مؤسسة المواصفات والمقاييس الأردنية

الرقم: م / عام / 20803
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معالي .....
عطوفة .....
سعادة .....

تحية طيبة وبعد،

أرجو معاليكم/عطوفتكم/ سعادتكم التكرم بالعلم بأن أسلوب العمل الفني المتبع في وضع المواصفات القياسية يقتضي تعميم مشروع التصويت على الجهات ذات العلاقة، وذلك لإبداء الرأي والتصويت عليه تمهيداً لعرضه على مجلس الإدارة لاعتماده كمواصفة قياسية أو قاعدة فنية أردنية.

لاحقًا لكتابنا رقم (م/عام/٦٢٨٧) تاريخ ٢٠٢٦/٣/١٨ بخصوص تعميم مشروع التصويت للمواصفة القياسية الأردنية ٤٥-٢٠٢٦/١ الخاص ببلاط التيرازو، **الجزء ١: بلاط التيرازو للاستعمال الداخلي**، أرفق لكم طيًا النسخة الثانية عن المشروع الذي أعدته اللجنة الفنية الدائمة لمنتجات مواد البناء رقم (٥٦)، علماً بأن اللجنة الفنية قامت بتعديلات فنية مظللة في المشروع المرفق.

يرجى التكرم بالإيعاز لمن يلزم بعرض هذا المشروع على المختصين لديكم وموافاتنا بردكم عليه خلال شهر من تاريخه، وذلك باستخدام بطاقة التصويت المرفقة، علماً بأنّ عدم الرد خلال هذه المدة يعتبر موافقة من قبلكم على المشروع المذكور.

وتفضلوا بقبول فائق الاحترام

المديـــر العـام بالوكالة

م. وفاء يوسف المومني

المرفقات : مشروع التصويت
: بطاقة التصويت

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نسخة/ أمين اللجنة الفنية م. بلقيس المكاوي
رب – ٢٠٢٦/١٠/١١

مؤسسة المواصفات والمقاييس الأردنية

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الإصدار الثالث

مشروع تصويت

(تبني معدّل)

بلاط التيرازو

الجزء ١: بلاط التيرازو للاستعمال الداخلي

Terrazzo tiles
Part 1: Terrazzo tiles for internal use

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مؤسسة المواصفات والمقاييس

المملكة الأردنية الهاشمية

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This Jordanian Standard cancels and replaces the same Jordanian Standard issued in 2009.

Foreword

The Jordan Institution for Standards & Metrology is the national standardization body in Jordan. The work of preparing Jordanian Standards is normally carried out by technical committees composed of the interested parties, which are involved in the scope of standard. All the interested parties have the right to vote on the draft Jordanian Standard during the enquiry stage, taking into consideration the importance of harmonizing Jordanian Standards with the International, regional or national standards (as much as possible) for the purpose of eliminating technical barriers to trade and facilitating the International trade.

Jordanian Standards are drafted in accordance with the rules given in the Jordanian Directive 1-2:2005, part 2: Rules for the structure and drafting of Jordanian Standards*.

The permanent technical committee for construction materials 2 has studied the Jordanian Standard 45-1:2009 related to **"Terrazzo tiles, Part 1: Terrazzo tiles for internal use"**, and the prepared project 45-1:2026 related to **"Terrazzo tiles, Part 1: Terrazzo tiles for internal use"** and has recommended to approve the project as a Jordanian Standard 45-1:2026, according to article (12) of standards and metrology law No. (22) for the year 2000 and its amendments.

This Jordanian Standard 45 includes the following parts under the same general title, **"Terrazzo tiles"**:
- Part 1: Terrazzo tiles for internal use.
- Part 2: Terrazzo tiles for external use.

This Jordanian Standard is a modified adoption of the European Standard 13748-1:2004 + A1: 2005**"Terrazzo tiles, Part 1: Terrazzo tiles for internal use"**, using reprint method, double vertical bars in the margins (‖) are used to indicate the incorporation of the amendments A1:2005 which is issued by the CEN into the text of the Jordanian Standard, while single vertical bars (|) in the margins are used to indicate the applicable technical modifications which have been changed and shown in annex NA, and single vertical dotted bars (⋮) in the margins are used to indicate the applicable editorial modifications which have been changed and listed below.

