Wastewater treatment plants —

Part 1: General construction principles

The European Standard EN 12255-1:2002 has the status of a British Standard

ICS 13.030.40; 13.060

National foreword

This British Standard is the official English language version of EN 12255-1:2002.

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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Kläranlagen - Teil 1: Allgemeine Baugrundsätze

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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 Management Centre or to any CEN member.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165 "Wastewater 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of an identical text or by endorsement, at the latest by July 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

It is the first part prepared by the Working Groups CEN/TC 165/WG 42 and 43 relating to the general requirements and processes for treatment plants for a total number of inhabitants and population equivalents (PT) over 50. 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

Part 13: Chemical treatment - Treatment of wastewater by precipitation/flocculation

Part 14: Disinfection

Part 15: Measurement of the oxygen transfer in clean water in aeration tanks of activated sludge plants

Part 16: Physical (mechanical) 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 and EN 12255-10 and EN 12255-11 were implemented together as a European package (Resolution 232/2001 taken by CEN/TC 165).

1) in preparation

This European standard is limited to general construction principles. Separate standards for special construction principles for elements of wastewater treatment plants are covered in other parts.

Safety principles and general data required are covered in EN 12255-10 and EN 12255-11.

Annex A is informative, annex B is normative.

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

1 Scope

This European Standard specifies general requirements for structures and equipment as they relate to wastewater treatment plants for a total population of more than 50 PT.

The primary application is designed for wastewater treatment plants for the treatment of domestic and municipal wastewater.

Requirements for structures which are not specific for wastewater treatment plants are not within the scope of this European Standard. Other ENs can apply.

Equipment which is not solely used in wastewater treatment plants is subject to the applicable product standards. However, specific requirements for such equipment when used in wastewater treatment plants are included in this part.

General principles of building construction, mechanical and electrical engineering are not subject of this standard.

This European Standard does not cover the design of treatment processes.

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

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 752-6, Drain and sewer systems outside buildings – Part 6: Pumping installations.

EN 809, Pumps and pump units for liquids – Common safety requirements.

EN 1085, Wastewater treatment – Vocabulary.

EN 12255-9, Wastewater treatment plants — Part 9: Odour control and ventilation.

EN 12255-10, Wastewater treatment plants – Part 10: Safety principles.

prEN 12255-12, Wastewater treatment plants — Part 12: Control and automation.

EN 60034-1, Rotating electrical machines – Part 1: Rating and performance (IEC 60034-1:1996, modified).

EN 60529, Degrees of protection provided by enclosures (IP code) (IEC 60529: 1989).

ISO 3506-1, Mechanical properties of corrosion-resistant stainless-steel fasteners – Part 1: Bolts, screws and studs.

ISO 3506-2, Mechanical properties of corrosion-resistant stainless-steel fasteners – Part 2: Nuts.

ISO 3506-3, Mechanical properties of corrosion-resistant stainless-steel fasteners – Part 3: Set screws and similar fasteners not under tensile stress.

ISO 4200, Plain end steel tubes, welded and seamless – General tables of dimensions and masses per unit length.

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
structure
any construction and its components built for the accommodation of equipment

3.2
equipment
any component which is installed in, mounted on, attached to, or operated on structures, in the performance of their intended function

3.3
unit
any structure including any related equipment which is used as a process stage and which can be isolated from other parallel, upstream or downstream structures

NOTE Examples for a unit are a grit chamber, a clarifier, an aeration tank, a thickener, a digester.

3.4
assembly
mechanical equipment that can be removed and replaced as a whole

NOTE Examples for an assembly are a pump, a compressor, a gas engine, an aerator.

3.5
wastewater treatment plant
system for the purification of wastewater including structures and equipment

3.6
client
municipality, city or other organisation which intents to built a wastewater treatment plant or parts thereof, or its representative

3.7
Bidder
company or other organisation which offers to built a plant, or to built or supply parts thereof

3.8
contractor
company or organisation which received a contract to built a plant, or to built or supply parts thereof

3.9
tracks
those parts of a structure on which wheels run

3.10
design loading Y_N
effective average loading in continuous operation under full load

NOTE It is greater than or equal to the value of the operating loading which, for example, fluctuates as a function of the given load.

