

Drainage calculation

Abwasser Hydraulikreport



Project cover sheet

Project and real property

Project number	1
Project name	Demoprojekt
Creation date	
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Country	Deutschland

Designer

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Versions

Date	
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Basis of the report

The hydraulic report was created from the following drawing: 'Abwasser Hydraulikreport'

Standards used

The pipe diameters and the dimensioning of the installed equipment were determined on the basis of the following regulations:

DIN 1986-100

Drainage systems for buildings and land - Part 100:
Provisions in conjunction with DIN EN 752 and DIN EN 12056

DIN EN 12056-2

Gravity drainage systems inside buildings Part 2:
Wastewater systems, planning and calculation

DIN EN 12056-3

Gravity drainage systems inside buildings Part 3:
Roof drainage, planning and dimensioning

DIN EN 12056-4

Gravity drainage systems inside buildings Part 4:
Wastewater lifting stations - planning and dimensioning

Calculation options

The following design parameters were used within the permissible limits of the aforementioned regulations.

Operational pipe roughness:

- Gravity drainage: 1.0 mm.
- Pressurised drainage: 0.1 mm

Section type	Flow velocity m/s	Gradient cm/m	Filling level %
SW			
Connection duct	0.7	1.0	70.0
Basic pipework	0.5	1.0	50.0
Collective pipework	0.5	1.0	50.0
Collective connection pipe, unventilated	0.5	1.0	50.0
Collective connection pipe, ventilated	0.5	1.0	50.0
Single connection pipe	0.5	1.0	50.0

Preset pipes / insulation

Section type	Pipe sequence	ϑ_L °C	Insulation	λ_D W/(m*K)	s_D mm
SW					
Connection duct	Geberit - PE	20.0	Uninsulated		
Basic pipework	Geberit - PE	20.0	Uninsulated		
Collective pipework	Geberit - Silent-db20	20.0	Uninsulated		
Downpipe	Geberit - Silent-db20	20.0	Uninsulated		
Collective connection pipe	Geberit - Silent-PP	20.0	Uninsulated		
Single connection pipe	Geberit - Silent-PP	20.0	Uninsulated		
Pressure pipe	Geberit - Mepla - PE	20.0	Uninsulated		
Downpipe delay	Geberit - Silent-db20	20.0	Uninsulated		
LT					
Main ventilation	Geberit - Silent-db20	20.0	Uninsulated		
Collective main ventilation	Geberit - Silent-db20	20.0	Uninsulated		
Ventilation valve	Geberit - Silent-db20	20.0	Uninsulated		
Direct secondary ventilation	Geberit - Silent-db20	20.0	Uninsulated		
Indirect secondary ventilation	Geberit - Silent-db20	20.0	Uninsulated		
Bypass ventilation	Geberit - Silent-db20	20.0	Uninsulated		
Air circulation	Geberit - Silent-db20	20.0	Uninsulated		

Pipe series used

DN	d_a mm	d_i mm	s_R mm	k mm	Delivery length m
PE					
150	160.0	147.6	6.20	1.00	5.00
Silent-db20					
125	135.0	123.0	6.00	1.00	3.00
100	110.0	98.0	6.00	1.00	3.00
Silent-PP					
100	110.0	102.8	3.60	1.00	3.00
70	75.0	69.8	2.60	1.00	3.00
50	50.0	46.0	2.00	1.00	3.00
90	90.0	83.8	3.10	1.00	3.00
Silent-db20					
70	75.0	67.8	3.60	1.00	3.00
90	90.0	79.0	5.50	1.00	3.00

DN	d _a mm	d _i mm	s _R mm	k mm	Delivery length m
PE					
56	56.0	50.0	3.00	1.00	5.00
50	50.0	44.0	3.00	1.00	5.00
Silent-db20					
56	56.0	49.6	3.20	1.00	3.00

