Mall CaviLine infiltration tunnel
Underground reinforced concrete infiltration system for infiltrating rainwater

In contrast to standard infiltration trenches with soakaway crates, tunnel infiltration trenches offer significant advantages, especially when the required underground cavities are formed from reinforced concrete as a near-natural material. Vaults made of reinforced concrete are structurally determinate and stable. This makes it possible to construct large cavities without internal bracing that would make it either difficult to operate and maintain the systems or only possible with special equipment.

Field of application

CaviLine infiltration tunnels can be arranged linearly or, in parallel operation, across a planar area. This enables them to be adapted to the respective conditions. In contrast to the more cubically arranged soakaway crates, the flat, wide-area design ensures a more favourable and volume-saving ratio between the tunnel volume and infiltration area. This often enables a smaller volume to be used.
The arrangement is optimal for linear structures such as roads and paths. Here, CaviLine can be buried under the road like a sewer system; the drainage discharge can then be provided from the sides. This makes it possible to dispense with a collector sewer system.

Functionality

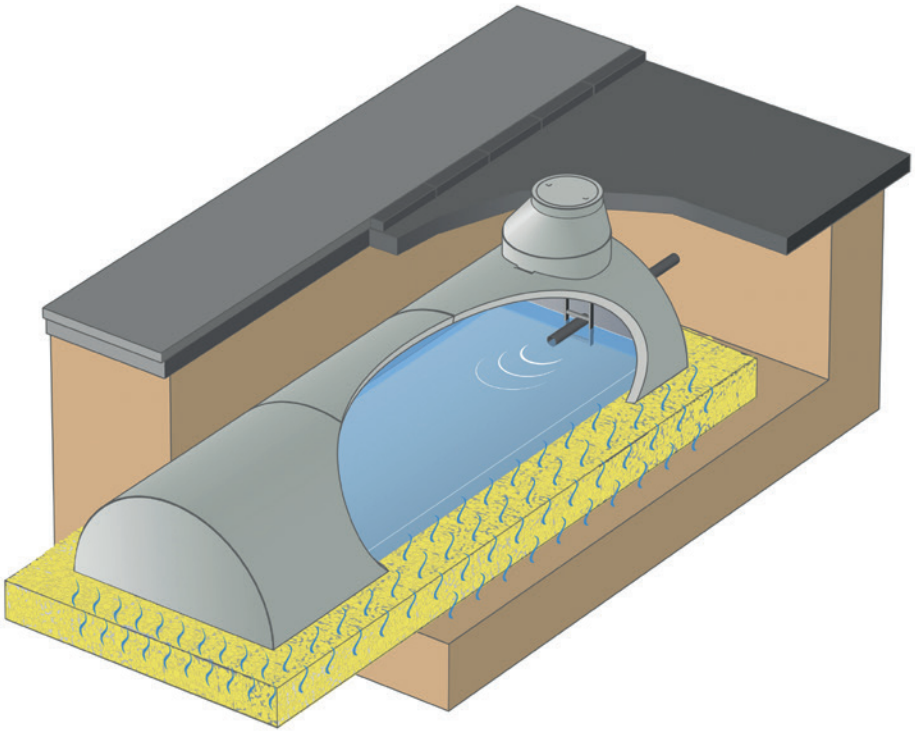
The design ensures an optimal ratio between the infiltration area and retention volume. This makes the required volume smaller than with cubic shapes. In addition, the infiltration path between the base of the infiltration system and the groundwater level is decisive for ensuring infiltration. Here, too, there is an advantage thanks to the flat, near-surface arrangement. Volumes and infiltration areas can be designed individually, depending on local conditions.

Maintenance and operation

Due to the internal height of 1.25 m, Mall's CaviLine infiltration tunnels are accessible in accordance with the German Social Accident Insurance (DGUV) definition. This provides considerable economic advantages for the maintenance and operation. No camera or maintenance robots need to be used; inspections, cleaning and repair can be carried out directly and with simple tools that are available everywhere.

