BS EN 15301-2:2007

Surfaces for sports areas —

Part 2: Determination of shear strength by dynamic top layer testing of unbound mineral surfaces in the laboratory

The European Standard EN 15301-2:2007 has the status of a British Standard

ICS 97.220.10

Confirmed February 2012

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 15301-2:2007.

The UK participation in its preparation was entrusted to Technical Committee PRI/57, Surfaces for sports areas.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2007

© BSI 2007

ISBN 978 0 580 50631 4

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15301-2

April 2007

ICS 97.220.10

English Version

Surfaces for sports areas - Part 2: Determination of shear strength by dynamic top layer testing of unbound mineral surfaces in the laboratory

Sols sportifs - Partie 2: Détermination par essai dynamique en laboratoire de la résistance au cisaillement de la couche supérieure des sols minéraux non liés

Sportböden - Teil 2: Bestimmung der Scherfestigkeit durch Prüfung der dynamischen Decklage von ungebundenen mineralischen Belägen im Laboratorium

This European Standard was approved by CEN on 24 February 2007.

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 CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

© 2007 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 15301-2:2007: E

Contents

Page

Foreword

This document (EN 15301-2:2007) has been prepared by Technical Committee CEN/TC 217 "Surfaces for sports areas", the secretariat of which is held by BSI.

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 October 2007, and conflicting national standards shall be withdrawn at the latest by October 2007.

EN 15301 *Surfaces for sports areas* consist of the following parts:

Part 1: Determination of rotational resistance

Part 2: Determination of shear strength by dynamic top layer testing of unbound mineral surfaces in the laboratory

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This part of EN 15301 specifies a method for determining the shear strength by dynamic top layer testing of unbound mineral surfaces in the laboratory.

2 Apparatus

The apparatus shall comprise the following components:

a) (250 ± 5) mm diameter mould with removable base;

b) steel plate used to distribute the compaction force (Figure 1);

c) compaction hammer with drop weight (Figure 1);

- mass of weight: (15,17 ± 0,25) kg;
- drop height: (620 ± 5) mm;

d) shearing disc (Figures 2, 3 and 4);

e) two shearing disc alignment gauges (Figures 2 and 3):