For the purpose of this Jordanian standard, the following editorial changes have been also made:
- Substitution of "this European Standard" by "this Jordanian Standard".
- The word "clause" has been added before the clause number in case of reference to certain clause.
- Substitution of "ISO 48" by "JS 508 ISO 48", to confirm with the updated published Jordanian Standard.
- Substitution of "EN 450" by "JS 10030-1 EN450-1", to confirm with the updated published Jordanian Standard.
- Substitution of "EN ISO 4288" by "EN ISO 21920-3", EN ISO 4288 has been withdrawn and replaced by EN ISO 21920-3.
- Deletion of "In general in Europe, water from the public supply is suitable." in clause 4-1-4, it is not applicable in Jordan because it is for the EU commission.
- Renumbering of clauses after deleting clause 4-2-4-3, Applying the Jordanian Directive 1-2:2005, part 2: Rules for the structure and drafting of Jordanian Standards.
- Deletion of "Breaking load" property row in table 5, due to the deletion of the clause 4-2-4-3 as mentioned in table NA –1.
- Deletion of annex ZA, it is not applicable in Jordan because it is for EU construction directive.
- Numbering of equations, Applying the Jordanian directive part 2: 1-2/2005 Rules For the structure and drafting of Jordanian standards.

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* under amendment.

Terrazzo tiles
Part 1: Terrazzo tiles for internal use

1- Scope

This Jordanian Standard specifies materials, properties and methods of testing for unreinforced cement-bound terrazzo tiles which are factory made and sold ready to be placed.
The tiles are intended for internal use.

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.
- ISO 4662, Rubber — Determination of rebound resilience of vulcanizates.
- ISO 6506-1, Metallic materials — Brinell hardness test, Part 1: Test method.
- ISO 7619, Rubber — Determination of indentation hardness by means of pocket hardness meters.
- ISO 8486-1, Bonded abrasives — Determination and designation of grain size distribution, Part 1: Macrogrits F4 to F220.
- EN 10083-2, Quenched and tempered steels, part 2: Technical delivery conditions for unalloyed quality steels.
- EN 13369:2004, Common rules for precast concrete products.
- EN ISO 21920-3, Geometrical product specifications (GPS) — Surface texture: Profile, Part 3: Specification operators (ISO 21920-3:2021).
- JS 30-1 Cement, Part1: Composition, specifications and conformity criteria for common cements.
- JS 115, Cement – White Cement.
- JS 508 ISO 48 Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).
- JS 2065, Standard specifications for concrete aggregates.
- JS 2133-2, Admixtures for concrete, mortar and grout, Part 2: Concrete admixtures — Definitions, requirements, conformity, marking and labeling.
- JS 10030-1 EN 450-1, Fly ash for concrete, Definitions, specifications and conformity criteria.

3- Terms and definitions

For the purposes of this Jordanian standard, the following terms and definitions apply:

3-1
terrazzo tiles
suitably compacted elements of uniform shape and thickness, which are compliant with this Jordanian standard. The tiles can be single – or dual – layered, They are either individually produced by compression and/or vibration, or cast as large cement-bound mineral aggregate sheets or blocks by means of vibration and/or compression and/or vacuum, before being cut to size

3-2
single-layered terrazzo tiles
terrazzo tiles made in a single homogeneous layer of granules or chippings of a suitable aggregate embedded in a paste of grey or white cement and water. Admixtures and additions can be used

3-3
dual-layered terrazzo tiles
terrazzo tiles made up of a facing or wear layer whose composition is similar to single-layered terrazzo tiles and a second layer known as backing or base concrete layer whose surface is not exposed during normal use and which in the case of a calibrated tile will be partially removed by specialized processing

3-4
work dimension
any dimension of a terrazzo tile specified for its manufacture to which the actual dimension should conform within specified permissible deviations
3-5
actual dimension
dimension of a terrazzo tile as measured
3-6
format
the dimensions of a terrazzo tile as specified in commercial terms, mostly in rounded figures
3-7
thickness
distance between the upper face and the bed face of the terrazzo tile
3-8
upper face
surface intended to be seen when in use
3-9
bed face
surface generally parallel to the upper face and in contact with the bedding after laying
3-10
facing layer
layer of concrete on the face of a tile of materials and/or properties different to the main body or backing layer of a terrazzo tile
3-11
slip resistance
property of the surface to maintain the adherence of a pedestrian foot
3-12
declared value
value for a requirement as declared by the manufacturer, taking into account the accuracy of the test and the variability of the manufacturing process
3-13
textured upper face
not flat upper face with a regular texture pattern

4- Requirements

Note: This Jordanian standard applies to ex-factory products and does not take into account the laying of the product.

