BRITISH STANDARD

BS EN
12255-11:2001

Wastewater treatment plants —

Part 11: General data required

The European Standard EN 12255-11:2001 has the status of a British Standard

ICS 13.060.30

National foreword

This British Standard is the official English language version of EN 12255-11:2001.

The UK participation in its preparation was entrusted to Technical Committee B/505, Wastewater engineering, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 May 2001

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Stations d'épuration - Partie 11: Informations générales exigées

Kläranlagen - Teil 11: Erforderliche allgemeine Angaben

This European Standard was approved by CEN on 4 February 2001.

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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 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of an identical text or by endorsement, at the latest by September 2001, and conflicting national standards shall be withdrawn at the latest by December 2001.

It is the eleventh part prepared by the working groups CEN/TC 165/WG 42 und WG 43 relating to general requirements and processes for wastewater treatment plants for more than 50 PT. The parts of the series are as follows:

Part 1: General construction principles
Part 3: Preliminary treatment
Part 4: Primary settlement
Part 5: Lagooning processes
Part 6: Activated sludge processes
Part 7: Biological fixed-film reactors
Part 8: Sludge treatment and storage
Part 9: Odour control and ventilation
Part 10: Safety principles
Part 11: General data required
Part 12: Control and automation[1])
Part 13: Chemical treatment
Part 14: Disinfection[1])
Part 15: Measurement of the oxygen transfer in clean water in activated sludge aeration tanks
Part 16: Physical (mechanial) filtration[1])

NOTE For requirements on pumping installations at wastewater treatment plants, provided initially as part 2 "Pumping installations for wastewater treatment plants", see EN 752-6 "Drain and sewer systems outside buildings – Part 6: Pumping installations".

The parts EN 12255-1, EN 12255-3 to EN 12255-8, EN 12255-10 and EN 12255-11 were implemented together as a European package (Resolution BT 152/1998). The date of withdrawal (dow) of all conflicting national standards is 2001-12-31. Until the date of withdrawal is reached the National and the already published European standards both coexist.

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 specifies data which is necessary for the planning, design, bidding, performance guarantees, construction, start-up and compliance testing of a wastewater treatment plant or parts of it.

Differences in wastewater treatment throughout Europe have led to a variety of practices being developed. This standard gives fundamental informations about the practices; this standard has not attempted to specify all available practices.

Detailed information additional to that contained in this standard may be obtained by referring to the bibliography.

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 (including amendments).

EN 1085
Wastewater treatment – Vocabulary

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[1]) in preparation

prEN 12255-1:1996
Wastewater treatment plants – Part 1: General construction principles

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 1085 and the following apply:

3.1
plant
a new wastewater treatment plant; an upgrading or extension of an existing wastewater treatment plant or a part of a new or extended wastewater treatment plant (e. g. sludge handling facilities)

3.2
client
a municipality, city or other organisation which intends to build a wastewater treatment plant or parts thereof, or its representative [prEN 12255-1:1996]

3.3
functional tender
a tender document that contains the design loads, a description of the site where the plant is to be erected, the relevant discharge limits and any additional requirements

NOTE Turn-key contractors design the plant on the basis of the requirements and plans specified by the client (possibly with the assistance of a consulting engineer) and give bids on the plant as a whole in accordance with an overall guarantee. The turn-key contractor who secures the contract is responsible for the construction and the start-up of the plant as well as for the compliance with requirements demanded in the tender documents (turn-key project).

3.4
sectional tender
tender documents prepared for different sections of work for a plant

NOTE e. g. earth work, concrete work, mechanical equipment, electrical installations, buildings etc. A plant is normally designed by a consulting engineer. Different companies may get the commission for the different sections. A consulting engineer may be commissioned to coordinate and to supervise the work.

3.5
consulting engineer
an independant engineer commissioned by the client designing a plant or parts of it and/or supervising the construction

NOTE He may assist the client with any work preparing all or part of the tender documents. He supervises the construction and checks the time schedule and costs. The consulting engineer has knowledge and experience in planning, design and operational aspects of wastewater treatment plants. In some countries a special certification may be required.

