

Gravity drainage systems inside buildings —

Part 4: Wastewater lifting plants — Layout and calculation

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 19 and a back cover.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165 "Waste water engineering", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2000, and conflicting national standards shall be withdrawn at the latest by June 2001.

This part is the fourth in a series relating to the functional requirements of gravity drainage systems inside buildings. There will be five parts, as follows: Gravity drainage systems inside buildings:

- Part 1: General and performance requirements
- Part 2: Sanitary pipework - Layout and calculation
- Part 3: Roof drainage - Layout and calculation
- Part 4: Wastewater lifting plants - Layout and calculation
- Part 5: Installation and testing, instructions for operation, maintenance and use

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part gives layout, operation and maintenance requirements for lifting plants for wastewater containing faecal matter, faecal-free wastewater and rainwater within buildings and sites, together with their discharge pipework and connection to drain. It also covers faecal wastewater lifting plants for limited applications.

2 Normative references

This standard incorporates by dated or undated reference provision from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions to any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1085
Wastewater treatment - Vocabulary

prEN 12050-1
Wastewater lifting plants for buildings and sites - Principles of construction and testing - Part 1: Lifting plants for wastewater containing faecal matter

prEN 12050-2
Wastewater lifting plants for buildings and sites - Principles of construction and testing - Part 2: Lifting plants for faecal-free wastewater

prEN 12050-3
Wastewater lifting plants for buildings and sites - Principles of construction and testing - Part 3: Lifting plants for wastewater containing faecal matter for limited applications

prEN 12050-4
Wastewater lifting plants for buildings and sites - Principles of construction and testing - Part 4: Non-return valves for faecal-free wastewater and wastewater containing faecal matter

EN 12056-1
Gravity drainage systems inside buildings - Part 1: General and performance requirements

EN 12056-2
Gravity drainage systems inside buildings - Part 2: Sanitary pipework - Layout and calculation

EN 12056-3
Gravity drainage systems inside buildings - Part 3: Roof drainage - Layout and calculation

EN 12056-5
Gravity drainage systems inside buildings - Part 5: Installation and testing, instructions for operation, maintenance and use

3 Definitions, symbols, units and designation

For the purposes of this standard, EN 1085 and the following definitions and symbols apply:

3.1 Definitions

3.1.1 wastewater lifting plant

device for the collection and automatic lifting of wastewater, which may or may not contain faecal matter, to a height above flood level

3.1.2 backflow

flow of wastewater from a drain or sewer against the direction of flow back into the connected pipework

3.1.3 flood level

the maximum level to which waste water can rise within a drainage system

3.1.4 backflow loop

part of the pressurized pipework from a wastewater lifting plant above flood level (see Figures 1 and 2)

3.1.5 duty flow, $\dot{V}_p$

flow discharged by the pumping device of the wastewater lifting plant against the total head at the duty point (see Figure 6)

3.1.6 discharge head, H_p

pressure produced by the pumping device of a wastewater lifting plant at the duty point to overcome the static height difference plus the total losses in the discharge pipework (see Figure 6)

3.1.7 collection tank for wastewater containing faecal matter

unpressurized part of a wastewater lifting plant in which the incoming wastewater is stored prior to lifting

3.1.8 useful volume

volume in the collection tank between switch-on level and switch-off level that can be lifted

3.2 Symbols

Table 1 — Symbols

Symbol	Unit	Definition
d_i	mm	Inside diameter
DN	mm	Nominal size
g	m/s^2	Gravitational constant (= 9,81 m/s^2)
H_{geo}	m	Static head
H_p	m	Discharge head of pumping device at duty point
H_{tot}	m	Total head
H_v	m	Head loss
$H_{v,A}$	m	Loss in valves and fittings
$H_{v,j}$	—	Dimensionless head loss as a function of pipe length
$H_{v,R}$	m	Friction loss in discharge pipework
L	m	Pipeline length
P_v	bar (N/m^2)	Pressure loss
Q_i ($\dot{V}$)	l/s	Wastewater inflow
Q ($\dot{V}_A$)	l/s	Flow generally
Q_p ($\dot{V}_p$)	l/s	Duty flow of pumping device
Q_R ($\dot{V}_R$)	l/s	Rainwater discharge
T	s	Minimum running time
V	l	Useful volume
v	m/s	Flow velocity
Z	—	Resistance factor

4 Protection against backflow

Even when a public drain or sewer system is designed in accordance with generally approved calculation methods and carefully maintained, it cannot, for economic reasons, be sized to be able to discharge the unusually large quantities of water which may arise during a heavy storm. Under these conditions surcharge the connecting drains and the building drainage system has to be taken into account.

A similar situation can be caused by unplanned inflows, blockages, overloading or reductions in cross-section.

In addition, failure of a pumping station can cause a sewer to surcharge. For these reasons, sanitary appliances below flood level shall be adequately protected against backflow. If no other information is available, in generally flat areas the level of the highway¹ at the point where the drain connects to the sewer may be assumed to be the flood level.

Protection against backflow may be provided by a wastewater lifting plant with a backflow loop (see Figures 1 and 2). Only a backflow loop will provide a high degree of security against backflow.

Alternatively, an anti-flooding valve may be used (see Figure 3), provided:

- there is a fall to the sewer, and;
- the rooms are of minor importance, i.e. no valuable items are present and the health of the inhabitants will not be affected in the case of flooding, and;
- the number of users is small and a WC is available above flood level, and;
- sanitary appliances do not need to be used during flooding.

¹ "highway" refers to the road, pathways, roadside shoulders, etc.