4-1 Materials

4-1-1 General

Only materials with established suitability shall be used. The suitability requirements of the materials used shall be given in the manufacturer's production control documentation. The suitability of materials shall be established in terms of their properties and performance. Where, by conformity with relevant specifications, the properties and performance of materials have been demonstrated, further testing need not be performed.

4-1-2 Cement

JS 30-1 and JS 115 apply. The suitability of cement shall be established in accordance with clause 4-1-1.

4-1-3 Aggregates

JS 2065 applies. Natural stone or other aggregates may be used provided that their suitability has been assessed according to clause 4-1-1.

4-1-4 Mixing water

The suitability of mixing water shall be established in accordance with clause 4-1-1.

4-1-5 Admixtures

JS 2133-2 applies. The suitability of admixtures shall be established in accordance with clause 4-1-1.

4-1-6 Additions (including mineral fillers, pigments and polymers)

Where applicable, fly ash shall conform to JS 10030-1 EN 450-1. The suitability of the other additions shall be established in accordance with 4-1-1.

4-2 Finished product requirements

4-2-1 General

When tested in accordance with the methods described in clause 5, the tiles shall comply with the following requirements at the minimum age of 28 days or at the age declared suitable for use by the manufacturer if earlier.

4-2-2 Geometrical requirements

4-2-2-1 General

The work dimensions of the tiles shall be specified by the manufacturer.

4-2-2-2 Thickness

Thickness class I (Th I): The thickness of the facing layer of the manufactured tile shall be at least 4 mm for a product that will not be ground after laying.

Thickness class II (Th II): The thickness of the facing layer of the manufactured tile shall be at least 8 mm for a product that will be ground after laying.

Isolated particles of aggregates protruding into the facing material shall be ignored. No thickness requirements are applicable to single layered tiles.

4-2-2-3 Dimensional deviations

Individual tiles when tested in accordance with clause 5-2 shall conform to the manufacturer's declared work dimensions within the permissible deviations. These deviations of the actual dimensions from the declared work dimensions shall be in accordance with Table 1.

Table 1 — Deviation of actual dimensions

Dimension	Tolerance
Edge length	± 0,3 %
Thickness of the tile	± 2 mm (for a thickness < 40 mm) ± 3 mm (for a thickness ≥ 40 mm)

The difference between any two measurements of the thickness of a single tile shall be ≤ 3 mm.

Tiles specified as calibrated shall have a tolerance on thickness of ± 1 mm.

4-2-2-4 Shape tolerances

4-2-2-4-1 General

The format of the terrazzo tiles shall be specified by the manufacturer, including at least the length, the width, and the thickness. For non-square or non-rectangular tiles, the manufacturer shall also specify all the work dimensions that are required to define the tile.

4-2-2-4-2 Straightness of edges of the upper face

When measured in accordance with clause 5-3, the maximum discrepancy between the edge and the ruler shall not exceed ± 0,3 % of the length of the considered edge.

4-2-2-4-3 Flatness of the upper face

When measured in accordance with clause 5-4, no point shall deviate from the surface by more than 0,3 % of the length of the considered diagonal. This does not apply to textured upper faces.

4-2-3 Surface characteristics and appearance

In natural daylight and dry condition, no projections, depressions, flakes or crazes shall be visible from a distance of 2 m. Permanent filling of minor voids is allowed. Colourings, where applied, shall be provided in a facing layer or throughout the tile. Slight variations in the colour consistency between

batches of tiles can be caused by unavoidable variations in the shade and properties of cement and aggregates, by the manufacturing process or by time. The manufacturer shall define what he considers as a batch.

Note: Special attention should be given to correct storage of the tiles before placing them into the works.

4-2-4 Mechanical properties

4-2-4-1 Breaking strength/Load

The breaking strength/load shall be tested in accordance with clause 5-5.

4-2-4-2 Breaking strength requirements

The breaking strength is deemed sufficient when the tiles comply with the following requirements when tested in accordance with clause 5-5:

- the mean breaking strength of four specimens shall be more than or equal to 4,00 MPa; and
- no individual result of the failure stress shall be lower than 3 MPa.

4-2-4-3 Abrasion

Abrasion shall be verified in accordance with the wide wheel test method described in clause 5-6-1 (modified Capon test) which is the reference test; alternatively, the Böhme test method described in clause 5-6-2 may be used. The abrasion requirement is assumed satisfied:

- if no individual test result exceeds 25 mm, when tested in accordance with the wide wheel test (see clause 5-6-1, modified Capon test);
- if no individual test result exceeds 30 $cm^3/50\ cm^2$, when tested in accordance with the Böhme test (see clause 5-6-2).

