SLOVENSKI STANDARD

oSIST prEN 16932-3:2016

01-januar-2016

Sistemi za odvod odpadne vode in kanalizacijo zunaj stavb - Črpalni sistemi - 3. del: Vakuumski sistemi

Drain and sewer systems outside buildings - Pumping systems - Part 3: Vacuum systems

Entwässerungssysteme außerhalb von Gebäuden - Pumpsysteme - Teil 3: Unterdruckentwässerungssysteme

Réseaux d'évacuation et d'assainissement à l'extérieur des bâtiments - Systèmes de pompage - Partie 3 : Systèmes sous vide

Ta slovenski standard je istoveten z: prEN 16932-3

ICS:

93.030	Zunanji sistemi za odpadno vodo	External sewage systems

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EUROPEAN STANDARD

NORME EUROPÉENNE

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November 2015

ICS 93.030

Will supersede EN 1091:1996, EN 1671:1997

English Version

Drain and sewer systems outside buildings - Pumping systems - Part 3: Vacuum systems

Réseaux d'évacuation et d'assainissement à l'extérieur des bâtiments - Systèmes de pompage - Partie 3 : Systèmes sous vide

Entwässerungssysteme außerhalb von Gebäuden - Pumpsysteme - Teil 3: Unterdruckentwässerungssysteme

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 165.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 16932-3:2015) has been prepared by Technical Committee CEN/TC 165 “Wastewater engineering”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

Together with prEN 16932-1 and prEN 16932-2 this document will supersede EN 1091:1996 and EN 1671:1997.

prEN 16932, *Drain and sewer systems outside buildings — Pumping systems*, consists of the following parts:

— Part 1: General requirements;

— Part 2: Positive pressure systems;

— Part 3: Vacuum systems.

Introduction

Drain and sewer systems are part of the overall wastewater system that provides a service to the community. This can be briefly described as:

— removal of wastewater from premises for public health and hygienic reasons;

— prevention of flooding in urbanised areas;

— protection of the environment.

The overall wastewater system has four successive functions; collection, transport, treatment, discharge.

Drain and sewer systems provide for the collection and transport of wastewater.

PrEN 752:2015 provides a framework for the design, construction, rehabilitation, maintenance and operation of drain and sewer systems outside buildings. This is illustrated in the upper part of Figure 1. PrEN 752:2015 is supported by more detailed standards for the investigation, design, construction, organization and control of drain and sewer systems.

This standard is one of a number of standards which support the general principles set out in prEN 752:2015. The relationship between these standards is illustrated in Figure 1.