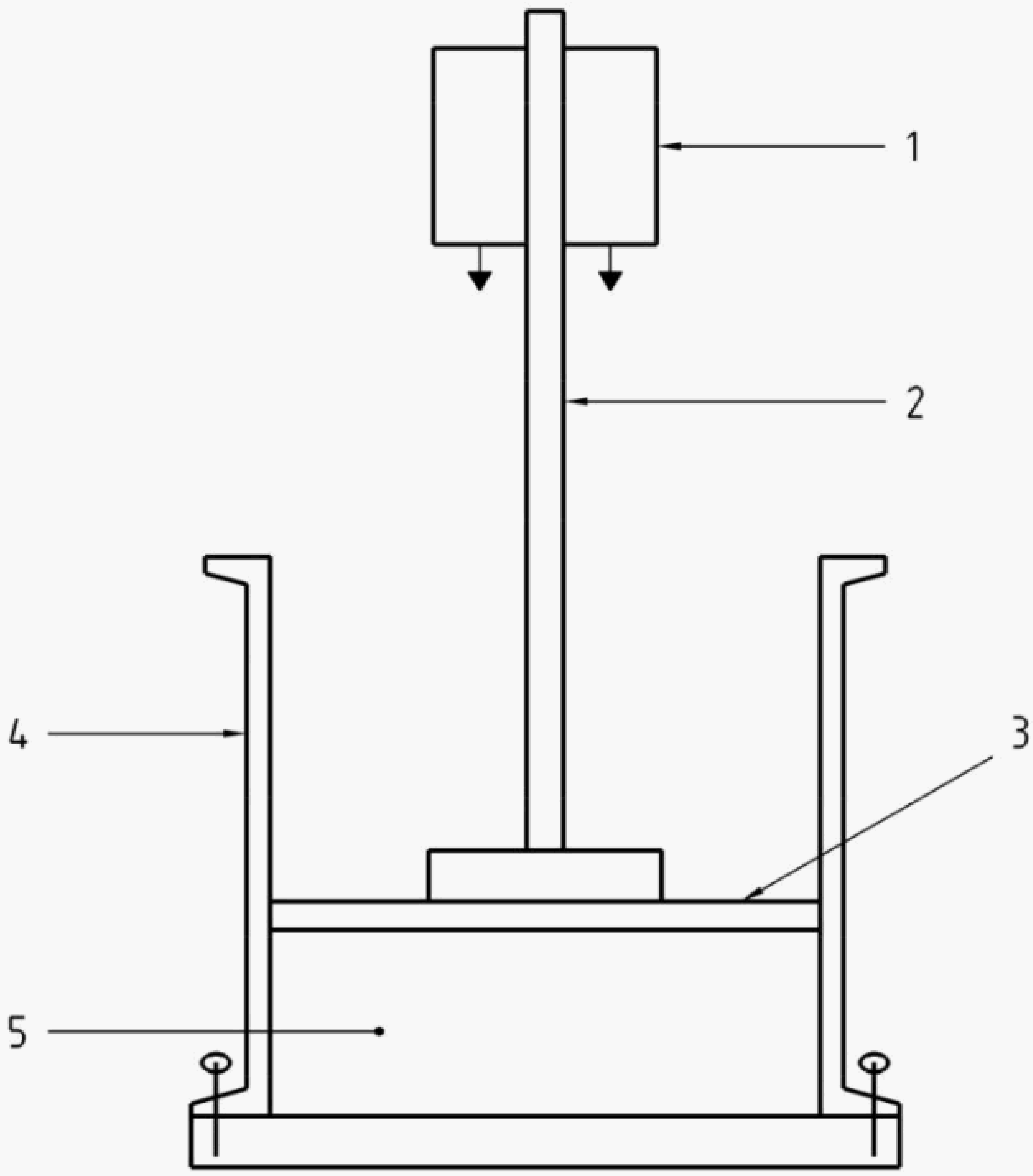
- centring gauge;
- vertical alignment gauge;

f) cardan shaft transmitting the force produced onto the disc (Figure 4);

g) device used to attach the measuring instrument to be installed on the test mould, with a vertical pin for the transmission of shear force by free rotation (Figure 4);

h) instrument for the dynamometric measurement of shear force by rotation (Figure 4);