3.6
turn-key contractor
a contractor building a plant or parts of it as a whole

NOTE The turn-key contractor is a company which has knowledge and experience in planning, design, construction and operational aspects of wastewater treatment plants.

4 Client options

The client decides whether a functional tender or a sectional tender shall be prepared.

The client may commission a consulting engineer to carry out one or more of the following:

– establish the design loads and data as described in clause 5;

– prepare the tender documents for a functional tender;

– design the plant and estimate the costs and prepare the tender documents for the sectional tender;

– inspect the construction in case of functional tendering;

– supervise and coordinate the construction in case of sectional tendering;

– evaluate the bids on the tenders and to propose which contractor or contractors (in case of sectional tendering) should be commissioned.

5 Basic design data required

Where applicable the following basic data either measured or estimated shall be provided by the client or his representative e. g. consulting engineer.

5.1 Loading data

5.1.1 Sewerage system

The data on the sewerage system should include:

– areas served by combined and/or separate sewers;

– proportions of flows and loads from separate and/or combined sewer systems in dry weather conditions;

– storage capacity for storm water within the sewerage system;

– potential to control and balance flows and loads within the sewerage system;

– infiltration flows in dry weather conditions and their seasonal fluctuations (where appropriate);

– septic and corrosive components of the wastewater.

5.1.2 Population served

The data on the population served shall include:

– current population connected to the sewerage system;

– population connected at start-up of the plant;

– population connected at design horizon;

– seasonal variations of population (e. g. holiday periods);

– weekly variations of population (e. g. movement of commuting population).

5.1.3 Significant trades and industries

A list of trades and industries which discharge significant loads to the sewerage system should include the following flows and loads e. g.:

– COD, BOD_5, KN, NH_4-N, NO_3-N, total phosphorus, total suspended solids, organic suspended solids, salinity and alkalinity;

shown as current, start-up, and design target data for:

– hourly peak (m^3/h, kg/h);

– weekly peak day (m^3/d, kg/d);

– maximum weekly average (m^3/week, kg/week);

– annual average (m^3/a, kg/a).

In addition, for trades and industries with seasonal fluctuations the periods of high and low loads shall be included preferably as an annual diagram.

The client shall specify dischargers who handle hazardous, toxic or inhibitory material and identify which precautions are necessary to prevent that hazardous, toxic or inhibitory materials being discharged.

Organic discharges with low biodegradability should be specified.

5.1.4 Data from existing wastewater treatment plants

The loading data and the operational results of the existing wastewater treatment plants contain valuable information. As a minimum the following data for at least the previous year shall be provided:

– annual wastewater flow (m^3/a), proportions treated physically, chemically and biologically;

– average quantity (m^3/d) and composition of sludge with % solids, and % volatile solids content and heavy metals;

– annual quantity of screenings, grit and floatables;

– average volume of liquor from sludge treatment (m^3/d) and organic and nutrient content;

– average quantity of digester gas (m^3/d);

– electrical energy produced from digester gas (kWh/a);

– electrical energy consumed (kWh/a);

– probability plots and diagrams showing the following over a year wastewater flows (m^3/d) and the daily loads of COD, BOD_5, KN, NH_4-N, NO_3-N, total phosphorus, total suspended solids, organic suspended solids, salinity and alkalinity;

– seasonal temperature of the wastewater or biological reactor temperatures over a year;

– diurnal fluctuation of the wastewater flow at dry weather conditions;

– peak flow at storm water conditions (m^3/h);

– amount and loads of other wastes than wastewater being delivered to the plant (e. g. night soil) and

– performance of the treatment plant.

5.1.5 Design flows and loads

The design flows and loads shall be based on the present flows and loads considering growth or decrease of the population, the trades and the industries and future connections of other communities, trades and industries. If there are no means to measure the present flows and loads the design data may be based on the projected population. In addition to the population the specific dry weather flow, *l*/(population ×d), a peak factor considering storm water and infiltration water and the specific loads in g/(population ×d) of COD, BOD_5, KN, NH_4-N, NO_3-N, total phosphorus, total suspended solids and organic suspended solids have to be provided. Flows and loads of trades and industries should be determined by measurements at the sites.