Calculation of total waste water discharge AS 1

Quantity	Designation	Connected load	Total connected loads	Waste water drainage	Percentage share taken into account
Pcs		DU l/s	ΣDU l/s	Q _{ww} l/s	%
20	GE CleanFloor30 Duschfläche 90 x 90 cm integriert, mit Dichtvlies, weiss matt	0.80	16.00		
20	GE Renova Wand-WC Tiefspüler weiß	2.00	40.00		
20	GE Renova Waschtisch, 65x50cm m. Hl. mittig, m. Ül., weiß	0.50	10.00		
4	Kitchen sink and dishwasher with common odour trap	0.80	3.20		
0.50 - Irregular use			69.20	4.16	100
Q_{ww}	Waste water discharge			4.16	
Q_r	Rainwater drainage			0.00	
Q_c	Permanent drainage			0.00	
Q_p	Pump flow rate			3.12	
Q_{tot}	Q_{ww} + Q_r + Q_c + Q_p			7.28	

Drainage areas

Overview of drainage areas

Designation	Surface area A_n m^2	Discharge coefficient C_s	red. Surface area A_{red} m^2
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1. Water-impermeable surfaces

ΣA_{n1}	0		0
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2. Partially permeable and slightly draining surfaces

ΣA_{n2}	0		0
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3. Parks, lawns and gardens

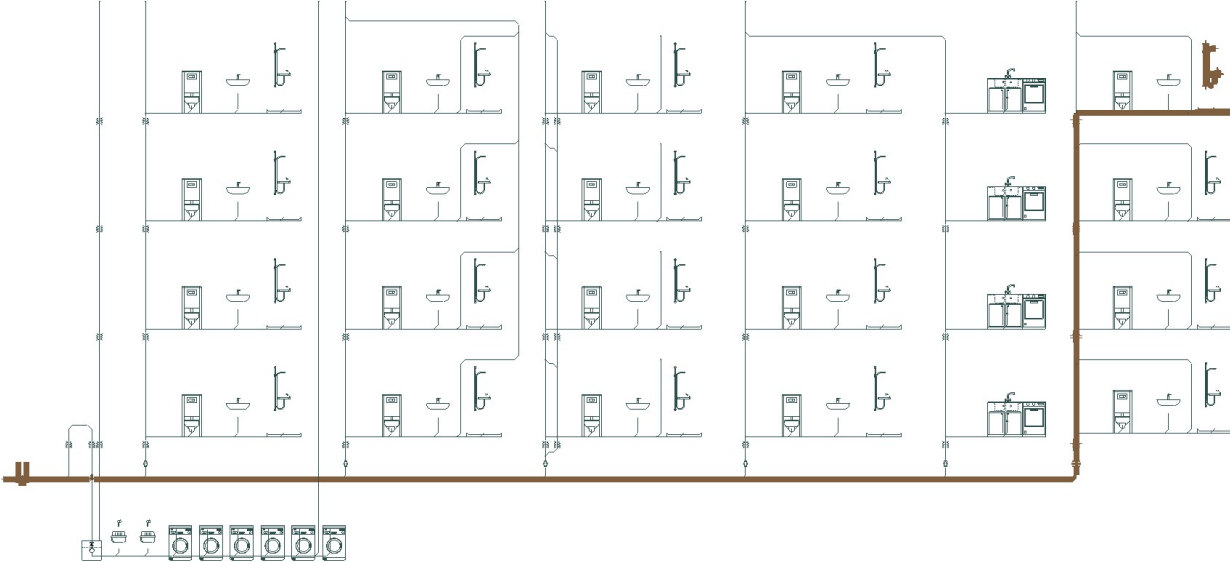
ΣA_{n3}	0		0
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Result area calculation

$A_{ges} = \Sigma A_{n1} + \Sigma A_{n2} + \Sigma A_{n3}$	0		
$A_{red} = \Sigma A_{red1} + \Sigma A_{red2} + \Sigma A_{red3}$			0
ΣA_{Dach}	0		
ΣA_{FaG}	0		
$GRZ = A_{Dach}/A_{ges}$ in %			

