



SWEDISH  
STANDARDS  
INSTITUTE

**SVENSK STANDARD**  
**SS-EN 14801:2006**

Fastställd 2006-07-07

Utgåva 1

## **Avlopp – Tryckklassifikation för produkter i rörledningar för vatten och avlopp**

## **Conditions for pressure classification of products for water and wastewater pipelines**

ICS 93.025; 93.030

Språk: engelska

Publicerad: september 2006

Europastandarden EN 14801:2006 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 14801:2006.

The European Standard EN 14801:2006 has the status of a Swedish Standard. This document contains the official English version of EN 14801:2006.

---

Uppllysningar om **sakinnehållet** i standarden lämnas av SIS, Swedish Standards Institute, telefon 08 - 555 520 00.

Standarder kan beställas hos SIS Förlag AB som även lämnar **allmänna uppllysningar** om svensk och utländsk standard.

*Postadress:* SIS Förlag AB, 118 80 STOCKHOLM  
*Telefon:* 08 - 555 523 10. *Telefax:* 08 - 555 523 11  
*E-post:* [sis.sales@sis.se](mailto:sis.sales@sis.se). *Internet:* [www.sis.se](http://www.sis.se)

EUROPEAN STANDARD

EN 14801

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2006

ICS 93.025; 93.030

English Version

## Conditions for pressure classification of products for water and wastewater pipelines

Conditions de détermination de la classe de pression des  
produits pour réseaux d'alimentation en eau ou  
d'assainissement

Bedingungen für die Klassifizierung von Produkten für  
Rohrleitungssysteme für die Wasserversorgung und  
Abwasserentsorgung nach auftretenden Drücken

This European Standard was approved by CEN on 5 June 2006.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

**Contents**

Page

Foreword.....3

Introduction .....4

1 Scope .....5

2 Normative references .....5

3 Terms and definitions .....5

4 Symbols and abbreviations .....6

5 Conditions .....7

5.1 General.....7

5.2 Constant parameters .....7

5.2.1 General.....7

5.2.2 Design life.....7

5.2.3 Temperature .....7

5.2.4 Negative pressure.....7

5.2.5 Unit weight of soil.....7

5.2.6 Native soil.....7

5.3 Variable parameters .....8

5.3.1 General.....8

5.3.2 Loading parameters .....8

5.3.3 Installation parameters .....9

5.4 Combined conditions ..... 10

6 Determination of allowable pressures PFA, PMA, PEA..... 11

6.1 General..... 11

6.2 Allowable pressures..... 11

6.2.1 Allowable operating pressure ..... 11

6.2.2 Allowable maximum operating pressure ..... 13

6.2.3 Allowable site test pressure ..... 13

6.3 Methods for the determination of allowable pressures..... 13

6.4 Procedure for the determination of allowable pressures..... 13

Annex A (informative) Considerations regarding longitudinal effects ..... 15

A.1 Longitudinal effects..... 15

A.1.1 General..... 15

A.1.2 Failure behaviour due to longitudinal effects..... 15

A.1.3 Failure modes..... 15

A.1.4 Longitudinal effects..... 16

Annex B (normative) Uniform classification of soils..... 20

Annex C (informative) Application example ..... 23

Annex D (informative) Information on the relationship between type of compaction and construction procedures ..... 24

Annex E (informative) Information regarding bedding reaction angle ..... 25

Bibliography ..... 26

## **Foreword**

This document (EN 14801:2006) 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 January 2007, and conflicting national standards shall be withdrawn at the latest by January 2007.

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

## **EN 14801:2006 (E)**

### **Introduction**

This document is intended to be used with EN 805 and European Product Standards for water supply and waste water components containing pressure classification, to ensure that the pressure classification specified in such European Product Standards will be related to the allowable pressures (i.e. PFA, PMA, PEA) as defined in EN 805.

The conditions mentioned in this document are considered to be the basics; product standards may specify additional conditions.

