DEKDRAIN Plastic and Galvanized

INSTALLATION MANUAL

DEKS
DRAINAGE
BY DESIGN
SINCE 1947

CALCULATION OF WATER VOLUME TO DRAIN

For a correct design of the canalization line, it is essential to know the volume of the rainwater that has to be drained.
To estimate an expected volume, it is used the Rational Method calculated as below

$$V = \frac{(\beta \cdot I_{cr} \cdot A)}{3.600}$$

V = Volume of water to drain (liter/second)
I_{cr} = Critical rainfall (mm/hr)
A = Area of the surface (sqm)
ß = Flow coefficient (depending on the type of terrain)

Surface Type	ß
Impermeable roof	0,70 ÷ 0,95
Asphalt surfaces well kept	0,85 ÷ 0,90
Stone surfaces with good concrete connection	0,75 ÷ 0,85
Stone surfaces with open joint	0,50 ÷ 0,70
Unpaved surfaces, square rail, non-development land	0,10 ÷ 0,30
Garden	0,20 ÷ 0,25

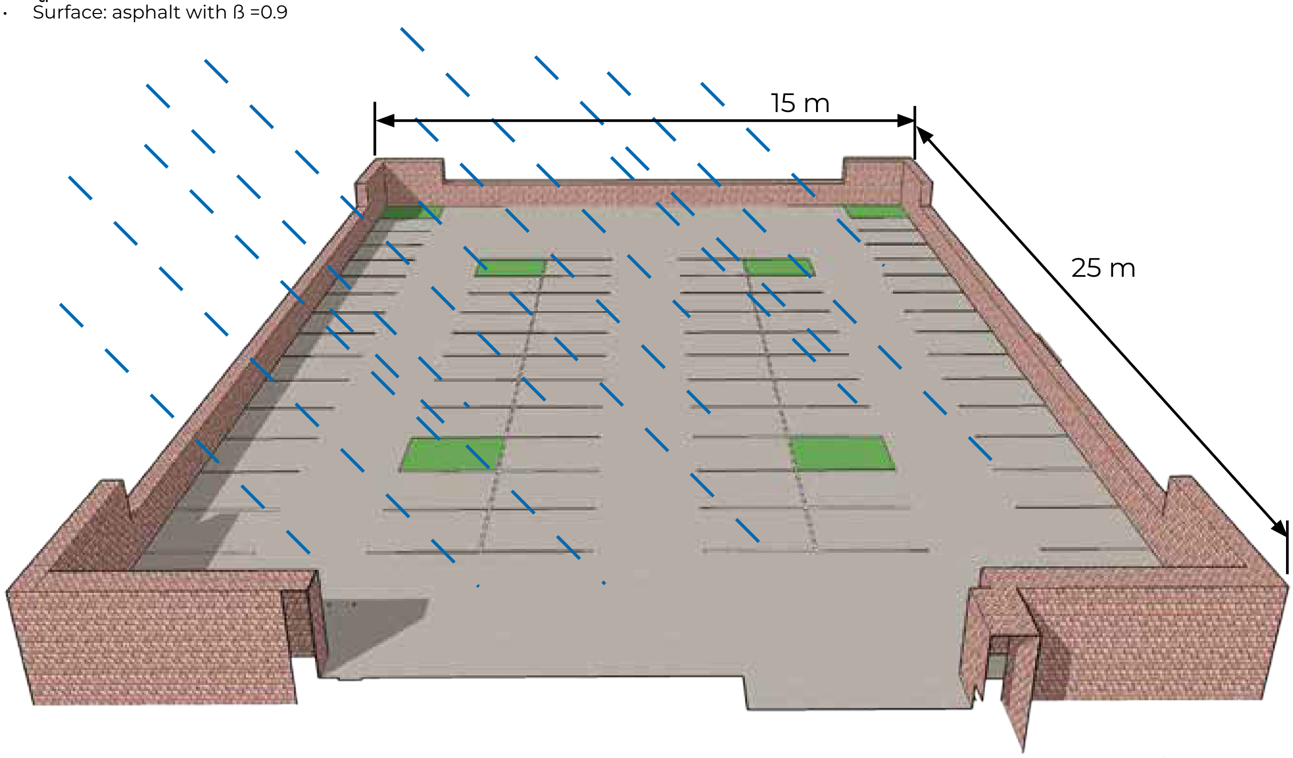
Source: Ippolito, 1960

Geographic Area	I_{cr}
North	100
Centre	80
South	60

*We accept no responsibility for any damage suffered or caused to third parties arising from the use of these data.

