BRITISH STANDARD

BS EN
12904:2005

Products used for treatment of water intended for human consumption — Silica sand and silica gravel

The European Standard EN 12904:2005 has the status of a British Standard

ICS 71.100.80

National foreword

This British Standard is the official English language version of EN 12904:2005. It supersedes BS EN 12904:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CII/59, Chemicals for drinking water treatment, which has the responsibility to:

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Products used for treatment of water intended for human consumption - Silica sand and silica gravel

Produits utilisés pour le traitement de l'eau destinée à la consommation humaine - Sable et gravier de quartz

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Quarzsand und Quarzkies

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Foreword

This document (EN 12904:2005) has been prepared by Technical Committee CEN/TC 164 “Water supply”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

This document supersedes EN 12904:1999.

Significant technical differences between this edition and EN 12904:1999 are as follows:

a) correction of the data on chemical composition in table A.1;

b) use of the more appropriate terms “silica sand” and “silica gravel” throughout the standard;

c) deletion of the reference to EU Directive 80/778/EEC of 15 July 1980 in order to take account of the last Directive in force (see[1]).

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Introduction

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this document:

a) This document provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

NOTE Conformity with the document does not confer or imply acceptance or approval of the product in any of the Member States of the EU or EFTA. The use of the product covered by this document is subject to regulation or control by National Authorities.

1 Scope

This document is applicable to silica sand and silica gravel used for treatment of water intended for human consumption. It describes the characteristics of silica sand and silica gravel and specifies the requirements and the corresponding test methods for silica sand and silica gravel. It gives information on their use in water treatment.

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 12901:1999, *Products used for treatment of water intended for human consumption - Inorganic supporting and filtering materials – Definitions*.

EN 12902, *Products used for treatment of water intended for human consumption - Inorganic supporting and filtering materials - Methods of test*.

3 Terms, definitions and symbols

For the purpose of this document, the terms, definitions and symbols given in EN 12901:1999 apply.

4 Description

4.1 Identification

4.1.1 Chemical name(s)

Silica, silicon dioxide (SiO_2).

4.1.2 Synonym or common names

Silica sand and silica gravel.

4.2 Commercial forms

Silica sand and silica gravel according to this standard are available in different particle size ranges.

5 Physical properties

5.1 Appearance

The product is a grey/white, yellow or multicoloured granular material.

The structure is crystalline, with a smooth to rough texture. The particle shape is spherical or angular depending mainly on the origin and manufacturing procedure (quarrying or dredging, or crushing). The shape influences filtration performance, see A.3.

The product shall be generally homogeneous and shall be visibly free of extraneous matter.

5.2 Particle size distribution

The particle size distribution shall be described by either:

a) effective size: (d_{10}), with a maximum deviation of ± 5 %;

uniformity coefficient: (*U*), shall be less than 1,5;

minimum size : (d_1), with a maximum deviation of ± 5 %;

or:

b) particle size range and mass fraction of oversize and undersize particles according to application.

The maximum contents of oversize and undersize shall be a mass fraction of 5 % for the application of the product in multi media filters and a mass fraction of 10 % for use in single media filters. For use as a support layer, maximum contents of oversize and undersize of mass fraction of 15 % are acceptable. See A.2.3 for examples of available particle sizes that are used.

NOTE 1 The particle size can decrease during transportation and handling.

NOTE 2 Other values can be necessary for certain applications.

5.3 Density

5.3.1 Bulk density loose

The bulk density loose shall be in the range of 1 400 kg/m^3 to 1 700 kg/m^3.

5.3.2 Bulk density packed

The bulk density packed shall be in the range of 1 500 kg/m^3 to 1 900 kg/m^3.

6 Chemical properties

This document specifies the minimum purity requirements for silica sand and silica gravel used for the treatment of water intended for human consumption. Limits are given for impurities commonly present in the products. Depending on the raw material and the manufacturing process other impurities may be present and, if so, this shall be notified to the user and when necessary to relevant authorities.

