



Sustainable rainwater management

Retention and controlled release

While planning new shopping center the designer and investor met with the challenge of sustainable rainwater management. Namely authorities demanded in project condition that the highest quantity of rainwater, discharged in nearest stream, should not extend the rainwater quantity, the stream was filled before the construction of the new shopping center.

Project:

Construction of the new shopping center in Lenart, Slovenia

Challenge:

Management of the rainwater when building new shopping center. Very poorly permeable clay soil is disabling the infiltration, unpleasant hydrological conditions with high groundwater require shallow installation.

Solution:

The construction of underground water retention basin, made from ACO Stormbrixx geocellular elements, wrapped in geomembrane with welded joints according to the system of the subcontractor company Sinteza lining d.o.o.

Surface Water Drainage

Drainage of the paved surfaces is arranged with suitable transverse and longitudinal slopes into KerbDrain KD 305 elements and line drainage elements Monoblock PD 150, anthracite color.

For the drainage of the rainwater from parking area there is sewerage system built in, into which the waters are collected and from there are taken for cleaning in light-liquid separator NS 80 l/s. Therefore mineral oil separator with bypass, integrated sludge trap and coalescent filter with closure device, according to SIST EN 858-1 was installed. Water collected in this way together with roof water is released in underground retention facility.

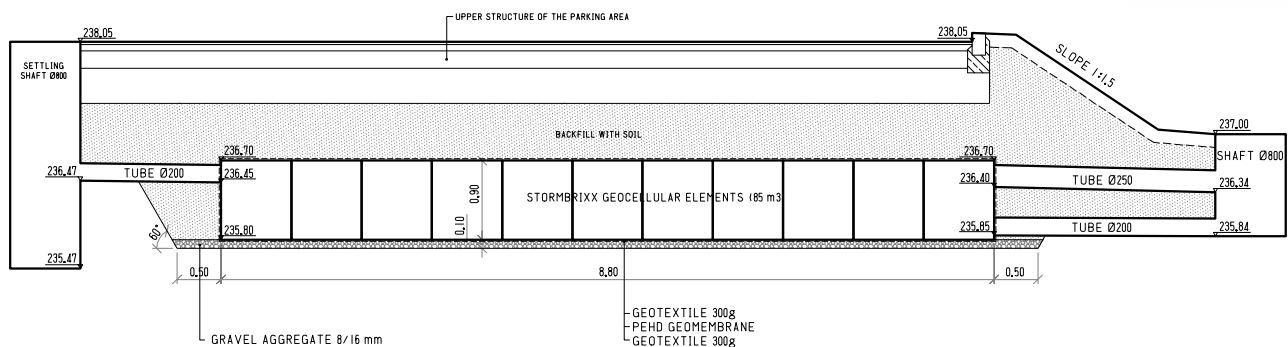
The retention tank prevents the instant inflow of rainwater into the stream and retains the difference in the discharge of water into the stream before and after the planned construction intervention. With the controlled outflow of rainwater from the tank in the amount, accepted by the stream before the construction of the commercial facility, the Globovnica stream will not be additionally burdened.

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Project was implemented in partnership with Sinteza lining d.o.o., leading company on the field of sealing, nature and environment protection, experts in installation of sealing foils (geomembranes), bentonite liner (GCL liner) and protection of the concrete from aggressive substances.
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Longitudinal retention tank cross section made of Stormbrixx SD geocellular elements wrapped in a geomembrane.

Retention tank

Requirements of consent authority with other words mean that in order to retain momentarily inflow of the rainwater into the stream before release retainer with flow regulator must be built, which will release rainwater from the newly, watertight surfaces (roof 2.500 m² and asphalt surface 3.300 m²) into the nearest stream in the amount of maximum 20 l/sec.

Because of the security before filling of retention tank during extremely heavy rainfall safety overflow was provided.

Rainwater – that flows down the throttle or overflow from the retention – can drain into the bed of the stream.

The retention is dimensioned according to the difference of the rainwater inflow into the stream before and after construction, namely:

- Inflow **after** construction 105 m³ – Inflow **before** construction 20 m³ = 85 m³
- The required retention volume is 85 m³ and was calculated with 15 minutes rainfall intensity and return period of 5 years, without taking into account regularly outflow in the amount of 20 l/sec. The dimensions of the retention were also adjusted (according to available space) to dimension 10.8 x 9.0 x 0.91 m. The time needed to empty the basin is 1.18 h.



A retention with dimensions 10.8 x 9.0 x 0.9 m and volume of 85 m³, is installed under the customers car parking area. The thickness of the cover (backfill soil and the upper road structure of the parking area) is 1.4 m.



Precise tailoring of the geomembrane around the perimeter of the retention with thoughtful switches with combination of automatic and extrusion welding for 100% waterproofing.



Preparation of 100% waterproof pipe breakthrough for waterproof connections to the pipe. The pipes have to be made of PEHD and smooth from outside.



Detail of the longitudinal weld of horizontal geo membrane laid on the floor and side geo membrane of the retainer.

Waterproof Geomembrane

The process of the installation of individual layers and welding is consisted of next positions:

Pos. 1: Supply, cutting, laying and thermal bonding of the protective geotextile with a minimum weight of 400 g/m², a minimum piercing strength CBR= 3000 N and min. tensile strength 19 kN. Geotextile is laid as a protection of the geomembrane in contact with Stormbrixx geocellular elements.

Pos. 2: Supply, cutting, laying and 100% waterproof welding of double-sided smooth PEHD geomembrane thickness of 2.00 mm according to the system of automatic and extrusion welding (system Sinteza lining Celje d.o.o.). All work was done by certified geomembrane welders.

Pos. 3: Pipes are made of PEHD and smooth outside.

Pos. 4: Supply, cutting, laying and thermal bonding of protective geotextile minimum of weight 400 g/m², a minimum piercing strength CBR=min. 3000 N and tensile strength 19 kN- Geotextile is laid as a protection of geomembrane in contact with filling material.

Workflow - In the following order:

Step 1: On the prepared ground first geotextile was placed (Pos. 4), in the floor area of the intended retention and addition needed for the fold.

Step 2: A geomembrane with folds from Pos. 2 is laid and welded on this geotextile.

Step 3: The geotextile from Pos. 1 is also placed on the geomembrane.

Step 4: On the basis prepared on this way geo cellular modular elements can be placed according to the planned project. Connections for inlet and outlet pipes are also made. The object is wrapped in geotextile groom Pos. 1 also on upper and side sides and connect with the geotextile from Step 2.

Step 5: Cutting and welding of the geomembrane and waterproof performance of the connections and connection with the geomembrane from Step 2 are performed.

Step 6: A test of water tightness of all welds is performed according to system of vacuum (vacuum bell testing) and with high-frequency tester (high frequency spark testing).

Step 7: Installation has to be completed with the final layer of the geotextile, connected with the one from Step 1. Underground retention object is ready for backfilling.

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