3.11
continuous load bearing capacity Y_C
load bearing capacity in continuous operation under full load

3.12
maximum loading Y_{max}
peak loading which is taken as the switch-off value to which, for example, overload circuit breakers are adjusted

3.13
maximum load bearing capacity Y_B
highest possible load bearing capacity limited to short-term load peaks, such as occur on switching on and off

NOTE In addition, alarm loadings Y_S, lying between the design loading Y_N and the switch-off loading Y_{max}, can be agreed as required, Y_N and Y_{max} being stated by the equipment supplier.

3.14
utilisation factor K_A
parameter for the effects on drive units etc., intrinsic to their operation

NOTE Usually K_A includes either directly or indirectly information on the loading, running time and temperature and is an overall value of the relationship between load bearing capacity and loading.

3.15
design service life [2)]
operating time until break-down of a machinery element under design loading, which is reached by a certain percentage of the elements tested

NOTE

as an example, the percentage for rolling bearings is 90 %;

the design service life is different from both the warranty time and an average service life of use, as used for cost efficiency calculations.

3.16
mode of operation
characteristic value related to the effects on motors and other electrical components intrinsic to their operation (e.g. frequency of starts, temperatures)

3.17
degree of protection
characteristic value related to the effects on motors and other electrical components intrinsic to their environmental conditions (e.g. effects of water or dust)

4 Requirements

4.1 General requirements

Wastewater treatment plants shall meet the following requirements:

a) national regulations shall be observed;

b) the discharge limits shall be met;

c) be capable of satisfactory treatment of the full range of flows and loads;

d) personal safety;

e) nuisance, odour, noise and toxicity, aerosols and foam shall be considered and shall meet the relevant requirements according to EN 12255-9 and EN 12255-10;

f) danger to operating personnel shall be minimized;

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2) Explanatory note see annex A

g) the required service life and long term structural integrity shall be achieved, including water and gas;

h) tightness;

i) provisions shall be made for case of operation and maintenance;

j) provision for future extensions or modifications of the plant shall be considered;

k) the reliability of operation shall be high and risk of danger and the impact of malfunctions shall be limited;

l) be cost effective in respect of total costs (capital and operating costs);

m) the energy consumption during construction and operation shall be considered;

n) the waste products shall be reduced in quantity and improved in quality as far as reasonably achievable to allow for reuse or safe disposal.

4.2 Design requirements

The following requirements shall be considered during the design stage of a wastewater treatment plant:

a) All assemblies that are subject to occasional failure (e.g. pumps and compressors) shall be installed with sufficient stand-by capacity so as to achieve full treatment capacity and efficiency with one assembly out of service. In the case where stand-by assemblies cannot be practically installed, provisions shall be made to replace rapidly by another one kept in stock.

b) Where practicable and necessary for maintenance work it shall be possible to bypass every unit or assembly, either by a parallel unit or assembly, channel or pipe.

c) Where necessary the inlet to the treatment plant shall include a facility which limits the flow. Such facilities may be balancing tanks and/or stormwater overflows as required by the authorities.

d) Where power supply is subject to prolonged interruption, wastewater treatment plants shall have emergency power generation or an equivalent facility to provide a sufficient power supply during power failure of the network, e.g. a terminal for easy connection with a readily available mobile power generator. Connected to the emergency power supply shall as a minimum include the measuring and control system, the pumps for waste water and return sludge and any aeration equipment (at a designed minimum capacity).

e) When the power supply is restored after an interruption, the treatment plant shall be designed so that normal operating status is resumed automatically.

f) Provision shall be made for taking representative samples upstream and downstream of each unit and of any flow whose characteristics are important for operation and supervision.

g) The design shall ensure that all information (quantities and qualities) that is important for effective operation of the plant is readily obtainable (e.g. flows, levels, pressures, temperatures, dissolved oxygen concentrations, pH-values, other concentrations).

h) The design shall enable cleaning, maintenance and repairs to be carried out easily and safely (e.g. access, flushing connections to pipes, isolation means).

i) Appropriate provision shall be made for the case of malfunction or emergency.

