SLOVENSKI STANDARD
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Sistemi za odvod odpadne vode in kanalizacijo zunaj zgradb - 5. del: Obnova

Drain and sewer systems outside buildings - Part 5: Rehabilitation

Entwässerungssysteme außerhalb von Gebäuden - Teil 5: Sanierung

Réseaux d'évacuation et d'assainissement a l'extérieur des bâtiments - Partie 5: Réhabilitation

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Réseaux d'évacuation et d'assainissement à l'extérieur des bâtiments - Partie 5: Réhabilitation

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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.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Contents

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 part is the fifth in a series relating to the functional requirements of drain and sewer systems outside buildings that operate essentially under gravity. There will be seven parts, as follows: Drain and sewer systems outside buildings -

Part 1 Generalities and definitions

Part 2 Performance requirements

Part 3 Planning

Part 4 Hydraulic design and environmental considerations

Part 5 Rehabilitation

Part 6 Pumping installations

Part 7 Operations and maintenance.

In drafting this part of this European Standard account has been taken of other available draft standards, in particular EN 476 "General requirements for components used in discharge pipes, drains and sewers for gravity systems".

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of an identical text or by endorsement, at the latest by March 1998, and conflicting national standards shall be withdrawn at the latest by March 1998.

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 European Standard is applicable to drain and sewer systems, which operate essentially under gravity, from the point where the sewage leaves a building or roof drainage system, or enters a road gully, to the point where it is discharged into a treatment works or receiving water.

Drains and sewers below buildings are included provided that they do not form part of the drainage system of the building.

This part sets out the principles and procedures for planning and design of rehabilitation works necessary to achieve prescribed levels of performance for existing drain and sewer systems.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions 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 of 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 752-1 Drain and sewer systems outside buildings - Part 1: Generalities and definitions.

3 Definitions

For the purposes of this standard, the following definitions, together with those given in EN 752-1 apply:

3.1 **rehabilitation:** All measures for restoring or upgrading the performance of existing drain and sewer systems. [EN 752-1:1995]

3.2 **renovation:** Work incorporating all or part of the original fabric of the drain or sewer by means of which its current performance is improved.

3.3 **repair:** Rectification of local damage.

3.4 **replacement:** Construction of a new drain or sewer, on or off the line of an existing drain or sewer, the function of the new drain or sewer incorporating that of the old.

3.5 **structural condition:** State of a drain or sewer in matters relating to the integrity of its fabric.

3.6 **tank sewer:** Oversized sewer which acts as a detention tank.

4 Sources of additional information

This standard sets out the essential requirements for good practice in various engineering activities relating to the planning, design and operation of drain and sewer systems. For supplementary detail and guidance reference should be made to national documents until such time as fully comprehensive European Standards are available.

The documents listed in annex A contain details which may be used in the framework of this part, given approval by the relevant authority.

5 General

This part sets out rules for analysis to achieve satisfactory structural and operational condition and the environmental performance of existing systems (see clause 6 of EN 752-2:1996). Damaged, defective or hydraulically overloaded drains and sewers represent a potential hazard through flooding and collapses, and through pollution of groundwater, soil and watercourses.

The problems found in existing drain and sewer systems are frequently interrelated and upgrading works will often be designed to overcome a number of problems at the same time. The investigation and planning of upgrading work should be carried out on complete catchment areas so that all problems and their causes can be considered together. In large sewer systems it may be necessary to start by investigating appropriate parts of the system.

The procedures described in this Standard may be applied in any drain and sewer system, but detailed application may have to take account of the age, location and type of system, the materials used in its construction, together with functional and climatic factors.

Typical procedures are shown in figure 1. The following sections outline these procedures in more detail.

6 Initial planning

6.1 Determination of performance requirements

The performance requirements for a rehabilitated system are similar to those for a new system (see EN 752-2 and EN 752-4), but special attention shall be given to the following:

- -hydraulic capacity;
- -operations and maintenance;
- -selection of materials;
- -access and installation constraints;
- -treatment of branch connections;
- -preservation of assets

In each of these areas there may be legal requirements, public expectations and financial constraints which will influence relative priorities.

Performance requirements may be set for:

- -hydraulic performance;
- -environmental impact;
- -structural integrity.