Advantages at a glance

+ Simple installation, few parts, minimum installation effort
+ No geotextile sheathing (only on base and joints)
+ High stability up to HGV 60
+ Cost-effective infiltration solution
+ Flat construction, can be easily extended
+ Ideal for supporting lineardrainage and in combination withrainwater treatment
+ Standardised volume and infiltration areas
+ Entire system can be accessed in accordance with DGUV regulation 103-003



Pretreatment

Infiltration always refers to discharging into the groundwater. As the largest drinking water reservoir, the groundwater body enjoys special protection. Water that is to be infiltrated must therefore almost always be pretreated.

Various stages of pretreatment are possible:

- Settling shaft with partial infiltration pipe through the infiltration stage as the simplest pre-treatment option
- Mechanical pretreatment stages with sedimentation units and predefined treatment capacity, such as the ViaSed sedimentation plant and the ViaTub lamella clarifier
- Stormwater settling basin without permanent retention as per DWA-M 176, such as the ViaKan lamella clarifier
- ViaPlus substrate filter with general technical approval from the DIBt
- Above-ground biological soil layer as with the Innodrain infiltration system

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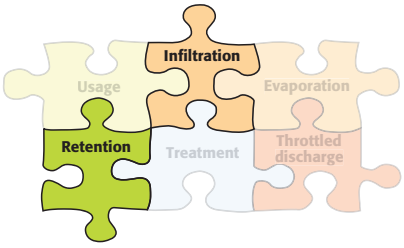


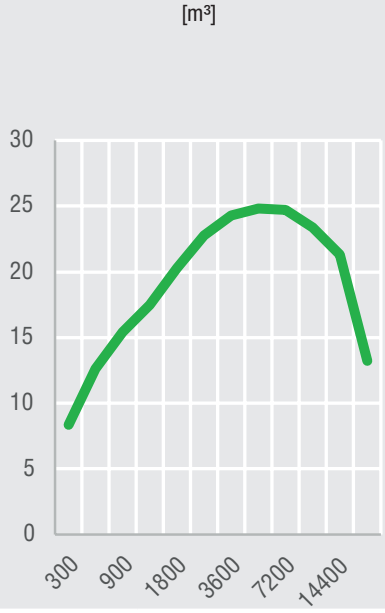
Dimensioning

The impoundment volume is determined according to the DWA-A 138 worksheet. Two factors are decisive in determining this: On the one hand, the amount of water accumulating in the course of heavy rainfall; here, the local heavy rainfall data from the KOSTRA DWD Atlas is available. On the other hand, the amount of water that can be drained away via the infiltration surface. Here, the infiltration rate into the existing soil (k_f value) is decisive. The required infiltration trench volume is derived from the difference between the respective precipitation and infiltration volumes for a given annuality of the rain event.

Example:

CaviLine type: 25 - 1 - 5		Infiltration area: 49.95 m²		Backwater volume: 30.17 m³	
Location: Kempten		Annuality: 5 a		A_i: 900.00 m²	$Q_{infiltrate}$: 1.40 l/s
k_f: 5,60E-05		I_{hy}: 1		v_f: 2.80E-05	

D	r_N	V_N	V infiltrate	V retained
[s]	[l/s.ha]	[m³]	[m³]	[m³]
300	324.90	8.77	0.42	8.35
600	248.60	13.42	0.84	12.59
900	205.70	16.66	1.26	15.40
1200	177.10	19.13	1.68	17.45
1800	140.50	22.76	2.52	20.24
2700	109.20	26.54	3.78	22.76
3600	90.50	29.32	5.03	24.29
5400	66.60	32.37	7.55	24.82
7200	53.70	34.80	10.07	24.73
10800	39.60	38.49	15.10	23.39
14400	32.00	41.47	20.14	21.33
18000	23.70	38.39	25.17	13.22
21600	17.60	34.21	30.21	4.00
43200	14.30	55.60	60.42	-4.82
64800	10.60	61.82	90.63	-28.81
86400	8.60	66.87	120.84	-53.97
172800	5.60	87.09	241.68	-154.59
259200	4.30	100.31	362.52	-262.21