4.3 Structural requirements

4.3.1 General

Structures shall be

stable to bear all loads during construction, operation and maintenance periods, e.g. water pressures, static and dynamic forces being induced by the equipment,

resistant against chemical and biological attack from wastewater, sludge, air and gas components and against temperatures and temperature changes as appropriate,

protected against flotation.

4.3.2 Dimensional tolerances

The permissible dimensional tolerances for structures which are required for the function of the equipment are specified in the relevant specific standards or annex B. Other dimensional tolerances shall be agreed with the supplier of the equipment.

4.3.3 Concrete tracks

Tracks shall be identified in the drawings.

Tracks shall be level and free of ridges.

Particular requirements in regard of the quality and placing of the concrete shall be met in order to reinforce the tracks against the effects of

compression and shear forces,

frost and de-icing salt.

The strength of concrete shall not be less than 35 N/mm². The thickness of the concrete covering of the reinforcement on the wall crest if exposed to de-icing salt shall be at least 1 cm more than normal.

The maximum pressure on the wheels shall be limited to:

rubber wheels 2,5 MN/m²;

polyurethane wheels 5,0 MN/m².

In the latter case, protection of the track with steel plates or other suitable material may be necessary.

4.3.4 Fixings and connections between equipment and structures

The possibility of differential settlement between structures, and between structures and equipment (such as pipelines) shall be taken into account. Sufficient flexible joints and flexibility in the equipment itself or in its connections to the structures shall be provided.

Reinforcement in the structure shall not be used for securing equipment.

Where different metals are in contact, measures shall be incorporated to prevent corrosion by galvanic action.

Where metallic fixings might be in electrical contact with the reinforcement of the structure appropriate electrical insulation shall be provided, e.g. insulating, chemical anchor with threaded rod.

4.3.5 Access

Safe access in the form of paths, gangways, bridges, stages and the like shall be provided to allow supervision, operating, servicing, cleaning and maintenance. Openings shall be provided which allow easy replacement of equipment.

The location of operating and maintenance points shall allow for adverse weather conditions and other hazards (e.g. handling of gases, vapours, sludge, oil and grease) and possibility of collapse, squeeze and sheer points.

The buildings and access shall be sufficiently large to allow all erecting and dismantling, maintenance and repair operations and replacement of assemblies in an easy manner.

Appropriate means shall be provided to deter access by unauthorised persons.

4.3.6 Building ventilation

In enclosed rooms, the possible existence of damp atmospheres, foul air and the risk of explosions shall be considered according to EN 12255-10. Adequate ventilation shall be provided according to EN 12255-9. If necessary, treating for frost protection shall be provided.

4.3.7 Water supply and drainage

Where occasional flushing is required, a water supply shall be installed. Process water shall preferably be used for this purpose. Appropriate means shall be provided to prevent process water from contaminating the drinking water network. Any national regulations for the quality of process water used for flushing shall be observed. This may be particularly important when water is pressurised.

Appropriate drainage shall be installed where water accumulation may occur due to overflow, leakage or flushing. In such locations, all floors shall be sealed and sloped towards a pit from where the water drains by gravity or is automatically pumped away.

All tanks should be constructed to allow emptying.

4.3.8 Lifting equipment

Lifting equipment or adequate provisions for removal shall be provided where necessary in order to allow all maintenance work and replacement of all assemblies.

4.3.9 Storage for hazardous chemicals and fuels

Where hazardous liquid chemicals or fuels are stored or conveyed, provisions must be made to prevent environmental impact in case of leakage. National regulations and any requirements in EN 12255-10 shall be observed. The required safety provisions (e.g. double tank walls, tanks in bunds, leak sensors) will depend on the volumes stored and potential risks.

Tanks containing chemicals that would interact to form a hazardous mixture or could attack the material of other tanks shall not share a single bund.