EXAMPLE

Imput data
- **A:** Surface of 15 x 25 (375 m²)
- **I_{cr}:** Hypothetical average rainfall (for North Italy) of 100 mm/h
- Surface: asphalt with ß =0.9



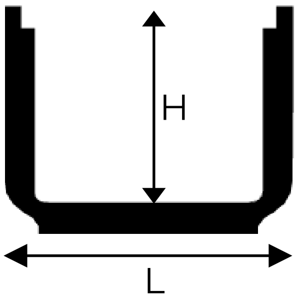
I_{cr} = 100
A = 375 m²
ß = 0.90

$$V = \frac{(0,9 \cdot 100 \cdot 375)}{3.600} = 9,36 \text{ l/sec}$$

9,36 are the water liter to evacuate every second from the example surface

CALCULUS OF THE FLOW RATES ACCORDING TO THE CHEZY FORMULA

The draining capacity for the above table were calculated according to the formula Chézy here below.



Ω = Channel Water Passage Section = H · L

$\Pi_{theorical}$ = Perimeter Theorical Moistened Max = L + 2H

$\Pi_{measured}$ = Perimeter Measured Moistened Max

R_i = Radius Plumber = Ω / $\Pi_{measured}$

i_f = Channel Slope

X = Friction Coefficient

V = Water Speed

$V = X \sqrt{(R_i \cdot i_f)}$

γ = Bazin Coefficient

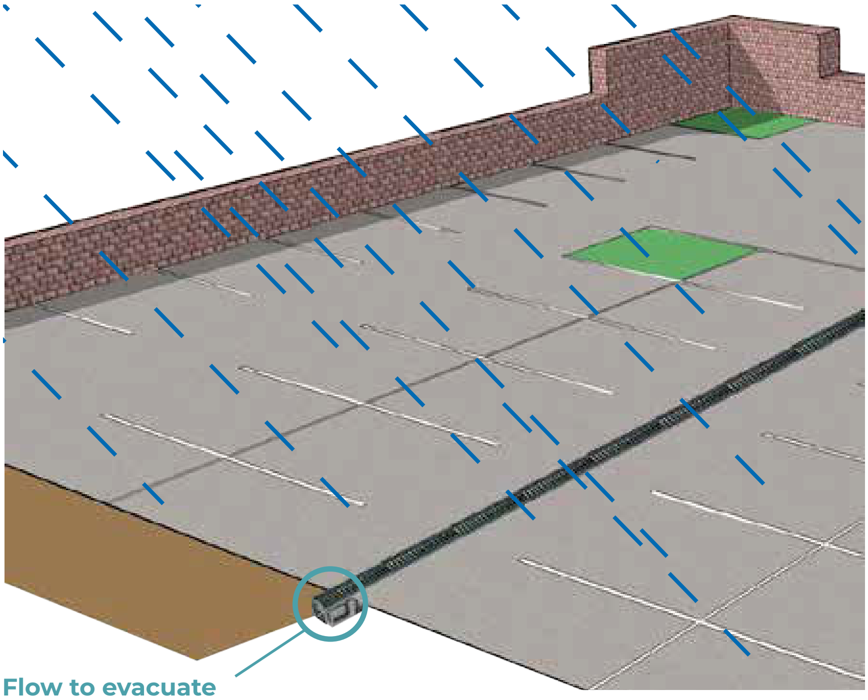
$X = 87 / (1 + (\gamma / \sqrt{(R_i)}))$

Q = Scope = V · Ω

Once you know the water volume to drain you can choose the most appropriate channel, whereas the slope may be prepared during the phase of installation.