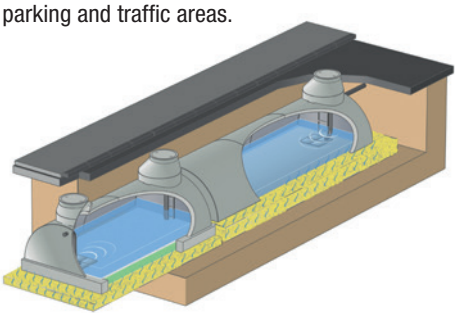
Maximum: 24.82

Adjustment factor f_Z: 1.15	Adjustment factor f_N: 1	Required retention volume: 28.54 m³

Mall CaviLine VS infiltration tunnel with pre-filter fleece and technical filter

The Mall CaviLine VS infiltration tunnel with pre-filter fleece and filter material in accordance with ÖNORM B 2506-3 is used for treating rainwater contaminated with polar-dissolved substances from parking and traffic areas.
The fleece removes fine filterable substances from the water that are not captured by mechanical systems. The technical filter material with a thickness of 30 cm removes polar-adsorbable substances, such as heavy metals.

We recommend pre-treating the rainwater in accordance with the pollution. This can be done with mechanical treatment plants (ViaSed, ViaTub) according to the inflow volume and expected pollution.
It is easy to replace exhausted or scoured filter layers with just a few means thanks to the very good accessibility of the plants. In addition, it is possible to combine infiltration tunnels for rainwater from roof areas with those for parking and traffic areas.



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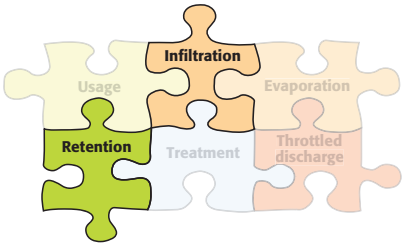

Mall CaviLine infiltration tunnel							
Components		**Length inside**	**Width inside**	**Height inside**	**Infiltration area**	**Volume**	**Weight**
		mm	mm	mm	m²	m³	kg
	Tunnel element	2500	2500	1250	9.25	6.10	2,500
	Tunnel end element	2400	2500	1250	11.10	5.90	3,230
	Tunnel end element with access	2400	2500	1250	11.40	5.90	3,250
	Saddle piece for shaft construction	–	–	–	–	–	210

Data for example configurations						
Type	**Length outside**	**Volume**	**Width Infiltration area**	**Heaviest single weight**	**Total weight**	Number of strings
	m	m³	m	kg	kg	
CaviLine 25–1–2	5.0	11.8	3.7	3,250	6,800	1
CaviLine 25–1–3	7.5	17.9	3.7	3,250	9,300	1
CaviLine 25–1–4	10.0	24.0	3.7	3,250	11,800	1
CaviLine 25–1–5	12.5	30.1	3.7	3,250	14,640	1
CaviLine 25–1–6	15.0	36.2	3.7	3,250	17,140	1
CaviLine 25–1–7	17.5	42.3	3.7	3,250	19,640	1
CaviLine 25–1–8	20.0	48.4	3.7	3,250	22,140	1
CaviLine 25–2–5	12.5	60.2	7.4	3,250	29,280	2
CaviLine 25–2–6	15.0	72.4	7.4	3,250	34,280	2
CaviLine 25–2–7	17.5	84.6	7.4	3,250	39,280	2
CaviLine 25–2–8	20.0	96.8	7.4	3,250	44,280	2
CaviLine 25–3–6	15.0	108.6	11.1	3,250	51,420	3
CaviLine 25–3–7	17.5	126.9	11.1	3,250	58,920	3
CaviLine 25–3–8	20.0	145.2	11.1	3,250	66,420	3
CaviLine 25–3–9	22.5	163.5	11.1	3,250	73,920	3

Length/width of the infiltration area = installation area for the tunnel elements + 50 cm space on all sides to the excavation pit wall or 100 cm space between the parallel tunnel elements

Tunnel elements: downwardly open half shells with an inside diameter of 2.5 m and a 100-mm wall thickness