4-2-5 Slip resistance

Used in the conditions they are intended for (in a dry state), terrazzo tiles for internal use have satisfactory slip resistance. If in an exceptional case the unpolished slip/skid resistance value (USRV) is required, the product shall be tested according to clause 5-7 and the result declared.

Note: The slip/skid resistance value relates to the tile as manufactured.

4-2-6 Water absorption

4-2-6-1 General

The water absorption shall be verified by testing in accordance with clause 5-8.

4-2-6-2 Water absorption requirements

The water absorption is assumed acceptable when both the following requirements are met:

- when tested in accordance with the method described in clause 5-8, the average of the three specimens shall not be more than 8 % and none of the individual results of the total water absorption shall be more than 9 % by mass;
- when tested in accordance with the method described in clause 5-8, none of the individual results of the water absorption through the tile face shall be greater than 0,4 g/cm^2.

4-2-7 Reaction to fire

Terrazzo tiles are considered to be reaction to fire Class A1fL without the need for testing, according to EC Decision 96/603/EEC,as amended.

4-2-8 Thermal conductivity

If terrazzo tiles for internal use are intended to contribute to the thermal performance of an element, the manufacturer shall declare their thermal properties using data given in Table L-2 of EN 13369:2004.

5- Physical test methods

5-1 Sampling plan and compliance criteria

Table 2 details the sampling and compliance criteria for the testing of each requirement.

Table 2 — Sampling plan and compliance criteria for initial and further type testing

Property	Requirements	Testing method	Number of tiles	Compliance criteria
Appearance, Dimensions and shape	4-2-2 and 4-2-3	5-2 , 5-3 and 5-4	8 [a)]	4-2-2 and 4-2-3 Each tile shall meet the requirements
Breaking strength	4-2-4-2	5-5	4	See 4-2-4-2
Abrasion resistance	4-2-4-4	5-6	3	See 4-2-4-4
Slip/skid resistance (only where tested)	4-2-5	5-7	5	The mean of the five tiles shall be declared
Water absorption	4-2-6	5-8	3	See 4-2-6-2
[a)] These tiles may be used for subsequent tests.				

5-2 Dimensional deviations

5-2-1 Apparatus

A steel rule with an accuracy of 0,5 mm. calipers with an accuracy of 0,1 mm.

5-2-2 Procedure

The dimensions shall be measured at 3 points. The maximum and minimum values shall be recorded.

5-3 Straightness of edges

5-3-1 Measuring device

A set of feeler gauges with an accuracy of 0,1 mm.

5-3-2 Testing method

The ruler is placed along the edge and the maximum discrepancy, i.e, between the edge and the ruler is noted (see Figure 1).

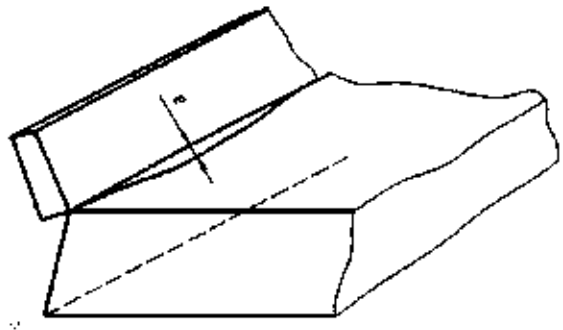


Figure 1 — measurement of edge straightness

5-4 Flatness of the upper face

5-4-1 Measuring device

Measuring equipment with an accuracy of 0,1 mm.

5-4-2 Testing method

The maximum convex or concave deviations shall be determined along the two diagonal axes of the upper face (see Figure 2).