4.4 Requirements for equipment

4.4.1 Principles for mechanical design[3)]

The use and requirements of the equipment shall be specified.

A general description and the following information shall be provided:

a) loads (e.g. traffic loads, wind loads, snow loads, operating loads and travelling single loads);

b) loadings (e.g. design loading, maximum loading, alarm loadings);

c) load bearing capacities (e.g. continuous load bearing capacity, maximum load bearing capacity);

d) utilisation factor K_A;

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3) Explanatory note see annex A

e) mode of operation according to EN 60034-1;

f) degree of protection provided by enclosures (IP Code) according to EN 60529. All gears and drives which are located above water, but near a place where water jet flushing may take place, shall be protected against spray water according to class IP 54 of EN 60529; gears and drives which may be directly cleaned with water jets shall be protected according to class IP 55 of EN 60529; gears and drives which may be submersed in water shall be protected according to class IP 67 of EN 60529;

g) service life classes: Design service life, as defined in 3.15, is divided in service life classes (see Table 1).

Table 1 — Design service life

	Service life class				
	1	2	3	4	5
Design service life h	undefined	10 000	20 000	50 000	80 000

Selection of the service life class shall take account of the real loading which can differ from the design loading (see informative Annex A for additional information).

NOTE Additional information in respect to specific equipment are included in the appropriate specific standards EN 12255-3 to EN 12255-8, prEN 12255-13, prEN 12255-14 and prEN 12255-16 (in preparation).

Other relevant regulations and standards (e.g. for cranes) have to be observed.

4.4.2 General design requirements

4.4.2.1 Walkways, stairs, platforms and gratings

Irrespective of the design traffic load, the load-bearing capacity of walkways shall not be less than 3,5 kN/m^2. In addition, the maximum deflection of a walkway shall not exceed 10 mm or the span divided by 200.

4.4.2.2 Covers, assembly openings, cleaning openings

The design and arrangement of covers, assembly openings and cleaning openings shall be consistent with the operational requirements of the plant. Openings shall be fitted with secure covers which cannot shut accidentally. Where frequent access is required, the covers shall be easily opened and closed.

4.4.2.3 Cable drums with spring motors

Spring motors used for cable drums may be employed only where the number of cycles does not exceed 1 000 per year and the path length does not exceed 30 m.

4.4.2.4 Pumps and pipelines

All pumps shall be appropriate to the conveyed medium and its condition. They shall conform to EN 809 and EN 752-6.

The minimum nominal diameter of pipes and pumps shall be specified appropriately to the medium conveyed. Generally, the minimum nominal diameter shall be DN 80 if mixtures of water and grit or sludges are conveyed. Smaller minimum nominal diameters may be agreed if upstream comminution or sieving is incorporated or where there is no risk of blockage.

Pumps shall be provided with individual isolating valves and check valves, if not otherwise specified. Positive displacement pumps shall be equipped with a sensor and a pressure switch to detect lack of liquid inflow and prevent damage.

Isolating and check valves shall be tight when closed and be appropriate for the medium and its condition (e.g. pressure, temperature, composition). If not otherwise specified, there shall be no internal obstruction to the flow when opened.

The forces and vibrations arising in pipe systems shall be taken into account in the design.

Where freezing may cause damage or interfere with operation of the wastewater treatment plant, or where heat losses are to be minimised, tanks and pipe systems shall be thermally insulated and underground pipelines shall be frost protected if necessary.

For pipelines conveying wastewater, sludge or digester gas, the pipe arrangement, the profile and the velocity shall be such that sedimentation (and condensation accumulation in gas or air pipes) and gas accumulation are avoided. Where this is not possible, means for the removal of sediment, condensate and gas accumulation shall be provided. Branches shall not be made in such a way that obstructions are likely to be formed. If not otherwise specified, the radius of bends shall be minimum three times the nominal diameter.

