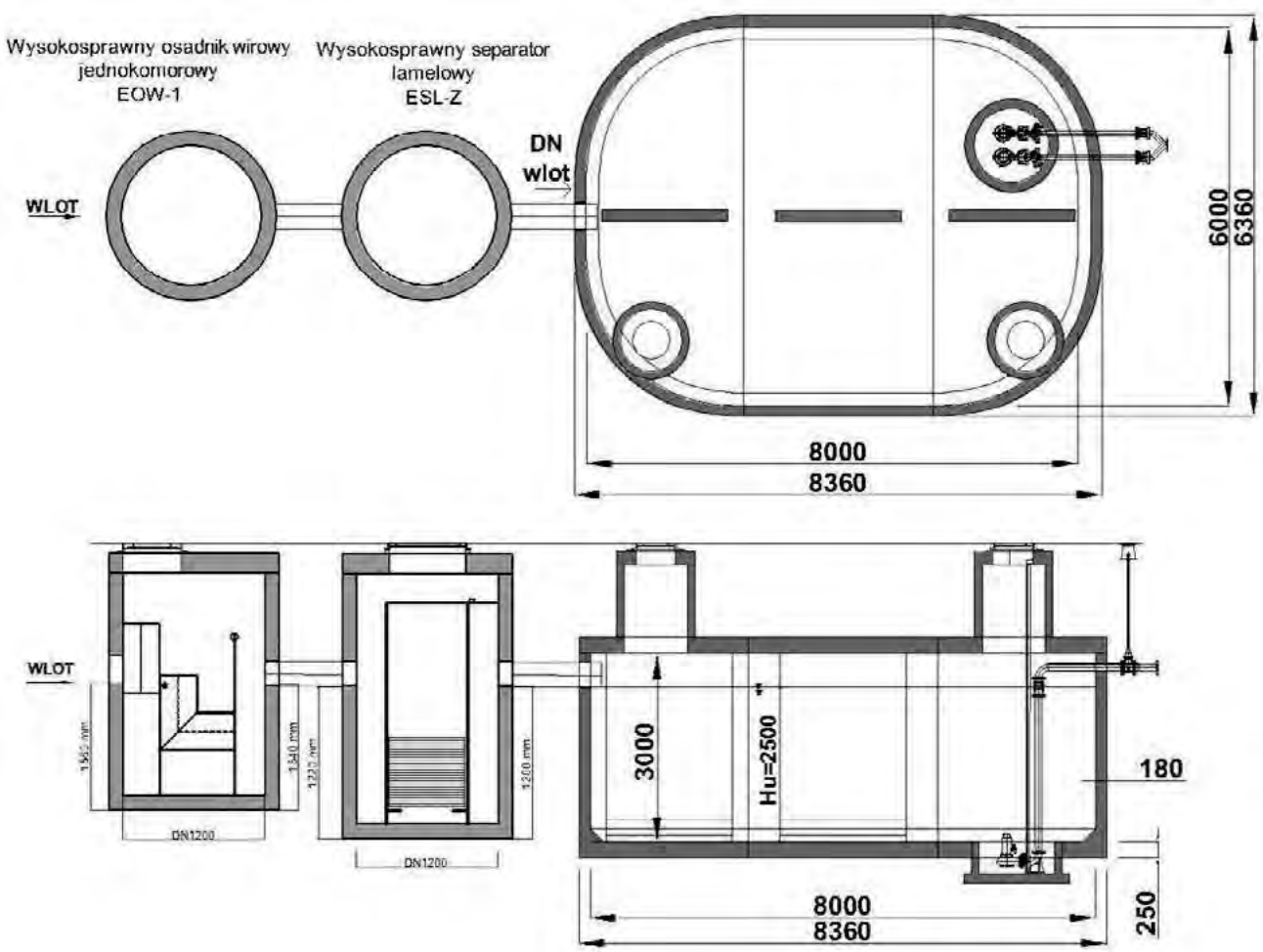
An example of an urban application is the Hydrozone II Clean system, which consists of a retention tank preceded by a pre-treatment system (i.e. a light liquid separator and suspended solids settling tank). The medium from the tank is discharged under pressure - a pumping system located directly in the tank's retention chamber. The location of the pre-treatment facilities directly upstream of the reservoir allows the size of the system to be optimised.
This will make it easier to carry out the periodic inspection, cleaning and maintenance tasks that will be necessary throughout the service life of HYDROZONE II.

Calculated for the **following input parameters:**

- catchment: non-permeable paving 0.5 ha
- run-off coefficient: 0.85
- probability: 20%
- permissible discharge limit: 5 dm^3/s
- risk factor: low
- nominal rain intensity: 15 [$dm^3/s \times ha$]

For these parameters, based on calculations, a Hydrozone II Clean system was selected:

- high-efficiency vortex separator EOW-1 10/100
- high efficiency lamella oil separator ESL-Z 10/100
- retention tank with a capacity of 103,3 m^3 and dimensions: 6000×8000×3000 [mm]
- pumping station capacity Q_{pomp} [dm^3/s] – 5
  Pumping station installed directly in the retention chamber, in the technological sump.