	CHANNEL	Water Passage H mm	Water Passage L mm	Water Passage Ω mm	Water Passage $\Pi_{theor.}$ mm	Water Passage $\Pi_{meas.}$ mm	Water Passage R_i	Friction Coef.	Bazin Coef.	Slope % 0,50 % (Scope Litres/second)	Slope % 1,00 % (Scope Litres/second)	Slope % 1,50 % (Scope Litres/second)	Slope % 2,00 % (Scope Litres/second)	Slope % 3,00 % (Scope Litres/second)
VELA	121 x 84	67	90	5.965	223	205	29	64,36	0,06	4,63	6,55	8,02	9,26	11,34

LINEAR DRAINAGE



Flow to evacuate 9,36 l/s*

CAPACITIES TABLE FOR THE PVC CIRCULAR TUBE

The following table shows the flow for the PVC round pipe, with different diameters, depending on the installation slope.

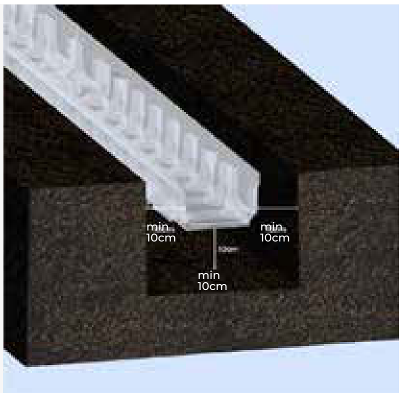
DIAMETER PVC TUBE (mm)	Slope %						
	0,50 %	1,00 %	1,50 %	2,00 %	3,00 %	5,00 %	10,00 %
	Scope Litres/second						
40	0,28	0,40	1,55	0,57	0,69	0,91	1,28
50	0,59	0,84	1,03	1,19	1,47	1,89	2,67
63	1,19	1,70	2,09	2,41	2,95	3,81	5,30
75	2,01	2,72	3,49	4,03	4,95	6,38	9,02
80	2,41	3,43	4,20	4,85	5,94	7,67	10,83
100	4,66	6,59	8,07	9,31	11,40	14,73	20,83
110	6,15	9,63	10,58	11,82	15,47	19,68	28,42
125	8,39	11,87	14,54	16,79	20,55	26,55	37,55
140	11,16	15,79	19,34	22,33	27,36	35,31	49,94
160	15,74	22,27	27,28	31,49	38,57	49,79	70,43

INSTALLATION INSTRUCTION

DekDrain channels are type M (EN 1433) and require concrete reinforcement, thick enough to support vertical and horizontal loads.

1. EXCAVATION

The depth of the excavation depends on the type and size of the channel chosen, plus the height of the concrete layer on the bottom. At this stage, it is also necessary to consider the possible passage of vertical and/or horizontal drainage pipes, and the presence of any wells for waste collection.
The channel must be laid starting from the lowest or drain point.



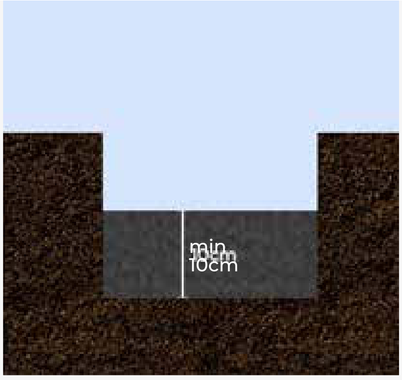
2. COCRETE BOTTOM LAYER

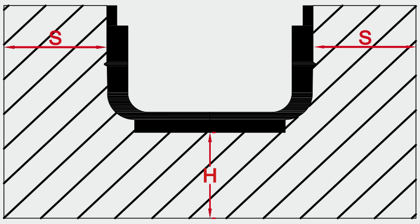
A layer of concrete must be laid on the laying surface, taking into account any slope for water drainage. The concrete that will be used for the base and lateral sides of the channel must have S4 fluidity properties, to allow the filling of all the cavities outside the channel.

The concrete bottom layer must guarantee resistance:
Rck*=25 N/mm2 for A15 class
Rck*= 30 N/mm2 for B125 class

For this reason stone aggregates with a maximum diameter of 15 mm must be used. Please note that DekDrain channels are not self-supporting, but require proper positioning and a concrete structure around them.

The height of the concrete base must be calculated based on the Flow Rate Class of the channel, according to the diagram below.