Plastic pipes shall have a minimum pressure rating of PN 6 if not otherwise agreed. The wall thickness of stainless steel pipelines shall be minimum of range A of ISO 4200 and the wall thickness of other steel pipelines shall be minimum of range D of ISO 4200 if not otherwise agreed.

Pipes shall be readily identifiable or marked to ease of identity.

Pipe systems shall be water and gas tight as necessary and the tightness shall be tested as specified in 5.4.

4.4.2.5 Blowers, compressors

Blowers and compressors shall be appropriate for the intended use and blowers for aeration shall deliver an air sufficiently free from oil.

Blowers and compressors shall be equipped with appropriate isolating and check valves and, where necessary, with temperature and pressure switches.

Noise and vibration should be considered (see EN 12255-10).

4.4.2.6 Measuring and control equipment

Measuring and control equipment serves to acquire process information which is necessary for the safe reliable and efficient operation of the wastewater treatment plant and its equipment.

The necessary measuring and control equipment shall be specified at an early planning stage, taking into account the installation conditions. This applies both to its location within the plant and to the layout and size of the structures as a function of the type of equipment (see prEN 12255-12).

4.4.2.7 Electrical equipment

The necessary electrical equipment shall be specified at an early planning stage, taking into account the installation conditions. This applies both to its location within the plant and to the layout and size of the structures depending on the type of equipment.

Additional information on specific structures and assemblies is given in the relevant specific standards. The relevant CENELEC standards and requirements of the local power supplier shall be observed.

For health and safety requirements see EN 12255-10.

For measurement and control equipment see prEN 12255-12.

4.4.2.8 Materials and corrosion protection

Materials used for the equipment shall be resistant to attack by the constituents of municipal wastewater and sludge, aerosols, sewage gases and atmospheric influences (e.g. micro-atmosphere) as appropriate and consistent with the relevant requirements. The client shall inform the equipment supplier of any special factors, such as the presence of septic sewage. If different materials are connected, detrimental galvanic corrosion shall be prevented. If load-bearing components are made of plastic material, detrimental effects of the environment (e.g. UV-radiation, temperature) shall be considered.

Unless otherwise specified, the supplier may assume that the wastewater concerned is municipal containing industrial effluents only in such portions that the characteristics lie within the limits given by the relevant consent standards for the discharge of wastewater into municipal sewers. On this basis, the equipment supplier shall select the materials.

Local conditions may require the use of particularly durable materials; this being subject to special agreement between contractor and client. Durability can be achieved by the use of materials inherently resistant to corrosion or by the application of a suitable coating. Where possible, anti-corrosion protection shall form part of the manufacturing process.

Materials shall be selected to meet the requirements specified in the tender documents. Special materials shall be used at the clients request.

Jointing elements (e.g. nuts, bolts, washers and screws) which are in contact with water or corrosive atmosphere should be made of stainless steel of class A2 or A4 according to ISO 3506-1 to ISO 3506-3, with the exception that use of high-strength material which is not available in class A2 or A4 is necessary to bear strong forces.

Additional requirements regarding materials and corrosion protection for specific components will be given in the relevant parts of this series.

4.4.2.9 Fabrication of welded equipment

Proof of qualification is required for the personnel fabricating welded structures and equipment (e.g. isolating gates, working platforms, conveyor systems, screening assemblies and sludge scrapers).

Special skills of the personnel in charge of welding work for systems which are to contain inflammable or explosive fluids, such as fuel or gas, are required.

These requirements do not invalidate other specifications for individual equipment, such as pressure vessels.

4.4.2.10 Scrapers

Since scrapers are used in several units which are covered in various parts of EN 12255, their design principles are specified in this general part.

a) Loads and dimensioning:

The traffic load on bridges shall be assumed to be 1,5 kN/m^2. Higher traffic loads may be agreed. The maximum deflection under combined action of its own weight and the main loads, with the exception of the traffic load, shall be the span divided by 500. The supporting structure shall be such that the main loads including operational loads do not cause any torsion liable to impair the scraper performance or resulting in its permanent deformation.

Brake motors or other devices with similar function shall be used for drives of lifting gears.