The following design data should be provided:

– maximum hourly wastewater flow Q_{max} (l/s) reaching the plant and the probable duration;

– details of discharge limits for storm water e. g. after screening, grit chamber, primary sedimentation or other treatment to a receiving water or a retention basin;

– design peak flow as remaining maximum flow after storm water discharge (l/s);

– diurnal variation of the flow at a typical dry weather working day (l/s);

– design loads as appropriate for the process in kg/h, kg/d, kg/week of COD, BOD_5, KN, NH_4-N, NO_3-N, total phosphorus, total suspended solids and organic suspended solids as well as the corresponding volume of wastewater;

– minimum daily and weekly ratios of COD/N and COD/P;

– in case of seasonal flow and load fluctuations, day-to-day variation of flow (m^3/d) and loads (kg/d) of the main parameters over a year;

– seasonal temperature of the wastewater over a year;

– annual volume of wastewater (m^3/a) and annual loads (kg/a) of COD, BOD_5, KN, NH_4-N, total phosphorus, total suspended solids and organic suspended solids.

5.2 Effluent quality, requirements for the disposal of residues and sludge

5.2.1 Effluent quality

The requirements of the discharge consent shall be provided. The mode of inspection (e. g. grab samples, 2-hour composite samples, 24-hour composite samples) and the requirements to meet the consent standard (e.g. permitted annual frequency of exceeding consent standard) shall be provided.

5.2.2 Requirements for storm water overflow discharge

If there are special requirements for storm water to be discharged from the wastewater treatment plant these shall be stated.

5.2.3 Requirements for the residues from preliminary treatment

The requirements for the disposal of the residues shall be stated, e. g. water content of screenings, organic content of grit, and whether separate or co-disposal of grit, screenings and floatable material are permitted.

5.2.4 Requirements for sludge disposal

The mode of sludge disposal which is preferred by the client, e. g. at agricultural utilization, landfill, incineration, co-incineration at power stations or other industries, shall be stated as well as the appropriate requirements, e. g.

stabilization, water content. If certain chemicals, (e. g. for mechanical dewatering), are prohibited these shall be identified.

5.3 Site description

The site description shall include:

5.3.1 Plans (maps) of the site

Plans (maps) of the site shall be provided indicating:

– elevation of site;

– contour lines and topography;

– site boundary;

– existing buildings and structures including existing wastewater treatment plant;

– all services including sewers, rising mains, water mains, electrical cables, telephone cables, gas mains including information on the capacity (e. g. pressure, voltage, flow);

– service roads (including permissable truck weight) and walkways;

– access from public road;

– final effluent discharge point with maximum, minimum and average water level of receiving water.

5.3.2 Existing wastewater treatment plants

The details of any existing treatment plant shall be described. Plans of layout and structures shall be provided. The condition of the concrete, service roads and the mechanical and electrical equipment shall be described.

5.3.3 Ground geology, groundwater and climate

Borehole information should be provided as follows:

– special characteristics of soil and ground water including information on possible contamination;

– location of the boreholes;

– ground conditions (e. g. clay, rock, sand);

– maximum, minimum and average groundwater levels.

Climatic informations including temperature, humidity, winds etc. should be provided.

5.3.4 Special site constraints

Any special site constraints shall be stated and may include the following:

– permissible maximum height of any building or structure;

– limits on odour or noise emissions;

– preservation of groundwater levels;

– preservation of environment and natural habitat;

– distances of any buildings from site boundary;

– any limits or restrictions on building, transport and operation;

– any special construction material requirements.

5.4 Additional data required

The following data required for design should be stated by the client or his representative:

a) the minimum number of parallel units;

b) bypasses;

c) stand-by equipment;

d) requirement for stand-by power supply (kVA);

e) any operational parameter (e. g. sludge age, retention time, surface loading, sludge loading) specifically requested by the client;

f) control and automation requirements;

g) design service life of equipment;

h) truck weight for service roads;

i) requirements (space and equipment/furniture) for workshops, laboratories, store rooms and offices;

j) performance guarantees for:

– the plant performance at design load; the testing period in length and time of the year shall be stated;

– the projected consumption of power and chemicals; testing may be performed together with the before mentioned testing; these tests may be requested for a lower load and/or for another period;

– single units, e. g. screen, mixer, aeration equipment, digester.