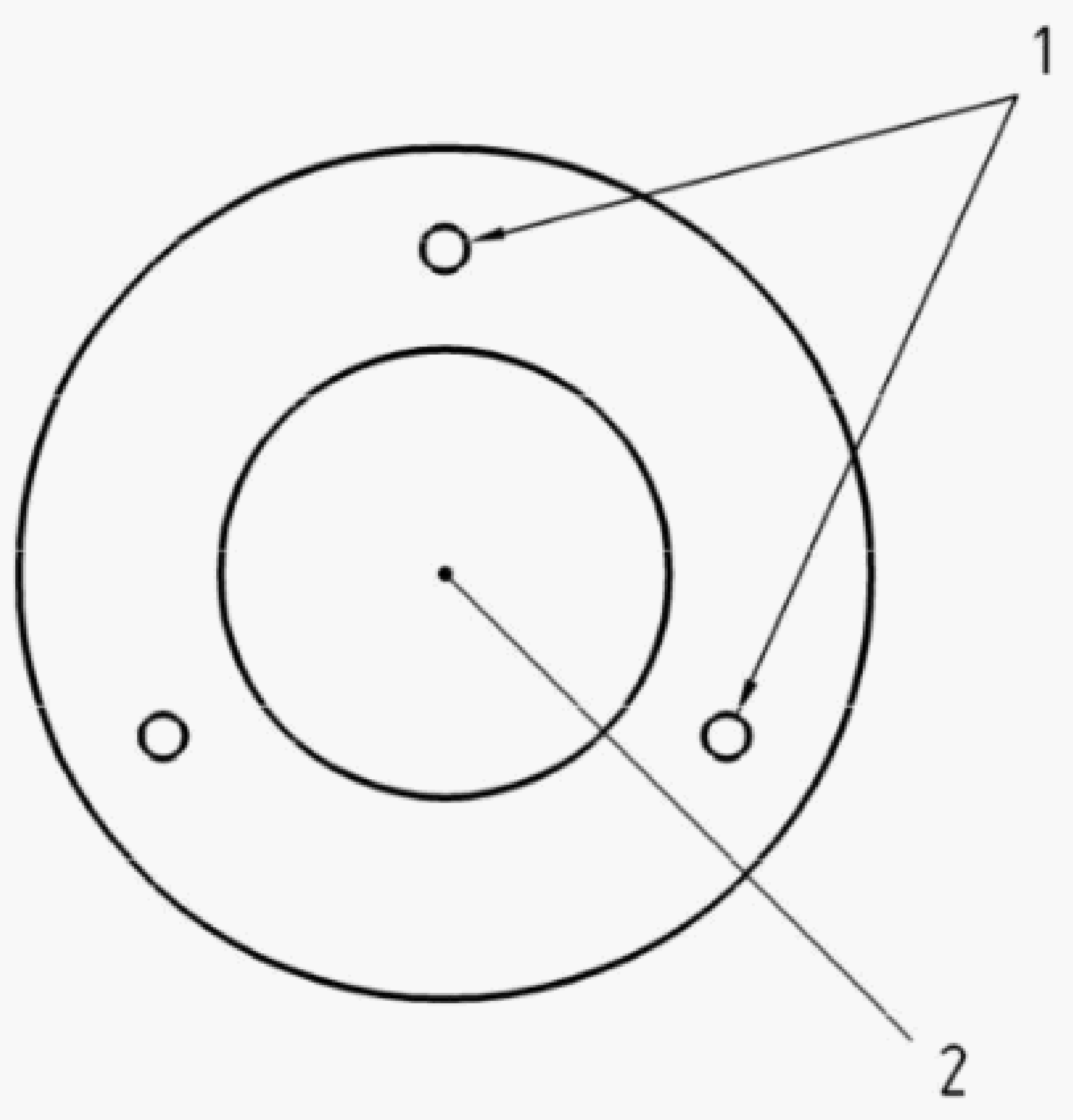
i) scales weighing up to 10 kg, to an accuracy of within ± 1 g.