Flow paths for waste water

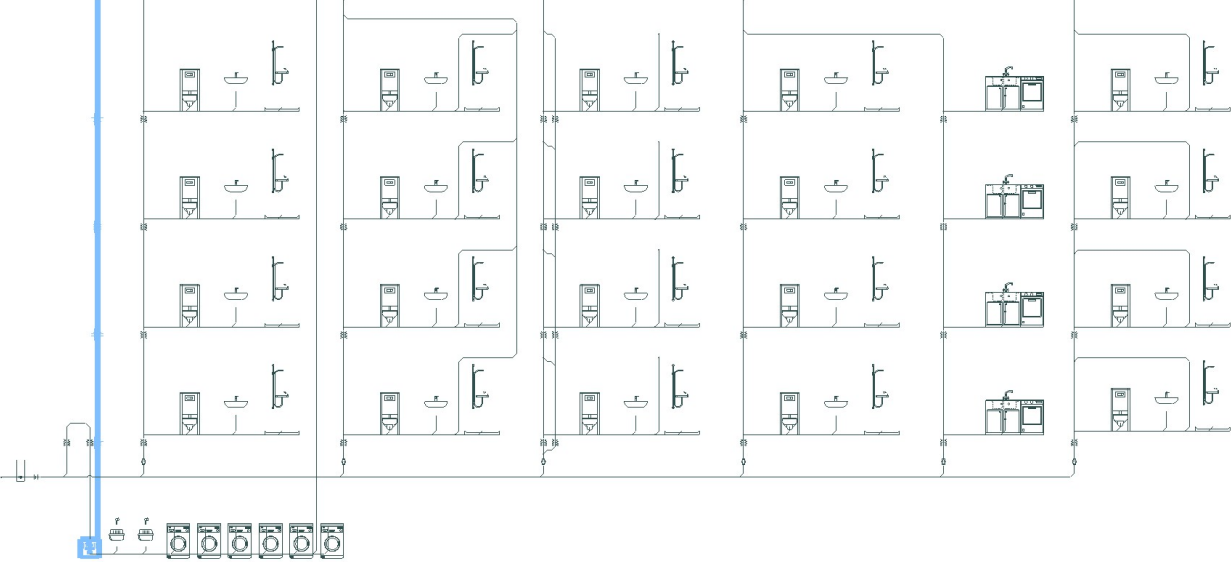
Flow path data sheet Fl.-No. 1

Starting point ENT 48					Location				
GE CleanFloor30 Duschfläche 90 x 90 cm integriert, mit Dichtvlies, weiss matt Connected load (DU): 0.80 l/s									
									
TS no.	l	ΣDU	Q _{tot}	DN	Pipe type	v	h/d _i	l*J	J
-	m	l/s	l/s	-	-	m/s	-	cm	cm/m
22	0.74	0.80	0.80	50	Silent-PP			0.74	1.00
21	0.60	0.80	0.80	70	Silent-PP	0.51	0.43	0.60	1.00
20	1.20	1.30	0.80	70	Silent-PP	0.51	0.43	1.20	1.00
19	1.10	3.30	2.00	100	Silent-PP	0.65	0.40	1.10	1.00
18	0.90	3.30	2.00	100	Silent-PP				
17	1.90	3.30	2.00	100	Silent-PP				
16	0.90	6.60	2.00	100	Silent-PP				
15	1.90	6.60	2.00	100	Silent-PP				
14	0.90	9.90	2.00	100	Silent-PP				
13	1.80	9.90	2.00	100	Silent-PP				
12	0.90	13.20	2.00	100	Silent-PP				
11	0.34	13.20	2.00	100	Silent-PP				
10	3.40	13.20	2.00	100	Silent-PP	0.65	0.40	3.40	1.00
9	5.20	16.40	2.02	100	Silent-db20	0.65	0.43	5.20	1.00
8	5.20	29.60	2.72	125	Silent-db20	0.70	0.36	5.20	1.00
7	5.20	42.80	3.27	125	Silent-db20	0.74	0.40	5.20	1.00
6	5.20	56.00	3.74	125	Silent-db20	0.76	0.43	5.20	1.00
5	2.00	69.20	4.16	125	Silent-db20	0.78	0.46	2.00	1.00
4	1.00	69.20	7.28	125	Silent-db20	0.90	0.65	1.00	1.00
3	0.40	69.20	7.28	150	PE	0.90	0.48	0.40	1.00
2	0.40	69.20	7.28	150	PE	0.90	0.48	0.40	1.00