NOTE In order to conduct performance guarantee testing it may be necessary to install additional piping, metering and monitoring devices (see 5.6.2).

5.5 Time schedule

a) For a sectional tender all relevant contractual mile stones shall be stated and should include:

– starting date of contractual delivering time;

– anticipated time scale of the start up and of the commissioning of the plant;

– the latest time scale for the contractor to report the construction and/or installations ready for inspection and for take over.

b) For a functional tender all relevant contractual mile stones shall be stated and should include:

– anticipated starting date of contractual delivering time (notice to proceed);

– time scale for delivering the documents (drawings approval, approval certificate);

– time scale for over all functional test (commissioning; commissioning certificate);

– time scale for provisional take-over and final take-over.

NOTE Depending on the specific national regulations the client with the help of the contractor should obtain the permission for the planned treatment process and construction work from the authorities prior to the notice to proceed. This permission should be obtained before the final contract.

5.6 Start-up and guarantee testing

5.6.1 Start-up

The client may ask for:

– vocational training of personnel;

– advice on the technology.

5.6.2 Guarantee testing

If performance guarantees are requested it shall be specified how the guarantees are to be tested and who will bear the costs. The client may ask for:

– client and contractor perform testing in cooperation;

– testing performed by a qualified third party in co-operation with the client;

– testing performed by a qualified third party in co-operation with the contractor.

The time frame and the methods for process and plant testing and chemical analysis shall be specified.

5.7 Operational cost information

The client should provide unit costs where appropriate. Examples include:

– personnel costs with indication of trade and skill level;

– electrical energy;

– fuel oil;

– natural gas;

– chemicals (e. g. for phosphate precipitation, sludge dewatering and denitrification);

– disposal of residues (screenings and grit) depending on the mode of disposal as stated in 5.2.3;

– disposal of sludge depending on the mode of disposal as stated in 5.2.4.

6 Documents to be provided by a turn-key contractor or the consulting engineer

6.1 Complete documents

If the information and data provided by the client are not sufficient for the design and the calculation of the costs additional information shall be requested:

a) by contractors immediately after receiving the tender documents

or

b) by a consulting engineer immediately when needed.

6.2 Design options

Normally the consulting engineer has to submit several options for which the costs are estimated. A turn-key contractor may also submit variants of the same treatment process.

6.3 Proposed solution

The offer of a turn-key contractor or the proposed solution of the consulting engineer shall be presented by text and drawings in detail in an agreed language. An abstract written for decision makers with no technical background should be provided. A list of abbreviations and symbols shall be attached. The process description shall be provided. It shall be explained how process objectives will be achieved.

The technological and hydraulic calculations including references shall be provided. The relevant design parameter for each offered treatment process has to be adequately documented to allow the client to assess the proposed process.

The procedures to ensure how normal operation is maintained during periods of malfunction, break-down of equipment and units out of operation for maintenance shall be described.

Within an agreed time scale the following general items (if applicable) shall be presented by text and drawings in detail:

– process control system (may be regarded as part of the treatment process), e. g. control panel, computer-control, sub control stations, instrumentation for process control;

– electrical power system including digester gas engines, transformers, cable arrangement, sub power meters, control station, peak power demand (kVA);

– lighting including types and luminous intensity, cables, switches;

– taps and hydrants for service water including the water distribution system as well as the water treatment plant if required;

– service roads according to the load as stated in 5.4;

– walkways;

– workshop, office and storehouse buildings including equipment and furniture as stated in 5.4;

– operating and maintenance manuals.

The properties of the material for construction and of the equipment installed shall be specified.

If not specified by the client the procedures for start-up and testing shall be stated.