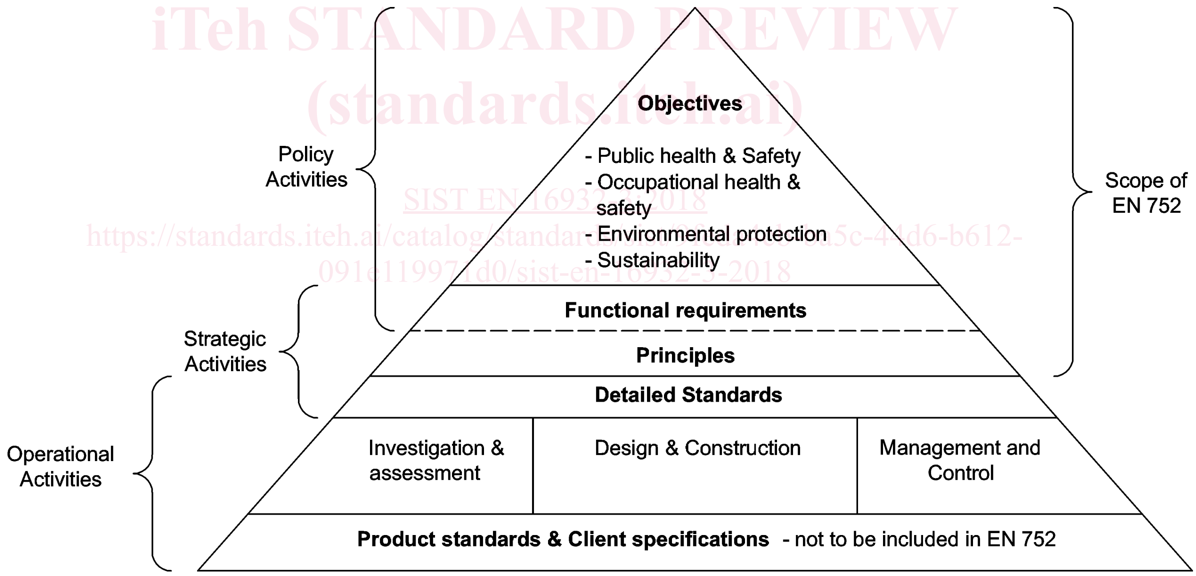


Figure 1 — Relationship to prEN 752:2015 and other drain and sewer standards

1 Scope

This European Standard specifies requirements for design, construction and acceptance testing of wastewater pumping systems in drain and sewer systems outside the buildings they are intended to serve. It includes pumping systems installations in drain and sewer systems that operate essentially under gravity as well as systems using either positive pressure or partial vacuum.

This document is applicable to vacuum drain and sewer systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16323, *Glossary of wastewater engineering terms*

prEN 16932-1:2016, *Drain and sewer systems outside buildings — Pumping systems — Part 1: General requirements*

prEN 16932-2:2015, *Drain and sewer systems outside buildings — Pumping systems — Part 2: Positive pressure systems*

prEN 16933-2:2015, *Drain and sewer systems outside buildings — Design — Part 2: Hydraulic design*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16323, in prEN 16932-1:2015 and the following apply.

NOTE 1 The following terms used in this standard are defined in EN 16323:
collection tank;
domestic wastewater;
extraneous flow;
foul wastewater;
gradient;
gravity system;
infiltration;
maintenance;
non-domestic wastewater;
pumping station;
relevant authority;
rising main;
runoff;
self-cleansing;
sewer;
sewer system;
surface water;
wastewater.

NOTE 2 The following terms used in this standard are defined in prEN 16932-1:
collection chamber;
controller;
forwarding pump;
interface valve;
level sensor;
lift section;

profile;
pump;
pump unit;
slope section;
submergible;
submersible pump;
vacuum generator;
vacuum pipeline;
vacuum drain;
vacuum sewer;
vacuum station,
vacuum vessel.

3.1
batch volume
wastewater volume in a collection tank that is removed during an evacuation cycle

3.2
interface valve unit
valve and controller in a collection chamber admitting wastewater and air into a vacuum sewer through a service connection

3.3
length specific population density
total population connected to a sewer divided by its length, and not including side branches

3.4
vacuum recovery time
time taken, after the operation of an interface valve, for the sub-atmospheric pressure at the valve to be restored to a value sufficient to operate the valve again

4 Planning vacuum sewer systems

4.1 Basis of design

Foul wastewater flow rates into the vacuum system shall be established in accordance with prEN 16933-2:2015, Clause 7. The design peak, the minimum and the 24 h average foul wastewater flow rates shall be established. Infiltration and other extraneous water flows shall also be taken into account. A typical average design flow is 150 l per person and day and a typical peak flow is 0,005 l per person and second. The designer shall state the average air and water flows for which the system is designed, the peak flow (litres per second) used in the design and how the dynamic and static head losses have been calculated.

Where a vacuum system intercepts wastewater from a gravity or pressure system or accepts wastewater from commercial or industrial sites, the design performance criteria including the peak flow shall be specified.

4.2 Location of collection chambers

The decision on whether each property has its own collection chamber or whether properties have common collection chambers should take account of:

a) the costs;

b) the ease of identifying the-origin of any debris causing a blockage;

c) the levels of the incoming drains; and

d) the available space.