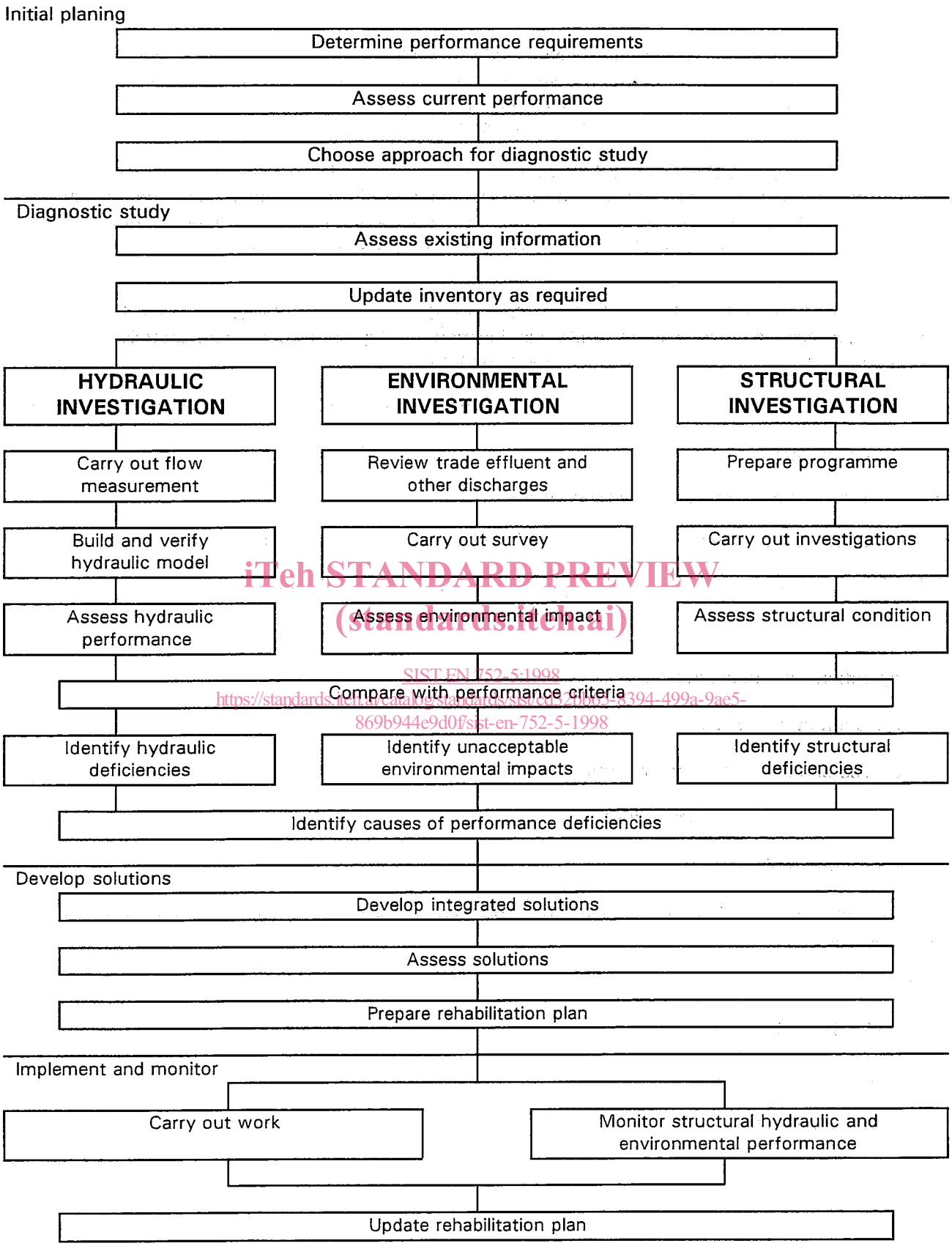

Figure 1: Flow chart for the rehabilitation of drain and sewer systems

For each aspect of performance different levels could be required for example:

-trigger levels which justify early upgrading action according to priority;

-target levels to aim for in upgrading, which shall be equal to the requirements for new construction, but which sometimes can only be achievable or necessary in the longer term.

Examples of performance requirements in use in different countries are included in documents listed in annex A.

6.2 Assessment of current performance

Performance problems on existing systems should be known through reports of incidents such as sewer collapses, flooding or polluted watercourses. Records of past incidents and any other relevant information should be brought together and a detailed assessment should be carried out to compare the current performance with the performance requirements (see 6.1).

6.3 Choice of approach for diagnostic study

Following the assessment of the current performance of the system it will be possible to decide whether the extent of the problems justifies an investigation of the entire catchment area. Where an investigation is required, it will be necessary to decide how detailed the diagnostic study of each of the aspects (hydraulic, environmental and structural) should be.

6.4 Setting priorities against each study

Where large numbers of complete or partial catchments are in need of study and upgrading, the existing information collected may also be used to assign priorities to the perceived problems in each catchment. These can then be used to draw up a comprehensive programme for investigation so that the catchments with the most serious problems are upgraded first.

7 Diagnostic study

7.1 Historical information collection

The collection and assessment of all available relevant information about the sewer system shall be carried out and is the basis from which all other activities are subsequently planned. Examples are:

-location, materials and size of drains and sewers including outfalls (inventory);

-relevant permits and legal requirements;

-previous operational, structural and safety measures to overcome the problems;

-nature and quantities of trade effluent;

-past inspections (surveys);

-previous hydraulic calculations;

-previous assessments of environmental impact;

-existing drain and sewer condition data;

-receiving water quality and use;

-groundwater levels and velocities;

-ground conditions including the potential for use of soakaways;

-groundwater protection zones;

-previous test information.