Load Class	A15	B125	C250	D400	E600	F900
Minimum Height H (mm)	100	100	150	200	200	250
Minimum Thickness S (mm)	100	100	150	200	200	250
Minimal Compression Resistance R_{ck} (N/mm^2)	25	30	30	30	35	37

3. CHANNEL INSTALLATION

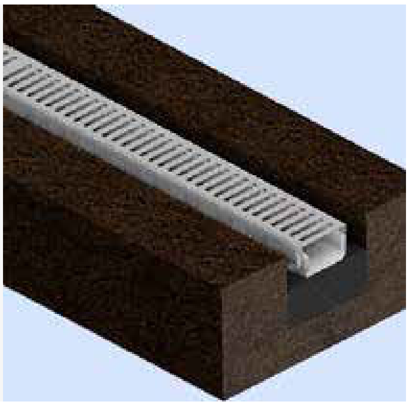
Always install the channels starting from the water discharge point (downstream), connecting the outlet to the sewer system or, if present, to the oil separator for the treatment of the rain.

4. CHANNEL CONNECTION AND INSTALLATION

The channels must be installed from downstream to upstream, then the upstream channel will be cut to obtain the desired length. For the best water tightness, it is also possible to use a bitumen-based sealant when connecting one channel to another.

5. INSTALLATION OF THE GRATINGS

Once the connection and installation of the channels have been completed, proceed to install the grids on the channels.

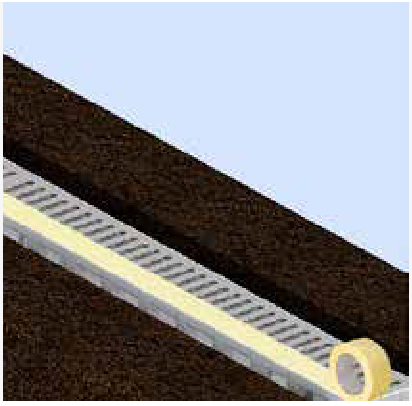


6. END-CAPS AND OUTLET

On the upstream channel, insert the end-cap (sealing it with the same product used previously) and prepare the connection with the outlet.

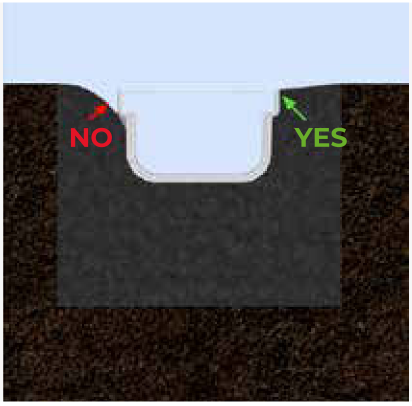
7. PROTECTION OF THE GRATING

It is essential to protect the grids already laid with a film or paper tape to avoid damage or scratches after the concrete itself has been poured.



8. CONCRETE FILLING

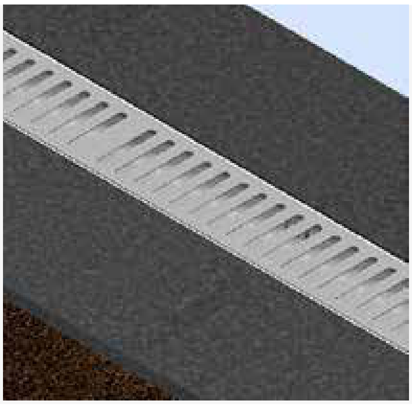
Fill the trench with concrete, taking care to fill all the spaces.
Use a finer-grained cement so that each groove is properly filled.
Make sure that the level of the grating is at least 2mm lower than the level of the finished flooring.