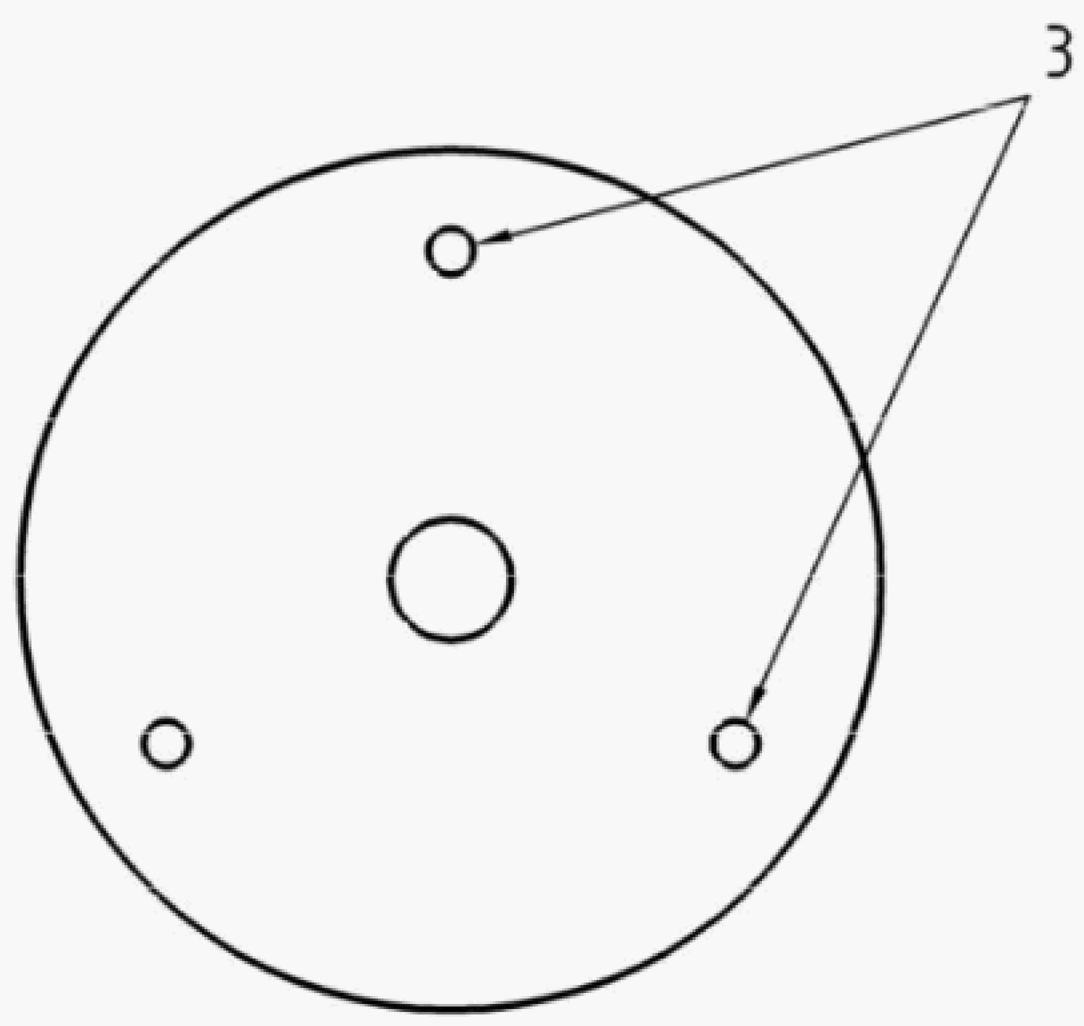
Key

1 drop weight
2 mass guide pin
3 steel plate
4 mould with removable baseplate
5 material