NOTE Users of these products should check the national regulations in order to clarify whether it is of appropriate purity for treatment of water intended for human consumption, taking into account raw water quality, required dosage, contents of other impurities and additives used in the products not stated in this document.

Limits have been given for impurities and chemical parameters where these are likely to be present in significant quantities from the current production process and raw materials. If the production process or raw materials lead to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

Silica sand and silica gravel shall conform to table 1.

Table 1 - Composition of silica sand and silica gravel

		Limit in mass fraction in % of the product			
		Type 1	Type 2	Type 3	
				$d_{10} < 2$ mm	$d_{10} \geq 2$ mm
SiO_2	min.	96	80	80	80
Acid-soluble material	max.	2	2	5	10

NOTE 1 The contents of SiO_2 and acid-soluble material give information about the source of silica sand and silica gravel.

NOTE 2 Other potential components are given in A.2.1.

NOTE 3 After filling, washing and commissioning of a filter system producing drinking water the silica sand or silica gravel should not increase the concentrations of chemical parameters (see [1]).

NOTE 4 Water-extractable substances, determined in accordance with the method for granular materials given in EN 12902, can be used to estimate the leaching of the chemicals specified in EN 12902.

7 Test methods

7.1 Sampling

Prepare the laboratory sample(s) required by the relevant procedures described in EN 12902.

7.2 Analysis

7.2.1 Particle size distribution

The particle size distribution shall be determined on samples taken at the point of manufacture using the method of test given in EN 12902.

7.2.2 Bulk density loose

The bulk density loose shall be determined in accordance with EN 12902.

7.2.3 Bulk density packed

The bulk density packed shall be determined in accordance with EN 12902.

7.2.4 Content of silica

The content of silica shall be determined in accordance with EN 12902.

7.2.5 Acid-soluble material

The content of acid-soluble material shall be determined in accordance with EN 12902.

8 Labelling- Transportation -Storage

8.1 Means of delivery

Silica sand and silica gravel shall be delivered in bags, semi-bulk containers, or bulk.

In order that the purity of the product is not affected, the means of delivery shall not have been used previously for any different product or it shall have been specially cleaned and prepared before use.

8.2 Risk and safety labelling according to the EU Directives [1)]

Silica sand and silica gravel are not subject to labelling regulations at the date of publication of this document.

NOTE 1 Annex I of the Directive 67/548/EEC on Classification, packaging and labelling of dangerous substances and its amendments and adaptations in the European Union contains a list of substances classified by the EU. Substances not in this Annex I should be classified on the basis of their intrinsic properties according to the criteria in the Directive by the person responsible for the marketing of the substance.

NOTE 2 Additional national regulations could apply to the labelling of this product.

8.3 Transportation regulations and labelling

Silica sand and silica gravel are not classified as dangerous goods.

8.4 Marking

The marking shall include the following:

- name "silica sand” or “silica gravel", trade name, grade and type;
- net mass;
- name and the address of the supplier and/or manufacturer;
- statement "This product conforms to EN 12904".

8.5 Storage

8.5.1 Long term chemical stability

Silica sand and silica gravel can be stored for an unlimited period of time and shall be adequately protected from outside contamination.

1) See [2]

Annex A
(informative)

General information on silica sand and silica gravel

A.1 Origin

A.1.1 Raw material

Natural silica sand, silica gravel.

A.1.2 Manufacturing process

Silica sand and silica gravel are produced by quarrying, dredging or crushing, cleaning, drying, and sieving.

A.2 Typical properties

A.2.1 Chemical composition

The composition depends on the origin. Typical values (mass fraction) are given as an example in table A.1 (the main components are given in clause 6).