## 1 Scope

This document applies to components (pipes, joints, fittings, ferrules and valves), which have pressure related classification in European Standards covering products which are intended to be used for buried water supply and waste water pressure pipelines outside buildings. It specifies combinations of loading conditions and installation conditions to be used in the design method by reference to the relevant product standard for the determination of the allowable pressures (PFA, PMA and PEA) as defined in EN 805.

This document does not apply as an installation guide.

NOTE 1 This document does not give the full range of installation and loading parameters for all components and does not specify calculation and/or test methods for determination of the allowable pressures.

NOTE 2 This document does not relieve designers of their obligation under EN 805:2000, 8.4; e.g. to consider all conditions not addressed in clause 5 (e. g. seismic loads).

NOTE 3 This document does not deal with marking of components.

## 2 Normative references

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

EN 805:2000, *Water supply — Requirements for systems and components outside buildings*

ENV 1046:2001, *Plastics piping and ducting systems - Systems outside building structures for the conveyance of water or sewage - Practices for installation above and below ground*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions regarding component related pressures in EN 805:2000 apply, and are repeated here for convenience.

### 3.1

#### **allowable operating pressure**

PFA

maximum hydrostatic pressure that a component is capable of withstanding continuously in service

[EN 805:2000]

### 3.2

#### **allowable maximum operating pressure**

PMA

maximum pressure occurring from time to time, including surge, that a component is capable of withstanding in service

[EN 805:2000]

### 3.3

#### **allowable site test pressure**

PEA

maximum hydrostatic pressure that a newly installed component is capable of withstanding for a relatively short duration, in order to ensure the integrity and tightness of the pipeline

[EN 805:2000]

**EN 14801:2006 (E)**

**4 Symbols and abbreviations**

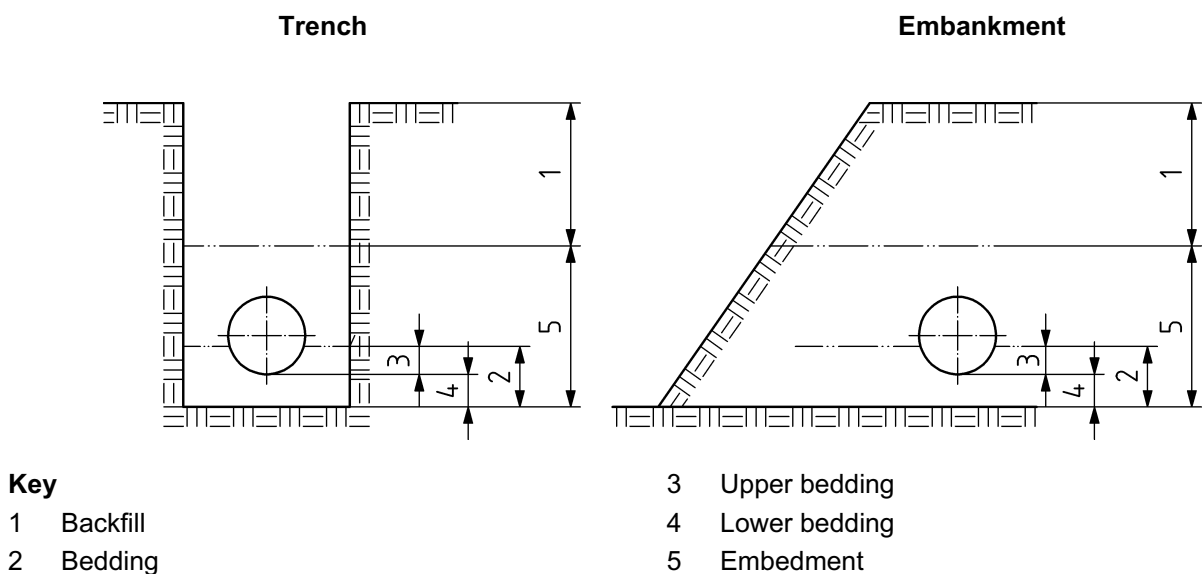
For convenience, Table 1 of EN 805:2000 is repeated here:

**Table 1 — Designations of pressures in English, French, German [EN 805:2000]**

Abbreviation <sup>a</sup>	English	French	German	related to
DP	Design pressure	Pression de calcul en régime permanent	Systembetriebsdruck	System related
MDP	Maximum design pressure	Pression maximale de calcul	Höchster Systembetriebsdruck	
STP	System test pressure	Pression d'épreuve du réseau	Systemprüfdruck	
PFA	Allowable operating pressure	Pression de fonctionnement admissible	Zulässiger Bauteilbetriebsdruck	Component related
PMA	Allowable maximum operating pressure	Pression maximale admissible	Höchster zulässiger Bauteilbetriebsdruck	
PEA	Allowable site test pressure	Pression d'épreuve admissible sur chantier	Zulässiger Bauteilprüfdruck auf der Baustelle	
OP	Operating pressure	Pression de fonctionnement	Betriebsdruck	System related
SP	Service pressure	Pression de service	Versorgungsdruck	

<sup>a</sup> Valid for all language versions

This document uses installation terms based on EN 805, these are illustrated in Figure 1.



**Figure 1 — Installation terms used in pipe laying in trenches and under embankments**



## 5 Conditions

### 5.1 General

Conditions for determination of allowable pressures (see clause 6) are differentiated in:

- constant parameters (see 5.2);
- variable parameters (see 5.3).

Fittings, ferrules and valves may have different loading parameters from the pipe to take into consideration, when determining the allowable pressures.

### 5.2 Constant parameters

#### 5.2.1 General

For the purposes of this document the parameters given in Table 2 are considered to be constant for all combined conditions (see 5.4).

#### 5.2.2 Design life

The design life of the components shall be at least 50 years, as specified in EN 805. This shall also be assumed for the determination of the allowable pressures (see clause 6). If applicable, Product Standards shall give re-rating factors or procedures for re-rating the allowable pressures of the components for other design lives.

#### 5.2.3 Temperature

The continuous operating temperature for the determination of the allowable pressures shall be assumed 20 °C. If applicable, Product Standards shall specify re-rating factors or procedures for re-rating for other temperatures.

#### 5.2.4 Negative pressure

Components shall be designed to withstand, when installed, transient pressure of 80 kPa below atmospheric (see EN 805).

#### 5.2.5 Unit weight of soil

The unit weight for native soil, embedment and backfill shall be assumed constant at 20 kN/m<sup>3</sup> for all determinations.

#### 5.2.6 Native soil

The type of native soil and its Relative Standard Proctor Density,  $D_{Pr}$ , shall be assumed constant for all determinations (see clause 6).

Table 2 — Constant parameters

Parameter	Constant
Design life	50 years
Continuous operating temperature	20 °C
Negative pressure (transient, below atmospheric)	80 kPa
Unit weight of soil (native soil, embedment, backfill)	20 kN/m <sup>3</sup>
Native soil type "Gs" <sup>a</sup>	4
Relative Standard Proctor Density of native soil ( $D_{Pr}$ ) <sup>b</sup>	100 %
<sup>a</sup> Classification of soil types, see Annex B. <sup>b</sup> If appropriate, equivalent values of Modified Proctor Density may be used.	

### 5.3 Variable parameters

#### 5.3.1 General

The variable parameters are the combination of several parameters, resulting from loading (see 5.3.2, e.g. soil loads, traffic loads, ground water loads) and installation (see 5.3.3, e.g. bedding, embedment, backfill).

For loading conditions A, B and C1, C2 (see 5.3.2 and Table 4), due to requirement of road owners/authorities, the compaction is always carried out directly against the trench wall with the sheeting, if used, being progressively withdrawn. Therefore sheeting removal does not affect the variable parameters.