Figure 1 — Compaction of the sample in the test mould



a) Shearing disc centring gauge



b) Vertical alignment gauge

Key

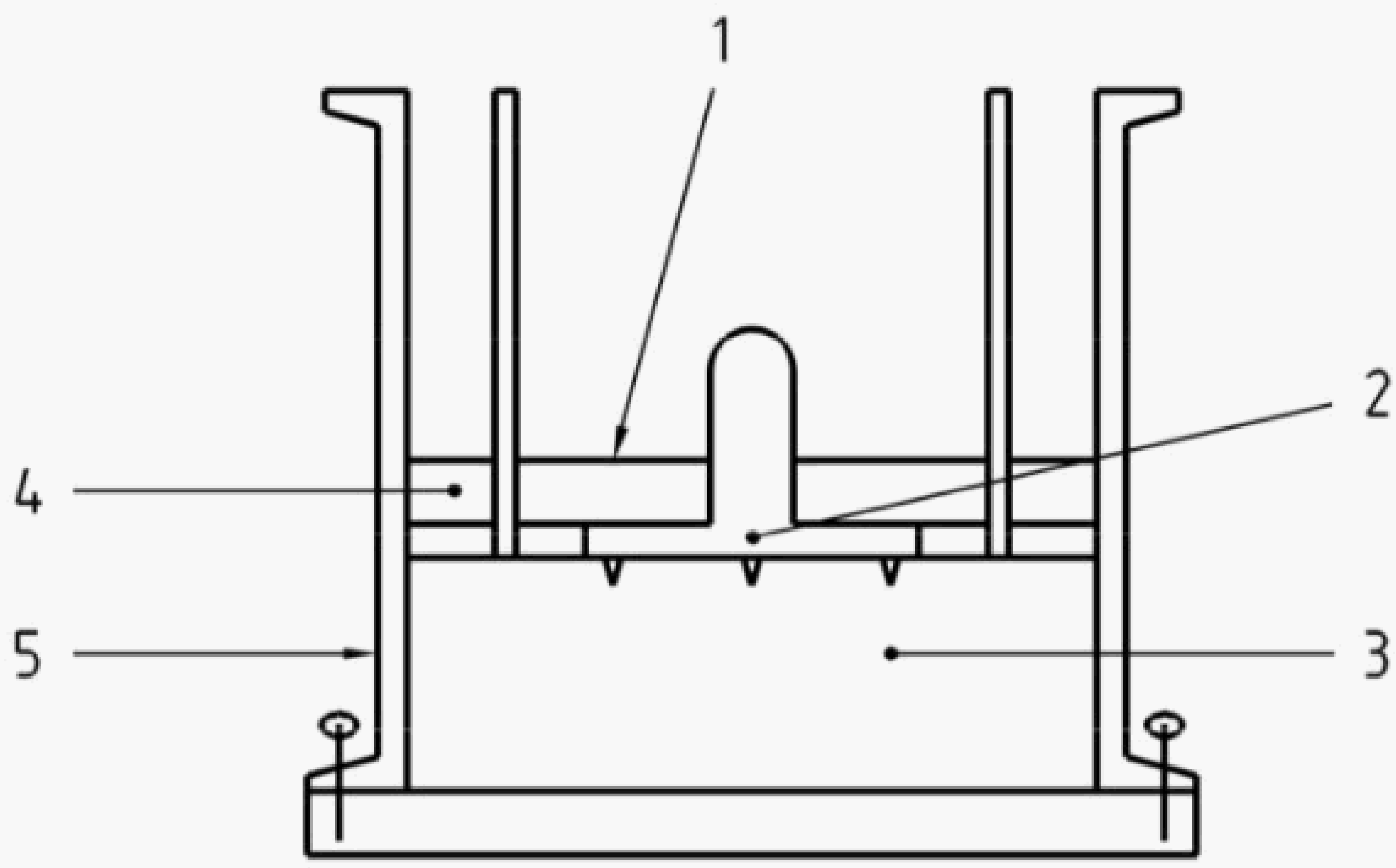
1 metal rod

2 shearing disc

3 positioning tube

NOTE The vertical alignment gauge tubes fit over the metal rods on the centring gauge.