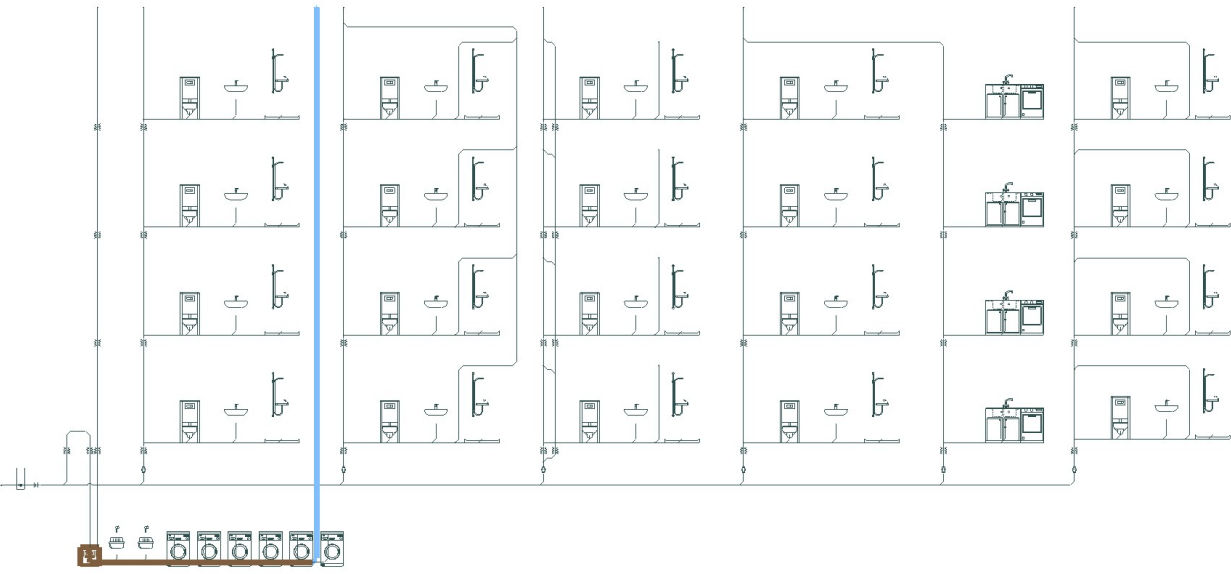
TS no.	l	ΣDU	Q_{tot}	DN	Pipe type	v	h/d_i	l^*J	J
-	m	l/s	l/s	-	-	m/s	-	cm	cm/m
1	0.00	69.20	7.28	150	PE	0.90	0.48	0.00	1.00

Ventilation pipework flow paths

Flow path data sheet Flow path no. 95

Location									
									
TS no.	l	ΣDU	Q_{tot}	DN	Pipe type	v	h/d_i	$l \cdot J$	J
-	m	l/s	l/s	-	-	m/s	-	cm	cm/m
215	14.45	0.00	0.00	70	Silent-db20				