For loading condition C3 (see Table 4), an embankment condition with no sheeting is specified.

#### 5.3.2 Loading parameters

The loading parameters of the loading conditions A, B and C given in Table 4 are:

- condition: trench/embankment
- compaction of backfill
- depth of cover (not less than 0,7m)
- traffic load
- width of trench
- ground water table.

In Table 4, the figures given for the loading parameters, derived from traffic loads, are differentiated for the loading conditions A, B and C.

##### — Loading condition A

is dominated by traffic load of a **Main road** under shallow depth of cover, i. e. covering the condition during road construction; the traffic load in Table 4 is expressed as the resulting additional soil pressure at pipe crown<sup>1)</sup>; in order to allow the assessment of the influence from good and moderate embedment

1) The additional pressure, derived from traffic loads at the surface level, takes into account the method of Boussinesq and the influence of impact according to EN 1295-1:1997, 5.2. In accordance with the method adopted by the European Product Standard for the determination of the allowable pressures, the pipe/soil interaction should be considered as specified in EN 1295-1:1997, 5.2.

quality, the loading condition A is combined with the installation conditions 1 and 2 respectively, resulting in the combined conditions A1 and A2.

— **Loading condition B**

is dominated by traffic load of an **Urban road** under shallow depth of cover, i. e. covering the condition during road construction; the traffic load given in Table 4 is expressed as the resulting additional soil pressure at pipe crown<sup>1)</sup>; in order to allow the assessment of the influence from good and moderate embedment quality, the loading condition B is combined with the installation conditions 1 and 2 respectively, resulting in the combined conditions B1 and B2.

— **Loading condition C**

is dominated by earth load; traffic load in a **Rural area**, due to high depth of cover, is of minor influence; the traffic load given in Table 4 is expressed as the resulting additional soil pressure at pipe crown; in order to allow the assessment of the influence from good, moderate and poor embedment quality, the loading condition C is combined with the installation conditions 1, 2 and 3 respectively, resulting in the combined conditions C1, C2 and C3.

The figures given in Table 4 regarding the degree of the compaction of the main backfill are due to the average requirements of road owners/authorities in Europe (main roads, urban roads, rural areas).

For guidance on longitudinal effects see Annex A (informative).

NOTE 1 PFA etc. does not incorporate longitudinal effects. The results of longitudinal effects cannot always be corrected by altering the allowable pressure (PFA etc.).

NOTE 2 Due to unfavourable site conditions (e.g. uneven trench bottom), differential settlements along the pipeline, either a step or a settlement in the trench bottom can occur; such conditions can cause damage to the components of the pipeline.

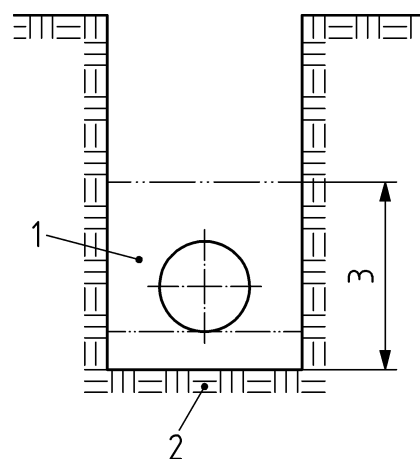
**5.3.3 Installation parameters**

The installation parameters of the installation conditions 1, 2 and 3 according to Table 4 are given in Figures 2, 3 and 4.

If appropriate, instead of Relative Standard Proctor Density ( $D_{Pr}$ ), equivalent values of Modified Proctor Density may be used.

**Key**

- 1 Soil type 2
- 2 Native soil type 4  $D_{Pr} = 100\%$
- 3 Embedment, average  $D_{Pr} = 96\%$  for calculation purpose



**Figure 2 — Installation condition 1 for type of compaction “WELL” in the embedment (see Column 1 of Table 4)**