Width and diameter of wheels of scrapers running on concrete tracks shall be as specified in Table 2, the permissible contact pressure complying with the specifications in section 4.3.3.

Table 2 — Minimum size of wheels

Wheel type	Minimum width b mm	Minimum diameter d mm
Driven wheels	75	300
Non-driven wheels	50	200
Guide wheels	50	200

b) design service life of bridge scraper components:

wheel drives: Class 3;

lifting drives: Class 2;

ball bearing slewing rims: Class 4.

c) design service life of components of centrally driven scrapers and rakes:

central bearings and gears: Class 4;

electrical motors: Class 3;

lifting drives: Class 2.

d) design service life of flight scrapers:

gears: Class 4;

motors: Class 3.

Structural tolerances given in annex B shall be applied.

e) design requirements of bridge scrapers for rectangular tanks:

Bridge scrapers shall be fitted with devices giving positive guidance to the bridge, such as lateral guide rollers, racks, chains.

The rotation of the wheels should be monitored.

Brake motors or other devices with similar function shall be used for drives of scrapers in rectangular tanks.

f) Operation and maintenance of bridge scrapers:

Drive mechanisms and ball bearing slewing rims shall be located so that replacement of these elements requires only slight lifting of the bridge.

Rollers on blades of rotating scrapers can only be inspected and replaced after emptying of the tank. If scraper blades are requested which are capable of being lifted above the water level while the tank is full, this shall be stated in the tender documents.

In winter, open air tracks of bridge scrapers shall be kept free from snow and ice; if manual removal is not intended, one of the following systems shall be provided:

means within the structure (e.g. track heating);

means of equipment (e.g. hot air blowers or rotating brushes fixed at the scrapers, means for dosing of anti-freeze agents which should not be aggressive to concrete).

4.4.3 Environmental impact

All relevant requirements concerning emission control shall be observed. All wastewater treatment plants shall be located and designed with due regard for their effects on the environment.

Where significant emission to the environment is likely as a result of the operation of a wastewater treatment plant, such emission shall be abated by special measures relating to structures, equipment and methods of operation, due consideration being given to the distance of the area to be protected from the treatment plant. Emission of odour, noise and pollutants (e.g. oil and grease) shall be prevented by means of suitable structures, equipment and mode of operation. Where additional measures to prevent or abate such emissions are required, these shall not impair the function, reliability, safety and maintenance of the plant and its components.

For further information about odour emissions and control see EN 12255-9.

4.4.4 Safety

For information about safety requirements see EN 12255-10 and the relevant specific standards of the series EN 12255.

4.4.5 Documentation

The basic documentation for wastewater treatment plants shall include "as completed" drawings for structures, parts of structures and equipment, means of corrosion protection, pipework plans, wiring diagrams, operating instructions, lubrication plans and lists of spare parts and wearing parts, all these requiring regular updating. The documentation shall enable the client to undertake all service, maintenance and repair work and shall contain the essential information for future modification or extension works.

The client shall specify the language in which the basic documentation is to be supplied.

Operating instructions shall cover the general process and any specific local modifications or peculiarities. Frequency and scope of routine tasks as well as the necessary servicing measures for all parts of the plant, including checking its quality of operation, shall be described.

4.4.6 Spare parts, special tools

Spare parts shall be recommended by the supplier and be listed separately and satisfactory provision must be made for their availability. Unless otherwise specified, the duty of the supplier to maintain availability of major spare parts continues until 10 years after the delivery date of the equipment. The supplier can transfer this obligation to a sub-supplier.

By definition, wearing parts have a limited service life. They are parts affected to high wear under normal operational conditions and shall be easily replaceable. Examples of wearing parts are moving sealings, driving belts or chains and sensor electrodes.

5 Test methods

5.1 Function and performance

Testing procedures relating to the function and performance of the wastewater treatment plant will be specified in the standard for general data (see EN 12255-11).

Testing procedures relating to the function and performance of various elements of the plants will be specified in the specific parts of EN 12255.