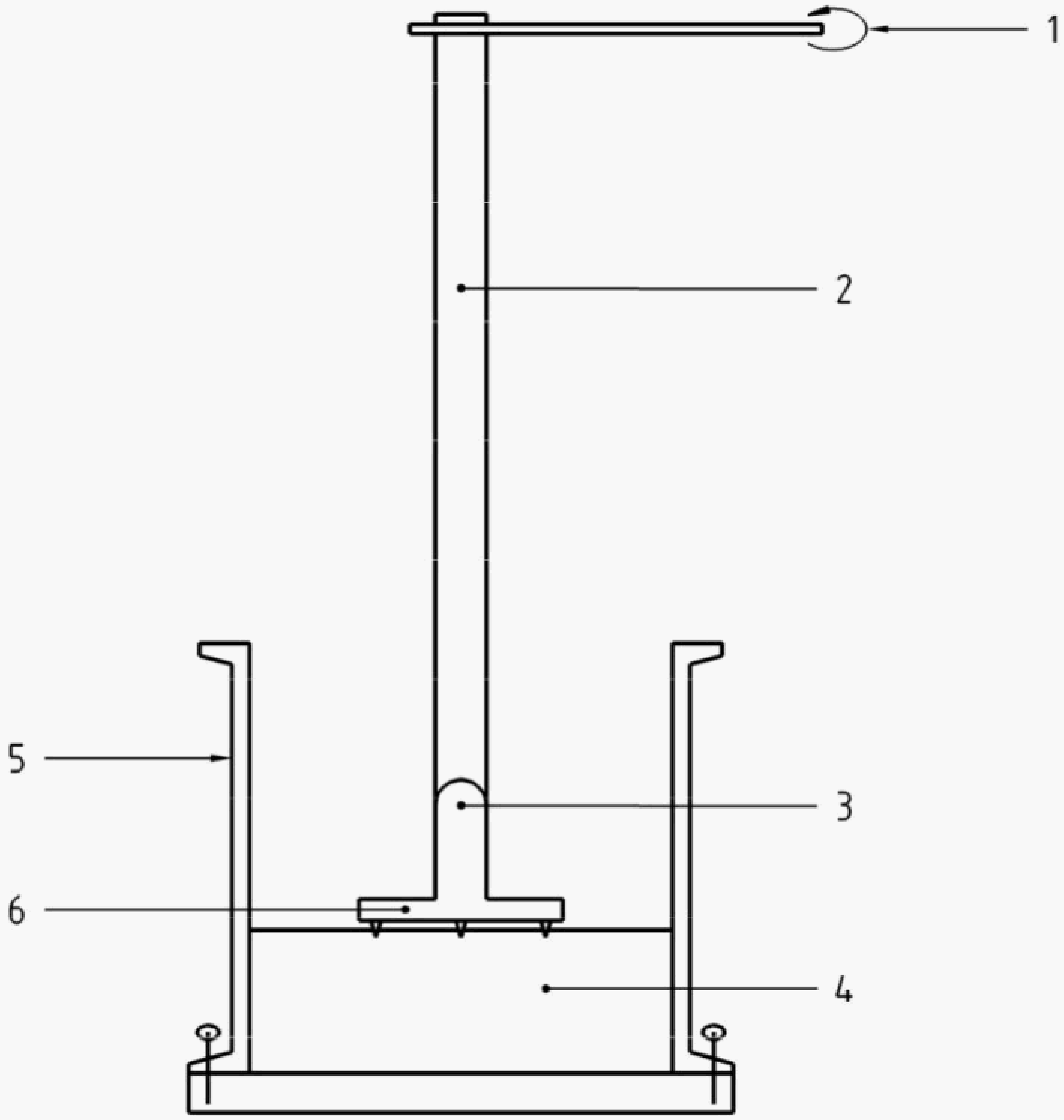
Figure 2 — Centring and alignment gauges



Key

1 vertical alignment gauge
2 shearing disc
3 compacted material
4 centring gauge
5 mould

Figure 3 — Shearing disc centring and adjustment



Key

1 shear force measuring instrument

2 rotation transmission rod

3 transmission cardan shaft

4 compacted material

5 mould with removable baseplate

6 shearing disc

Figure 4 — Shearing

3 Preparing the test specimen

Measure the water content of the material.

Take a sample weighing (4 000 ± 10) g in dry mass.

Moisten the sample to obtain 0,7 of the water content at the optimum Proctor test, W_{OPN}, then homogenize the mixture with a previously moistened stirrer. Leave the material in a watertight container for 16 h.

After 16 h, check the water content and adjust, if required.

Compact the sample, replacing the porous stone with the metal plate during compaction.

NOTE The purpose of the compaction process is to obtain a dry density of 95 % of the optimum density according to the normal Proctor test (the OPN density) on a thickness of 40 mm.

Composition of the test specimen shall be as follows:

D = diameter of the mould, i.e. D = 101,5 mm;

h = height of the test specimen, i.e. h = 40 mm;

W_e = test water content, i.e. $W_e = (0{,}7\ W_{OPN} \pm 1)$ %;

Q_{Pr} = optimum Proctor density of the material;

G_n = mass of the wet sample, expressed in grams.