Collection chambers should be located close to the properties served in order to keep the lengths of drain pipes to the chambers short. They can be located on private property (particularly where each property is served by an individual collection chamber) or on public ground (e.g. in streets or footways). However, they shall always be accessible for maintenance by the operator of the vacuum system unless an isolation valve is provided on the vacuum drain in an accessible location.

The type and costs of chambers shall be considered, e.g. whether they need to have watertight frames and covers, and whether they need to bear traffic load.

4.3 Route and profile of vacuum pipelines

The route and profile of vacuum drains and sewers should be planned taking account of the following:

a) the numbers and locations of the collection chambers (see 4.2);

b) avoiding up-hill movement of wastewater where possible;

c) minimising the length of the vacuum pipelines;

d) avoiding obstacles (e.g. ditches, watercourses, major roads, railways) where possible;

e) maintaining a minimum 1:500 downslope gradient. However, this minimum gradient should be increased where normal construction tolerances (see Clause 9) cannot be achieved, for example when using trenchless construction methods;

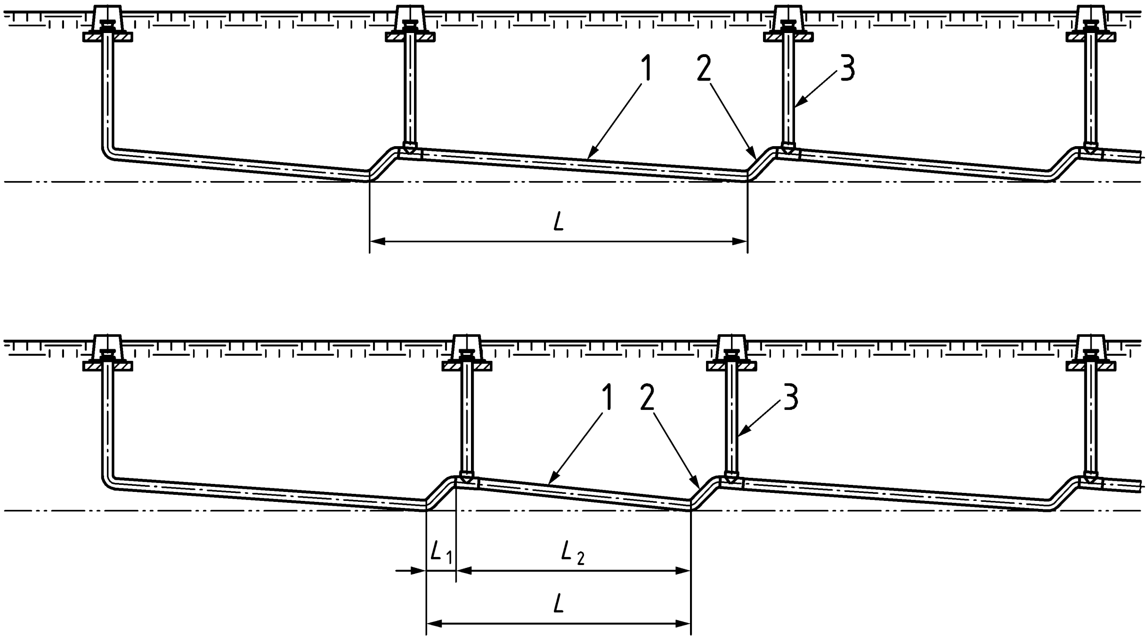
f) short radius bends ($R < 3 \times DN$) should be avoided;

g) limiting the height of each lift section to no more than 1,5 metres - a series of smaller lifts is preferable to a single high lift;

h) limiting the distance between lift sections to no less than 6 metres on vacuum sewers and 1,5 metres on vacuum drains;

i) maintaining self-cleansing conditions in the vacuum pipeline by limiting the distances between lift sections to no more than 100 metres ($DN \leq 150$) or 150 metres ($DN > 150$), also in downsloping terrain, to ensure surge flushing.

Examples of the profile of vacuum pipelines are shown in Figures 2 to 8.