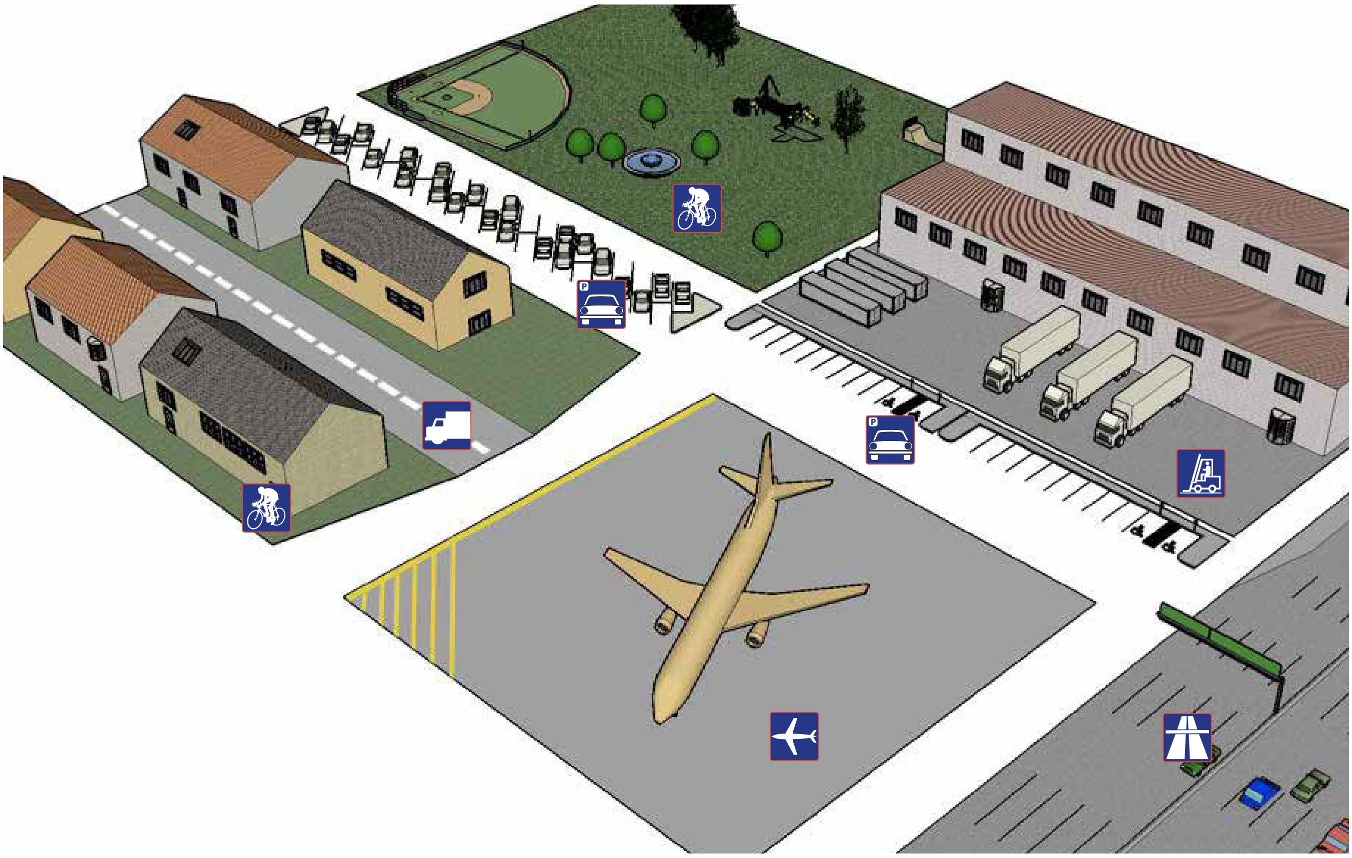
9. FINISHING

When laying the final covering, make sure that the final flooring is at least 2 mm higher than the upper edge of the channel or the upper surface of the grating.
Then remove the protective film and attach the grids to the channel.
Wait at least 3 days before pedestrian transit or for the removal of the grids and 5 days for vehicular transit.

If asphalt is used, be sure to use it cold.



TECHNICAL SITUATIONS WHERE A DRAINAGE CHANNEL IS REQUIRED



The drainage channels are certified according to European legislation UNI EN 1433 which provides for a division in the following classes of load:

Class A15 = 15 kN load test

Group 1: Areas that can be used only by pedestrians and cyclists.

Class B125 = 125 kN load test

Group 2: Pedestrian paths, pedestrian areas and comparable areas, parking for private cars or multilevel car parks

Class C250 = 250 kN load test

Group 3: Road curbs and areas not directly exposed to vehicle traffic or similar; elements of the curb are always comprised in Group 3.

Class D400 = 400 kN load test

Group 4: Roads with heavy traffic (including pedestrian streets), docks and parking areas for all types of road vehicles.

Class E600 = 600 kN load test

Group 5: Areas subject to extremely heavy vehicles traffic, for example roads and docks in ports.

Class F900 = 900 kN load test

Group 6: Areas subject to loads from large wheels, for example flooring airport.