Example II

Hydrozone Benefit with pretreatment system, retention chamber, EPM measuring module, refreshment module ENZ and watering module EPZ

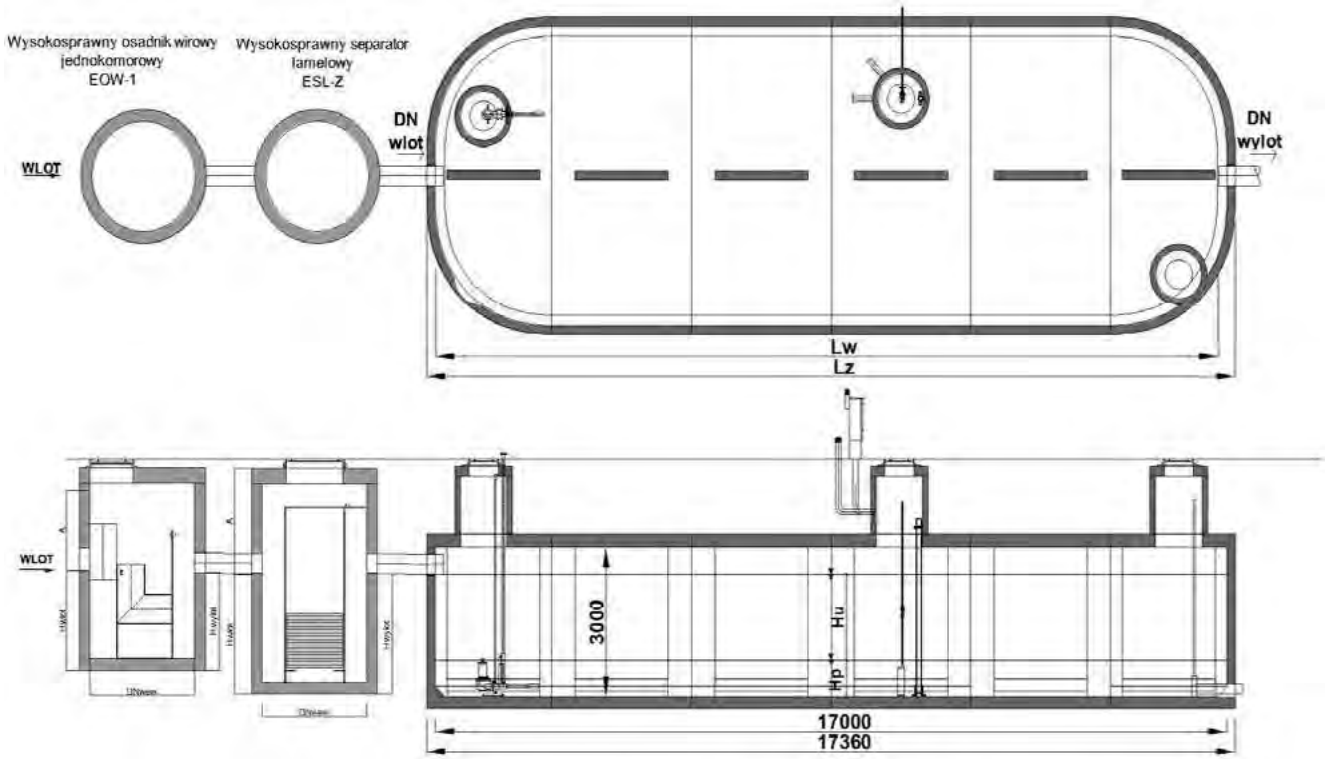
One example of an application in urban development may be the Hydrozone II Benefit system, consisting of a retention tank preceded by a pre-treatment system (i.e. a light liquid separator and a suspended solids settling tank). Rainwater can be used for the purpose of watering greenery. In this case, in order to manage water in the retention part, the EPM metering system must be used, in addition, the ENZ system can be used. Medium from the tank is gravity drained - an automatic outflow cut-off system located directly in the retention chamber of the tank.

Calculated for the **following input parameters::**

- catchment: roofs 0,8 ha
- runoff coefficient: 0,96
- probability: 20%
- permissible discharge limit: 5 m^3/s
- risk factor: low
- natężenie deszczu nominalnego: 15 [$dm^3/s \times ha$]
- nominal rain intensity: 200 m2

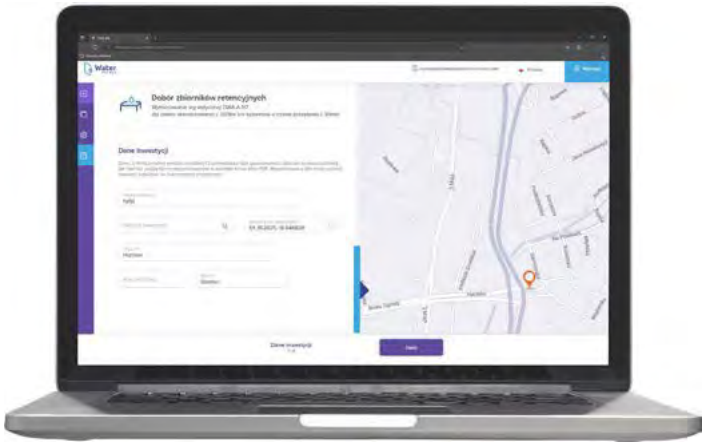
For these parameters, based on calculations, a Hydrozone II Benefit system was selected::

- high-efficiency vortex separator EOW-1 30/300
- high efficiency lamella oil separator ESL-Z 15/150
- retention tank with a capacity of 235, m^3 and dimensions: 6000×17000×3000 [mm]
- gravity discharge EOG DN200
- refreshment module ENZ-4-1
- measurement module EPM
- watering module: EPZ400



Our selection tool is available at:

waterfolder



https://ecol-unicon.com/kalkulatory

