INTERNATIONAL STANDARD

ISO 2591-1

First edition
1988-12-01

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Test sieving —

Part 1 : Methods using test sieves of woven wire cloth and perforated metal plate

Tamisage de contrôle —

Partie 1 : Modes opératoires utilisant des tamis de contrôle en tissus métalliques et en tôles métalliques perforées

Reference number
ISO 2591-1 : 1988 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2591-1 was prepared by Technical Committee ISO/TC 24, *Sieves, sieving and other sizing methods.*

This edition of ISO 2591-1 cancels and replaces in part ISO 2591 : 1973, of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Test sieving —

Part 1 : Methods using test sieves of woven wire cloth and perforated metal plate

0 Introduction

0.1 General considerations

Test sieving is used in many industries on a wide variety of materials and for different purposes. No single method of test sieving can be specified to cover the many applications, and certain industries have already produced specifications for sieving procedures which are incorporated in the appropriate International Standard for a limited application. Standardized series of nominal openings of test sieve media are specified in ISO 565, and standardized technical requirements on test sieves are standardized in ISO 3310.

ISO 2591 is intended as a guide to all who are responsible for deciding on test sieving procedures, including those concerned with specific materials, and it formulates general principles of sieving which may be applied to many natural and artificial materials.

The procedures given depend on the predominant size range of the particles in a sample, and it is recognized in this part of ISO 2591 that some materials are difficult to sieve and require specially developed techniques (see clause 4).

Test sieving may be undertaken

a) as part of a research project involving an investigation of the particle size of a material;

b) as part of a control procedure for the production of material where the particle size distribution is important;

c) as the basis of a contract for the supply of material specified to be within stated grading limits.

The principles to be followed in the sieving procedure will be similar in each case but the actual detail may vary considerably according to the purpose for which the results are required. For example, the main criterion for a sieve analysis undertaken for research purposes may be consistency in one laboratory, whereas for a procedure which forms part of a specification in a contract it may well be maximum reproducibility between laboratories consistent with reasonable cost of testing.

The accuracy required for quality control purposes may well be relatively low and the predominant factors could be low cost, maximum mechanization and speed in obtaining the result. A simplified procedure with a given operator and particular apparatus in one set-up may be found adequate for control purposes, even though the reproducibility of the procedure as used between different laboratories may not be very good.

0.2 Principles of sieving

A single test sieve separates a particular material into two fractions, of which one is retained by the sieving medium and the other of which passes through its apertures. When applied to particles of non-spherical shape the procedure is complicated by the fact that a specific particle with a size close to that of the nominal aperture size of the test sieve may pass through the apertures only when presented in a favourable position, and will not pass through when presented in other positions. As there is inevitably a variation in the size of the sieve apertures, prolonged sieving will cause the larger apertures to exert an unduly significant effect on the sieve analysis: the proportion of oversize apertures is limited by the specifications for test sieves. The procedure is also complicated in many cases by the presence of so-called "near aperture size" particles which cause blinding of the sieve apertures and reduce the effective area of the sieving medium.

The process of sieving may be divided into two stages: firstly, the elimination of particles considerably smaller than the sieve apertures, which could occur fairly rapidly, and secondly, the separation of "near aperture size" particles, which is a gradual process rarely reaching completion. Both stages require all particles put on the sieving medium to have the opportunity of passing through an aperture. Ideally, each particle should be presented individually to an aperture, as is permitted for the largest aperture sizes, but for most sizes this is impracticable. The effectiveness of a sieving technique depends on the amount of material (charge) put on a sieve and the type of movement imparted to the charge on the sieve.

If the charge is too large, the bed of material on the sieving medium will be too many particles deep to allow each one the opportunity of being presented to an aperture in the most favourable position in order for gauging to be completed in a reasonable time. The charge, therefore, is limited by a requirement on the maximum amount of material retained at the end of sieving appropriate to the aperture size of the test sieve. However, the sample to be sieved has to contain enough particles to be representative of the consignment, so a minimum size of sample is specified. In some cases, the sample will have to be subdivided into a number of charges if the requirement for preventing overloading of the sieves is to be satisfied.

The movement imparted to a sieve by hand can be adapted, by experience, to meet the needs of the material and the sieving medium; different techniques are required for particles of quite different size. A machine, however, is usually designed to impart a particular combination of movements, irrespective of the aperture size of the test sieve or the characteristics of the material, and may not be readily adaptable to be equally effective for different materials. Nevertheless, a machine does not get tired and moderate effectiveness may often be acceptable providing that sieving continues long enough.

When this part of ISO 2591 was being prepared, the alternatives of shaking the sieve by hand and by means of a machine were considered. Hand shaking by an experienced operator is generally more effective when sieving relatively coarse particles. For fine powders, however, the end point may be approached more rapidly, and certainly with less effort, by using one of the many mechanical and other sieving techniques now commercially available. Hand sieving and machine sieving are not mutually exclusive; machine sieving followed by a final brief hand sieving to ensure that the end point has been reached (see 7.2.7) may achieve the best results.

0.3 Correlation of results from different methods of size analysis

It may be necessary to combine size distributions determined by different methods, e.g. sieving, sedimentation, elutriation or microscopy. It is preferable to cover the range of a single distribution using a single method, but this is not always possible. A simple, but admittedly not a particularly accurate, procedure for establishing correlation factors for two different sizing techniques is to overlap the methods of size determination so that one or more size classes are assessed by both methods.

1 Scope and field of application

This part of ISO 2591 draws attention to and describes the main factors affecting test sieving and the results obtained; it also specifies general principles to be followed concerning apparatus, procedure and presentation of results.

It applies to methods in which test sieves of woven wire cloth or perforated metal plate are used. Test sieving methods using test sieves of electroformed sheet will form the subject of ISO 2591-2.

2 References

ISO 565, *Test sieves — Woven metal wire cloth, perforated plate and electroformed sheet — Nominal sizes of openings.*

ISO 2395, *Test sieves and test sieving — Vocabulary.*

ISO 3310, *Test sieves — Technical requirements and testing —*

Part 1: Test sieves of metal wire cloth.

Part 2: Test sieves of perforated metal plate.

Part 3: Test sieves of electroformed sheets. [1)]

3 Definitions

For the purposes of this part of ISO 2591, the definitions given in ISO 2395 apply.

4 Material to be sieved

4.1 General

Materials to be test sieved range from very coarse lumps, such as coal and stone, to very fine materials, such as pigments and clay; they differ in their physical and chemical properties. Information about the properties of a material is helpful in judging its sieving characteristics, and should be noted in the test report. The more important properties affecting sieving are dealt with in 4.2.

Because of the considerable variety of material properties encountered, it is not possible to specify a single method of test sieving which applies to all materials. The sieving method appropriate to a material should be stated in an International Standard or national standard, or in other specifications dealing with that material.

4.2 Physical and chemical properties

4.2.1 Density

The following kinds of density are important in test sieving:

a) effective particle density, which can affect the duration of sieving;

b) apparent bulk density, which can influence the quantity of material to be taken for sieving.

4.2.2 Friable nature

Some materials are liable to reduce in size during sieving because of their friable nature. This property should be taken into account in the handling of the material during sampling and test sieving.

4.2.3 Abrasive properties

Some materials, e.g. emery powders, are abrasive; these wear out the sieves and modify the apertures in the course of a prolonged sieving operation. It is desirable to ascertain whether or not the material is abrasive before commencing the test and to check the conformity of the apertures of the sieving medium against the specified tolerances.

1) At present at the stage of draft.