INSTALLATION PICTURES











CHEMICAL RESISTANCE TABLE

legend: + resistant
0 partially resistant
- not resistant

Description	Concentrations	Temp. ° C	PP	HD-PE
Acetic acid	Technically pure, glacial	20	+	+
		40	+	+
		60	0	0
Acetic aldehyde	Technically pure	20	+	0
Acetic anhydride	Technically pure	20	+	+
Acetone	Technically pure	20	+	+
Ammonia	Technically pure	20	+	+
		40	+	+
		60	+	+
Ammonium fluoride	50% aqueous	20	+	+
Ammonium hydroxide	Aqueous, saturated cold	20	+	+
Ammonium nitrate	10% aqueous	20	+	+
Ammonium sulphate	10% aqueous	20	+	+
Ammonium vinegar	All, aqueous	20	+	+
		40	+	+
		60	+	+
Aniline	Technically pure	20	0	0
Antifreeze, liquid	Technically pure	20	+	+
Aqua regia	Normal Concentration	20	-	-
Aqueous boric acid	All, aqueous	20	+	+
		40	+	+
Aqueous phosphoric acid	50% aqueous	20	+	+
	85% aqueous	20	+	+
		40	+	+
		60	0	+
Assalic acid	Aqueous, saturated cold	20	+	+
Barace	All, aqueous	20	+	+
Benzyl alcohol	Technically pure	20	+	+
Butane, gas	Technically pure	20	+	+
Butiadene	Technically pure	20	+	+
Butyl acetate	Technically pure	20	+	0
Calcium hypochlorite	Aqueous	20	+	+
Chloric acid	10%, aqueous	20	+	-
Chloric acid	20%, aqueous	20	0	-
Chlorine	Wet, 97% gaseous	20	-	-
Chlorobenzene	Technically pure	20	0	+
Chloroform	Technically pure	20	-	0
Chromic acid	Until 50% aqueous	20	0	0
		40	-	-
Chromic alum	Aqueous, saturated cold	20	+	+
Cicloesana	Technically pure	20	+	+
Cicloesanola	Technically pure	20	+	+
Citric acid	10%, aqueous	20	+	+
		40	+	+
		60	+	+

Description	Concentrations	Temp. ° C	PP	HD-PE
Cyclohexanone	Technically pure	20	+	+
Dichloroethylene	Technically pure	20	-	-
Dimethylamine	Technically pure	20	+	+
Dioxane	Technically pure	20	+	0
Dry fluorine	Technically pure	20	-	-
Elano	Technically pure	20	+	+
Ethyl acetate	Technically pure	20	+	+
		40	0	0
Ethyl alcohol	96% Technically pure	20	+	+
		40	+	+
		60	+	+
Ethyl ether	Technically pure	20	0	+
Ethylbenzene	Technically pure	20	0	0
Ethylene chloride	Technically pure	20	0	0
Ethylene oxide	Technically pure	20	-	-
Ethylenediamine	Technically pure	20	+	+
Fluorosilicic acid	32% aqueous	20	+	+
Formaldehyde	40% aqueous	20	+	+
Formic acid	Until 50%	20	+	+
		40	+	0
		60	+	0
Glycerine	Technically pure	20	+	+
Glycolic acid	37% aqueous	20	+	+
Hydrobromic acid	50%, aqueous	20	+	+
Hydrochloric acid	10%, aqueous	20	+	+
		40	+	+
		60	+	0
	Until 30% aqueous	20	+	+
		40	+	0
		60	+	0
	36% aqueous	20	+	+
		40	+	0
		60	+	-
	50% aqueous	20	+	+
Hydrofluoric acid	70% aqueous	20	+	+
Hydrogen	Technically pure	20	+	+
Hydrogen peroxide	30% aqueous	20	+	+
		40	+	+
		60	+	0
	90% aqueous	20	+	-
Hydrogen sulfide	Technically pure	20	+	+
Iodine (tincture)		20	+	+
Isooltano	Technically pure	20	+	+
Lactic acid	10% aqueous	20	+	+
Lactic acid	10% aqueous	40	+	+
Lead tetraethyl	Technically pure	20	+	+
Liquid bromine	Technically pure	20	-	-