Flow path data sheet Flow path no. 96

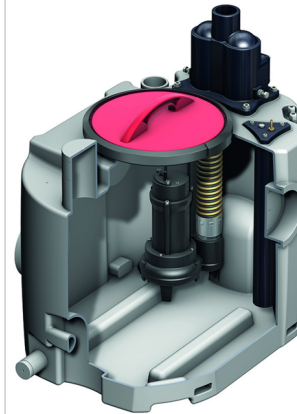
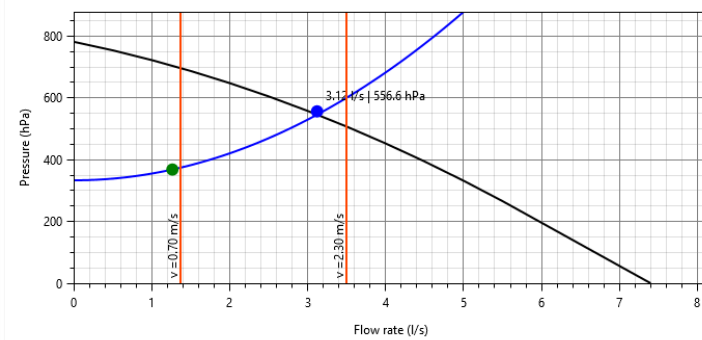
										Location
										
TS no.	I	Σ DU	Q_{tot}	DN	Pipe type	v	h/d_i	I^*J	J	
-	m	l/s	l/s	-	-	m/s	-	cm	cm/m	
149	0.60	6.40	1.26	90	Silent-PP	0.58	0.42	0.60	1.00	
150	0.76	5.60	1.18	90	Silent-PP	0.57	0.40	0.76	1.00	
151	0.74	4.80	1.10	90	Silent-PP	0.56	0.39	0.74	1.00	
152	0.80	4.00	1.00	70	Silent-PP	0.55	0.48	0.80	1.00	
153	0.80	3.20	0.89	70	Silent-PP	0.53	0.45	0.80	1.00	
154	0.80	2.40	0.80	70	Silent-PP	0.51	0.43	0.80	1.00	
155	0.80	1.60	0.80	70	Silent-PP	0.51	0.43	0.80	1.00	
156	0.50	0.80	0.80	70	Silent-PP	0.51	0.43	0.50	1.00	
216	14.44	0.00	0.00	56	Silent-db20					

Lifting systems

Lifting system design AHA 1

Characteristic diagram

LP Multi-Mini MDP1.1 400V/50Hz



Operating point

Flow rate	Q_p	11.23	m ³ /h
Delivery head	H_p	5.68	m
Flow velocity	v	2.05	m/s
Reynolds number	Re	89,409	

Total wastewater discharge

Quantity	Designation	DU	ΣDU
6	Odour trap for washing machines up to 8 kg	0.80	4.80
2	Geberit Publica cleaner sink for hinged grating: 45x35x33.5cm,	0.80	1.60
Total DU's		ΣDU	6.40
$\sqrt{\Sigma DU}$			2.53
Discharge coefficient	K	0.50	-
Waste water generation	Q_{ww}	1.26	l/s
Rainwater accumulation	Q_{ra}	0.00	l/s
Total wastewater discharge		Q_{tot}	1.26

Geodetic height	H_{geo}	3.40	m
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Pressure pipe

Geberit HDPE pipe: d=50mm

Nominal diameter	DN	50	-
Inner diameter	D_i	44.0	mm
Volume	V	1.52	l/m
Operat. Roughness	k	0.25	mm
Length	l	5.3	m
Contents	V	8.93	l

Quantity	Designation	Zeta	$\Sigma\zeta$
5	Geberit HDPE bend: 45°, d=50mm	0.30	1.50
1	Geberit HDPE bend: 45°, d=50mm	0.30	0.30
4	Geberit electrofusion coupling: d=50mm	0.30	1.20
1	Geberit HDPE branch fitting 45°: d=125mm, d1=75mm	0.60	0.60