Key

1 slope section with minimum 1:500 gradient

2 lift section

3 inspection pipe

H lift height (H ≥ d_i + 50 mm with d_i = internal pipe diameter)

h maximum hydrostatic head difference at the lift section (h = H − d_i)

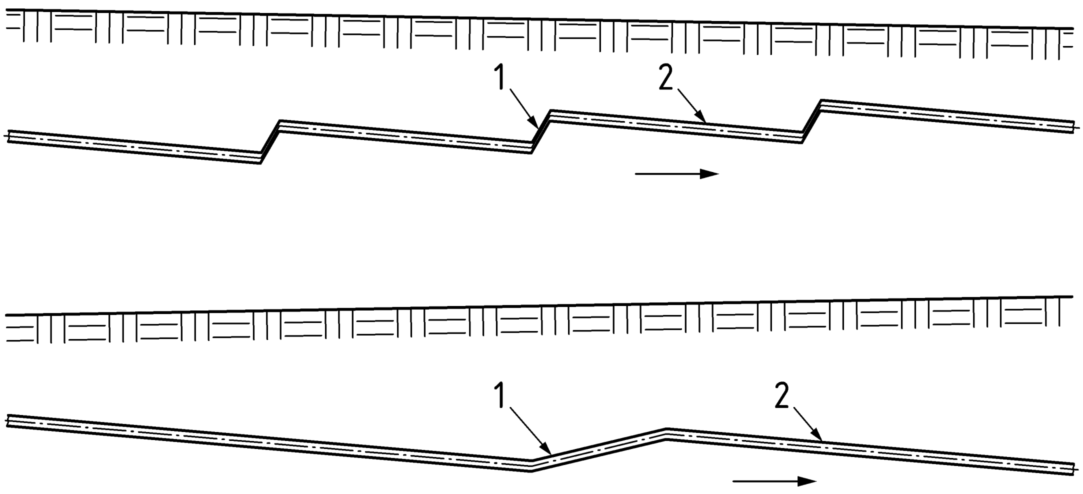
L1 length of lift section (for wave profile: L1 > 2 · $(R \cdot H)^{1/2}$ with R = minimum bending radius)

L2 length of slope section with minimum 1:500 gradient

L distance between low points (L = L1 + L2 ≤ 100 m (where DN ≤ 150) or 150 m (where DN > 150 m))

d_i internal diameter of the pipeline

Figure 2 — Vacuum sewer profiles (not to scale)

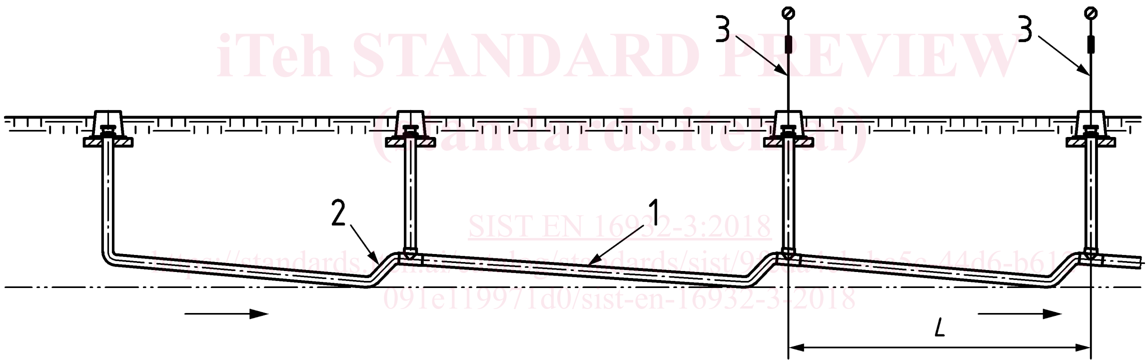


Key

1 lift section

2 slope section

Figure 3 — Examples of vacuum sewer profiles for uphill and downhill terrain (not to scale)



Key

1 slope section with minimum 1:500 gradient

2 lift section

3 inspection pipe

L distance between inspection pipes (L ≤ 100 m)

Figure 4 — Vacuum sewer with sewer inspection pipes (not to scale)