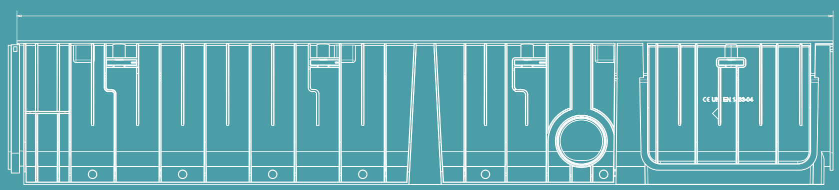
legend: + resistant
0 partially resistant
- not resistant

Description	Concentrations	Temp. ° C	PP	HD-PE
Lubricating oils		20	+	0
Maleic acid	Aqueous, saturated cold	20	+	+
Mercury	Pure	20	+	+
Methane	Technically pure	20	+	+
Methyl alcohol	All, aqueous	20	+	+
Methyl chloride	Technically pure	20	0	-
Metiletichetone	Technically pure	20	+	+
Naphtha		20	0	0
Naphtha		40	-	-
Naphthalene	Technically pure	20	+	+
Nitric acid	40% aqueous	20	0	0
		40	0	0
		60	-	-
	65% aqueous	20	0	0
		40	-	-
		20	-	-
Nitrotoluene	Technically pure	20	+	+
Octylphtalate	Technically pure	20	0	+
Oil		20	+	0
Oleum	10% of SO_3	20	-	-
Olive oil		20	+	+
Oxygen	Technically pure	20	+	+
Oxygen	Technically pure	60	0	0
Ozone	In the air until 2%	20	0	0
Paraffin oil		20	+	+
Perchlorethylene	Technically pure	20	0	0
Perchloric acid	10% aqueous	20	+	+
		40	+	+
		60	+	+
	70% aqueous	20	+	0
		40	0	-
Petrol	Traces of lead and aromatic compounds	20	+	0
		40	+	0
		60	0	-
Petroleum	Technically pure	20	+	+
		40	+	0
		60	0	0
Phenol	Until 10% aqueous	20	+	+
Phosgene	Technically pure, liquid	20	0	0
Phthalic acid	Saturated, aqueous	20	+	+
		40	+	+
Potassium bichromate	Satured, aqueous	20	+	+
Potassium permanganate	Aqueous, saturated cold	20	+	+
Propane	Technically pure, liquid	20	+	+
Silicone oil		20	+	+

Description	Concentrations	Temp. ° C	PP	HD-PE
Sodium hydroxide	50% aqueous	20	+	+
		40	+	+
		60	+	+
Sodium hypochlorite	12,5% of active chlorine, aqueous	20	0	0
Sodium iodide	Aqueous	20	+	+
Sodium nitrate	Aqueous, saturated cold	20	+	+
Sodium oxalate	Aqueous, saturated cold	20	+	+
Sodium phosphate	Aqueous, saturated cold	20	+	+
Sodium silicate	All, aqueous	20	+	+
Stearic acid	Technically pure	20	+	+
Sulfur	Technically pure	20	+	+
Sulfuric acid	Until 40% aqueous	20	+	+
		40	+	+
		60	+	+
	Until 60% aqueous	20	+	+
		40	+	+
		60	+	+
	Until 80% aqueous	20	+	+
		40	+	+
		60	0	0
	90% aqueous	20	0	0
		40	0	0
	96% aqueous	20	-	-
		40	-	-
		60	-	-
Sulfuric anhydride		20	-	-
Sulphurous acid	Saturated, aqueous	20	+	+
Tartaric acid	All, aqueous	20	+	+
Tetrachlorine	Technically pure	20	0	0
Tetrahydrofuran	Technically pure	20	0	-
Toluene	Technically pure	20	0	0
Trichlorethylene	Technically pure	20	-	-
Trichloroacetic acid		20	+	+
Trichloroethane	Technically pure	20	0	0
Trietoloammina	Technically pure	20	+	+
Urea	Until 30% aqueous	20	+	+
Vaseline	Technically pure	20	0	+
Vinyl acetate	Technically pure	20	0	+
Wine vinegar)	Normal Concentration	20	+	+
Xylene	Technically pure	20	-	-

The substances related below have no influence on the HD-PE at PP a temperature from 20° to 60°.
For other substances and/or temperatures and concentrations consult our technical office.

www.deks.co.uk



SINCE 1947

DEKS

DRAINAGE

BY DESIGN