Fixed data:

Proctor densities, expressed in g/cm^3;

optimum water content, expressed as a percentage

$$G_n = 0{,}95 Q_{Pr}\left(1+\frac{W_e}{100}\right)\times h\left(\frac{D^2}{4}\right)\times\pi$$, expressed in grams.

4 Producing the test specimen

Take three samples, wet mass G_n, and subject them to static compaction using a press, or to pseudo-dynamic compaction, as described in clause 3, after evening out and compressing the sample in the mould with a wooden or rubber ram.

5 Procedure

Slightly wet the test specimen material until its water content, W, is 0,7 W_{Pr} and compress it in the test cylinder until the optimum Proctor density of the material, Q_{Pr}, is obtained. To do this, divide the test specimen evenly into equal parts, place it in the mould and press it down gently using a rubber ram to separate the fine and coarse elements without crushing them. Place the steel plate, on which the impacts made by the compression device are evenly distributed, on the surface of the uncompressed test specimen. Remove a quantity of material so that, after compression, the height of the layer of the test specimen is 60 mm.

Calculate the quantity required for this purpose by using the following equation:

$$G_n = Q_{Pr}\left(1 + 0{,}7\frac{W_{Pr}}{100}\right) \times h \times A$$

where

G_n is the mass of the wet test specimen, expressed in grams;

Q_{Pr} is the optimum Proctor density of the material, expressed in grams per cubic centimetre;

W_{Pr} is the optimum water content, expressed as a percentage;

h is the height of the compressed test specimen, expressed in centimetres;

A is the area of a compressed sample, expressed in square centimetres.

After compression, turn and remove the steel plate. Remove any loose granular material from the surface of the test specimen. Insert the lower part of the built-in gauge and the shearing disc attached to its recess. Finally, place the upper part of the built-in gauge on top. Apply manual pressure to the upper part, causing the pins to penetrate the test specimen. In addition, apply pressure by hammering gently with the wooden ram to drive the upper part, and therefore also the shearing disc, down until the guide bolts of the lower part are flush with the copper tubes of the upper part (Figure 2).

Remove the built-in gauge, install the holding device, yoke and measuring instrument and attach them to the shearing disc (Figure 3).

Do not subject the shearing disc to any additional vertical load. Consequently, prior to shearing, ensure a vertical clearance of 0,3 mm to 0,5 mm for the shearing disc. Rotate the shearing disc evenly with the torque spanner so that after 1 s, the moment of torsion corresponds to a shearing tension of T_S = 50 kN/m^2. Maintain this load continuously for 2 s, then increase it steadily until it reaches breaking point. Record the maximum moment of torsion.

Carry out a minimum of three tests. Record the mean reading of three tests.

6 Results

Calculate the shear strength by rotation of the surface using the following equation:

$$T_s = \frac{M_{max}}{\pi \frac{D^2}{4}\left[H + \frac{D}{8}\right]}$$

where

T_S is the shear strength by rotation, expressed in kN/m^2;

M_{max} is the maximum moment of torsion, in kNm, for which the friction in the bearings shall be deducted from the reading;

D is the diameter of the shearing disc, expressed in metres;

H is the length of the pins, expressed in metres.

7 Test report

The test report shall include the following particulars:

a) reference and year of this European Standard, i.e. EN 15301-2:2007;

b) complete identification of the surface tested;

c) shear strength;

d) individual test results, if required;

e) details of any deviation from the procedure.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover.
Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001.
Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre.
Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration.
Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001.
Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

Details and advice can be obtained from the Copyright & Licensing Manager.
Tel: +44 (0)20 8996 7070. Fax: +44 (0)20 8996 7553.
Email: copyright@bsi-global.com.

BSI

389 Chiswick High Road

London

W4 4AL