6.4 Calculation and presentation of costs

6.4.1 Construction costs

Considering the particular conditions of the area and the site, the costs for the complete plant shall be calculated.

Differentiation shall be made between the costs for civil works (e. g. concrete tanks, houses, roads), the costs for mechanical equipment and the costs for electrical installations including monitoring and process control.

In addition the costs arising for start-up and guarantee testing shall be stated.

6.4.2 Operational costs

Considering the particular conditions of the process and the site the annual operational costs shall be presented in accordance with flow and load based on the costs and prices as stated in 5.7 as follows:

a) personnel costs: based on number and skilled level required, working in shifts and/or regular working time;

b) energy costs: to be separately calculated for (where appropriate):

– raw wastewater pumping,
– main treatment process (e. g. aeration, mixers, internal pumping, scrapers),
– tertiary treatment,
– sludge treatment including pumping, mixing, mechanical dewatering,
– miscellaneous (e. g. lighting, heating of buildings);

based on the estimated consumption of (where appropriate):

– electrical energy,
– natural gas,
– digester gas,
– fuel oil;

c) costs for chemicals: to be separately calculated based on the estimated consumption where appropriate for:

– primary sedimentation for pre-precipitation and/or flocculation,
– biological reactors for phosphate precipitation,
– biological reactors for denitrification,
– final clarifiers or filters for phosphate precipitation,
– final clarifiers or filters to improve solids removal,
– sludge to improve thickening,
– sludge dewatering;

d) costs for disposal of residues and sludge: to be separately calculated based on the estimated volume or mass where appropriate for:

– screenings,
– grit,
– grease and floatables and
– sludge;

e) costs for maintenance of civil works and equipment shall be separately calculated where appropriate for:

– office buildings, workshops, store houses, laboratories and other non-process buildings,
– tanks and channels exposed to wastewater or sludge,
– pipes exposed to wastewater, sludge or gas,
– plastic tanks and pipes exposed to wastewater, sludge or gas,
– mechanical equipment including spare parts and lubricants,
– electrical equipment including instrumentation and monitoring.

6.4.3 Presentation of costs

The client may commission a consulting engineer to estimate the costs as specified in 6.4.1 and 6.4.2. The consulting engineer shall estimate the total annual costs for alternatives including capital costs.

At sectional tendering the contractors shall give bids on the costs for all items listed in the tender documents. They may offer and state the costs of special solutions which are adequate to that described in the tender documents.

A turn-key contractor shall give a bid on the costs as specified in 6.4.1 and 6.4.2 and as requested in the tender documents.

Based on the bids the client shall be able to calculate the total annual costs of the plant including capital costs using cost benefit analysis.

Bibliography

The following documents contain details which can be used within the framework of this standard.

This list of documents which are published and used by the members of CEN was correct at the time of publication of this European Standard but should not be considered to be exhaustive.

France

Ministère de l'equipement, du logement et des transports (96-7TO);
Conception et exécution d'installations d'épuration d'eaux usées. Fascicule n° 81 titre II.

Germany

ATV-A 102 [2])
Allgemeine Hinweise für die Planung von Abwasserableitungsanlagen und Abwasserbehandlungsanlagen bei Industrie- und Gewerbebetrieben (German only)

ATV-A 106 [1])
Design and construction planning of wastewater facilities

ATV-A 200 [1])
Grundsätze für die Abwasserentsorgung in ländlich strukturierten Gebieten (German only)

ATV-DVWK-A 198
Ermittlung von Bemessungsgrundlagen für Abwasseranlagen

Leitlinien zur Durchführung von Kostenvergleichsrechnungen. Länderarbeitsgemeinschaft Wasser (LAWA), Stuttgart 1994. (German only)

Portugal

Direcção Geral da Qualidade do Ambiente -
Manual de Tecnologias de Saneamento Basico Apropriadas a Pequenos Aglomerados;
SEARN, rua de O Século 51 – 1200 Lisboa Portugal

[2]) Available at: Gesellschaft zur Förderung der Abwassertechnik e. V. (GFA),
Theodor-Heuß-Allee 17, 53773 Hennef

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