This information should be assessed to determine what further information is required in order to carry out the diagnostic study.

7.2 Inventory update

The inventory shall be updated so that a sufficient record of the sewer system is available. This can include the following information:

-the location, dimensions, shape and type of material of all drains and sewers;

-the position depth and levels of manholes and the levels of connections to the manholes;

-the positions of connections to drains and sewers;

-the layout of ancillary structures such as combined sewer overflows and pumping installations, including details of any special plant (e.g. pumps or screens).

7.3 Hydraulic investigation

7.3.1 Hydraulic surveys

Testing and inspection procedures can be required in order to ensure an adequate evaluation of flows (dry weather and storm), infiltration, exfiltration and wrong connections. Surveys can include precipitation and flow measurements, identification of wrong connections and groundwater measurements.

7.3.2 Hydraulic modelling and verification

A sewer flow simulation model can be necessary in order to understand the hydraulics of the system. However, a model may not be necessary:

-where there are no known hydraulic problems (particularly where the sewer system takes only wastewater flows);

-and where there are no combined sewer overflows;

-and where structural problems are to be solved using techniques which do not reduce the hydraulic capacity of the sewer.

Information on the use of computer based sewer flow simulation programs is given in clause 11 of prEN 752-4:1995.

Verification and/or calibration of the models is necessary. The procedures used depend on the program.

If suitable agreement is not obtained, the model input data should be checked and then the sewer records. Having identified possible causes of error it will often be necessary to confirm these by site inspection and then adjust the model accordingly. Data shall not be modified without justification based on an inspection of the system.

7.3.3 Assessment of the hydraulic performance

The results of the hydraulic surveys and/or the verified flow simulation model shall be used to assess the hydraulic performance of the system for a range of rainfall conditions related to the performance requirements (see clause 11 of EN 752-4:1997).

7.4 Environmental investigation

7.4.1 General

Where necessary surveys shall be carried out to provide any data not available from records.

7.4.2 Trade effluents

The location of trade effluent sources shall be identified and the nature, quality, quantity and the potential environmental hazards reviewed.

7.4.3 Watertightness

Investigations can be required to determine where there is leakage from drains and sewers, giving priority to drains or sewers which pass through aquifer protection zones or where they carry particularly hazardous substances (see clause 7 of EN 752-2:1996).

7.4.4 Receiving water quality

The quality of all receiving waters shall be determined to see whether it meets the requirements and if not, whether the sewer system is a significant factor.

7.4.5 Other environmental impacts

Consideration should be given to other environmental factors such as noise, odour and visual intrusion.

7.4.6 Assessment of environmental impact

The results of the investigations shall be considered together with estimates of the frequency, duration and volume of discharges to receiving waters, determined using a verified flow simulation model (see 7.3.2) where this is available. This information shall then be used to assess the environmental impact (including impact on soil and groundwater) of the sewer system (see clause 12 of EN 752-4:1997 and annex D of EN 752-4:1997).

The results of the structural investigation (see 7.5), the trade effluent survey and other relevant investigations shall be examined to identify:

- sources of hazardous effluents;
- exceedence of permissible concentrations and discharges;
- other deviations from permits.

7.5 Structural investigation

7.5.1 Prepare programme

It is important to ensure that investigation of the system is selective in order to avoid duplication of previous work. The structural investigations may include either a complete survey of the drain and sewer system or a more selective approach.

7.5.2 Carry out investigations

The recording and assessment of the actual condition of drain and sewer systems can be carried out directly by walking through or indirectly with the aid of a closed circuit television (CCTV) system. The drain and sewer system shall be cleaned as necessary to make it possible to record and assess the actual condition. During the survey the system shall be kept free from wastewater as far as necessary.

The condition of the system, and in particular the defects, shall be recorded as accurately and comprehensively as possible. A uniform coding system should be used to ensure that the results can be compared. Details of standardised coding systems in use in various countries can be found in the documents listed in annex A.

The defects listed shall include:

- -unacceptable cracks;
- -deformation;
- -open, defective or displaced joints;
- -defective connections;
- -tree root intrusion, infiltration, sediment and debris;
- -subsidence;
- -fractures;
- -defective manholes;
- -chemical or physical attack.

Where appropriate, other qualitative and quantitative investigation techniques may be used. These include sonar (for submerged pipes) and radar or other geophysical techniques (e.g. for detecting voids behind the wall of the sewer pipe).

The results of the structural investigations can also be relevant to the assessments of the hydraulic performance and environmental impact.

7.5.3 Assess structural condition

Once the system has been inspected, the next stage is to examine the results to identify those areas requiring action. A number of methods have been developed to assist in this process. Details of these are given in the documents listed in annex A.

7.6 Identify causes of performance deficiencies

Based upon the results of the hydraulic, environmental and structural investigations, the causes of performance deficiencies shall be determined. The relative impact of each cause should be assessed in order to develop appropriate solutions and to set the priority for action.