5.2 Tightness testing of concrete structures

Tightness testing of concrete structures containing liquids shall be performed by filling the structures with this liquid or water followed by visual inspection prior to backfilling and measuring leakage according to national practice.

5.3 Tightness testing of earthen basins

To be carried out according to national practice.

5.4 Tightness testing of other structures and equipment

Such testing is carried out by a pressure test with a suitable medium. If appropriate and if the structure or equipment is operated with under-pressure, a vacuum test may be performed. National regulations and standards for pressure and vacuum tests shall be observed. If no national regulations exist the client shall specify whether and how a test shall be performed.

Annex A
(informative)

Explanatory notes

Ref.: 3.15 Design service life

4.4.1 Principles for mechanical design

To ensure trouble-free operation of the equipment of sewage treatment plants, differing requirements have been specified for the service life of components subject to alternating stresses, for example rolling bearings, sliding bearings, toothing, chain, rope and belt drives, clutch and brake linings.

Service life calculations of these machinery components are dealt with in standards and in the relevant technical literature, an important factor in such calculations being the stress pattern as a function of time.

To determine the design service life of a machinery component, the calculation is based on the nominal load on the load side, inclusive of the relevant operating factors.

The required design service life is to be derived from the required service life class to be included in the further parts of this standard. Details, including grading of these service life classes are given in Table A.1.

Depending on the type of equipment, the effective loading can be lower than the nominal load on the load side, for which reason alone the effective service life can be longer than the design service life.

Table A.1 — Service life classes and design life of machinery components

service life class	design service life h	stresses				possible examples
		degree of stress	switch-on period	loading	speed	
1	–	insignificant	short	short	low	slewing drives, container-movement
2	10 000	low	short	medium	any	screens
3	20 000	normal	medium	high	any	screens
			long	medium	any	wheel drives for scrapers
4	50 000	high	long	long	any	drives for surface aerators, etc., bearings for rotary distributors
5	80 000	extremely high	long	long	any	as for service life class 4, but for particularly high stresses or under special installation conditions

These parameters are related to the effects on motors and other electrical components intrinsic to their operation. These parameters are selected to suit the requirements to be met by the component of the unit concerned. This does not invalidate other relevant specifications.

EXAMPLE Wheel drives for scraper are, in practice, very seldom stressed at the nominal rating (corresponding to the rolling resistance when all main loads are acting on the load side). For this reason, the effective service life of such an equipment can be assumed to be a multiple of the value of 20 000 h given in Table A.1. If, however, a scraper is to be operated continuously close to its nominal rating on the load side, than a correspondingly higher service life class is agreed.

In the case of other equipment where the average loading is nearer to the nominal rating on the load side, for example in the case of screens subjected to high loading, the running time, which is usually relatively short, is taken into account when assessing the design service life. If such equipment is loaded in continuous operation, a correspondingly higher service life class is agreed.

Annex B
(normative)

Structural tolerances

B.1 Circular tank

B.1.1 Circular tank with scraper

inner diameter of the tank: ± 0,03 m;

bottom contour: ± 0,03 m.

B.1.2 Circular tank with a scraper bridge travelling on the side wall (track)

inner diameter of the tank: ± 0,03 m;

bottom contour: ± 0,03 m;

inner and outer diameter of the track: ± 0,03 m.

B.2 Rectangular tank

distance of the side walls and tracks from the middle axis: ± 0,02 m;

distance of the tracks from each other: ± 0,02 m;

distance of the side walls from each other: ± 0,02 m;

bottom surface laterally: ± 0,01 m;

level of tracks a distance of 4 m: ± 0,02 m.

Only for suction type scraper and other non-swivelling scrapers:

depth of tank (bottom to track): ± 0,02 m.

Bibliography

The following documents contain details which can be used within the framework of this standard. This list was correct at the time of publication but should not be considered to be exhaustive.

European Standard

prEN 12255-14, Wastewater treatment plants — Part 14: Disinfection.

prEN 12255-16, Wastewater treatment plants — Part 16: Physical (mechanial) filtration. [4)]

4) in preparation

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