Table A.1 - Chemical composition

		Mass fraction in %		
Parameter		Type 1	Type 2	Type 3
Al_2O_3	≤	3	13	13
Fe_2O_3	≤	2	10	2
CaO	≤	1,5	1	5
K_2O	≤	2	4	1
Na_2O	≤	1,5	2	1

Mineralogical and petrological analyses give additional information.

A.2.2 Mechanical strength

The mechanical strength of silica sand and silica gravel is high.

Abrasion products consist of dust and small particles of material. They are formed during transportation, filling, and washing. Abrasion products are not completely removed by washing.

The existing methods for determination of abrasion do not lead to exact results regarding behaviour of filter media during operation. They can be used only for comparison of different filter media.

A.2.3 Examples of particle size distribution

Examples of particle size distribution described by different particle size ranges and a permissible mass fraction of oversize and undersized product are given in table A.2.

Table A.2 - Examples of particle size range

				Permissible mass fraction, % a)	
Particle size range mm				Undersize	Oversize
Silica sand	0,4	to	0,8	5	5
	0,5	to	1,0		
	0,6	to	1,18		
	0,63	to	1,0		
	0,71	to	1,25		
	0,85	to	1,7	10	10
	1,0	to	1,6		
	1,0	to	2,0		
	1,18	to	2,8		
	1,6	to	2,5		
Silica gravel	2,0	to	3,15		
	2,36	to	4,75		
	3,15	to	5,6		
	5,6	to	8,0	15	15
	6,7	to	13,2		
	8,0	to	12,5		
	8,0	to	12,5		
	12,5	to	16,0		
	13,2	to	26,0		

a) Generally the maximum permitted contents of undersize and oversize are a mass fraction of 5 % for application of the product as a filtration layer in multi media filters, a mass fraction of 10 % for use in single media filters and a mass fraction of 15 % for application as a support layer.

Other particle size ranges can be specified.

A.2.4 Density

A.2.4.1 Absolute density

The absolute density is generally in the range of 2,5 g/cm^3 to 2,8 g/cm^3.

A.2.4.2 Particle density dry

The particle density dry is generally in the range of 2,5 g/cm^3 to 2,8 g/cm^3.

A.2.4.3 Particle density wet

The particle density wet is generally in the range of 2,5 g/cm^3 to 2,8 g/cm^3.

A.3 Use

A.3.1 Function

Silica sand and silica gravel are used as filtering or supporting materials.

A.3.2 Specific amount

The amount of silica sand and silica gravel used depends on application. Filtration rate and filter media depth vary with the suspended matter content of the water to be filtered.

A.3.3 Means of application

Silica sand and silica gravel are used in open or closed, single or multi media, filters.

Silica sand is also used in "slow sand filtration" systems.

A.3.4 Secondary effects

The products have no secondary effects.

A.4 Hydraulic characteristics

A.4.1 Interstitial volume

The interstitial volume is approximately 0,4 (*V/V*). If used for calculations the interstitial volume should be measured.

A.4.2 Head loss in filtration

Head loss depends on size, shape and roughness of particles, filtration rate, filter bed depth, and water temperature.

A.4.3 Expansion in up-flow washing

The expansion during washing depends on flow rate, effective size, density, shape and roughness of particles, and water temperature.

A.5 Rules for safe handling and use

Silica sand and silica gravel are not hazardous products:

- it is recommended to avoid dust formation;

- when handling dry product the use of a dust mask is recommended, especially when using air conveying.

A.6 Emergency procedures

A.6.1 First aid

In case of contact with skin, it is recommended to wash with water.

In case of contact with eyes, it is recommended to flush with plenty of water.

In case of inhalation, it is recommended to move to fresh air.

A.6.2 Spillage

It is recommended to sweep up and to discard in a refuse container or repackage.

A.6.3 Fire

No special requirements are necessary.

Bibliography

[1] 98/83/EC, *Council Directive of 3 November 1998 on the quality of water intended for human consumption*.

[2] 67/548/EEC, *Council Directive of 27th June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances and its amendments and adaptations*.

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