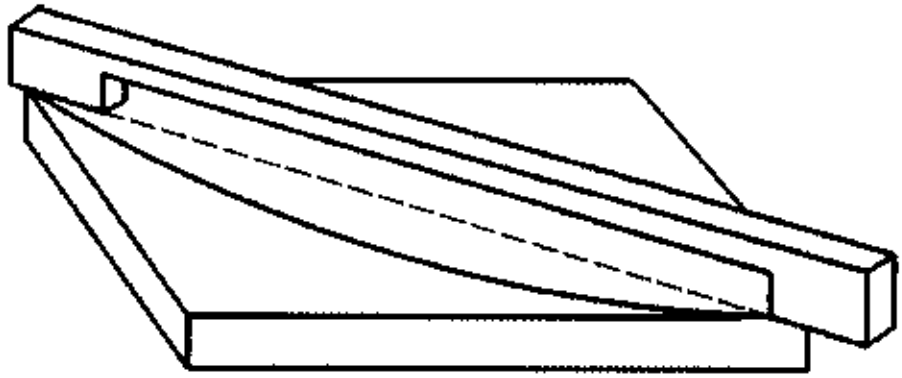
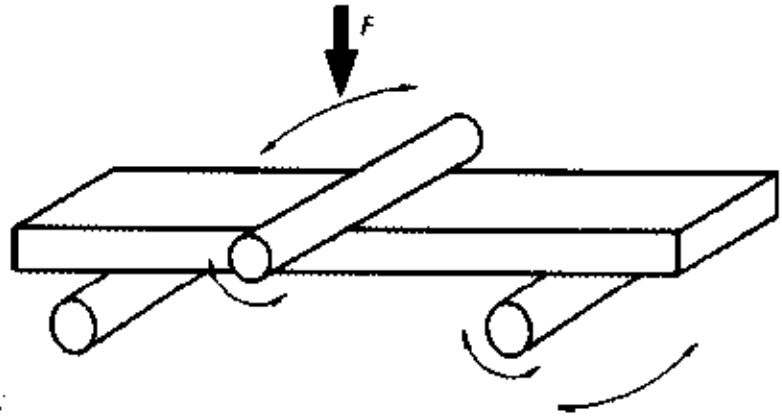


Figure 2 — Measurement of upper face flatness

5-5 Breaking strength and breaking load

5-5-1 Apparatus

The transverse testing machine shall have a scale with an accuracy of ± 3 % over the range of the anticipated test loads and be capable of increasing the load at specified rates. It shall be constructed in such a way that it can induce 3 point bending into the sample without torsion. The load inducing bar shall be equidistant between the supports. The length of the supports and the load inducing bar shall be at least equal to the width of the sample to be tested (see Figure 3). The upper and lower bearers shall be parallel and rigid, and round or rounded to a radius of (20 ± 1) mm. If packing pieces are used, they shall be medium density fiberboard and their width shall not exceed 25 mm. Their thickness shall be (4 ± 1) mm and they shall be approximately 10 mm longer than the size of the specimen's plane.



Key
F: load

Figure 3 — Principle of testing

The actual span between the bearers shall be within 0,5 % of the specified span rounded to the nearest millimeters.

5-5-2 Preparation

Use whole tiles when their plan shape includes at least two parallel straight edges. In other cases, use sawn samples with the largest possible plan area which includes two parallel straight edges.

If necessary, remove any burrs, high spots, etc. Immerse the tiles under water at (20 ± 5) °C for (24 ± 3) h, remove, wipe dry and test immediately. If a face is rough, textured or curved, prepare it by grinding or capping until fully flat. Other methods of preparation may be used for routine testing

providing there is a correlation between the results of the two methods, e.g. using unground rough, textured or curved tiles instead of ground tiles.

5-5-3 Procedure

The distance between the supports shall be 2/3 of the length of the tile, with an accuracy of ± 0,5 %. Place the sample with its upper face uppermost, symmetrically on the bearers of the testing machine and with its shorter side parallel to the supporting bearers. Depending on the surface profile of the tile any one of the following shall be used at the discretion of the manufacturer:

- No packing;
- Packing;
- Capping or grinding.

Apply the load without shock and increase the load uniformly so that the required load is reached within (45 ± 15) s.

5-5-4 Testing of non-rectangular tiles

Non rectangular tiles should be cut to be rectangular.

5-5-5 Calculation of results

Calculate the strength T (in MPa) of the tile tested from the equation:

$$T = \frac{3 \times P \times L}{2 \times b \times t^2} \quad \text{..... (1)}$$

where

T: strength, in MPa.

P: breaking load, in N.

L: distance apart of the supports, in mm.

b: width of the tile at the failure plane, in mm.

t: thickness of the tile at the failure plane, in mm.

Record the individual result T in MPa and the breaking load in kN.

5-5-6 Test report

Report the strength of the specimens and their mean value to the nearest 0,1 MPa and their breaking load to the nearest 0,1 kN.

5-6 Abrasion resistance

5-6-1 The wide wheel abrasion test

5-6-1-1 Principle of wide wheel abrasion test

The test is carried out by abrading the upper face of a tile with an abrasive material under standard conditions.

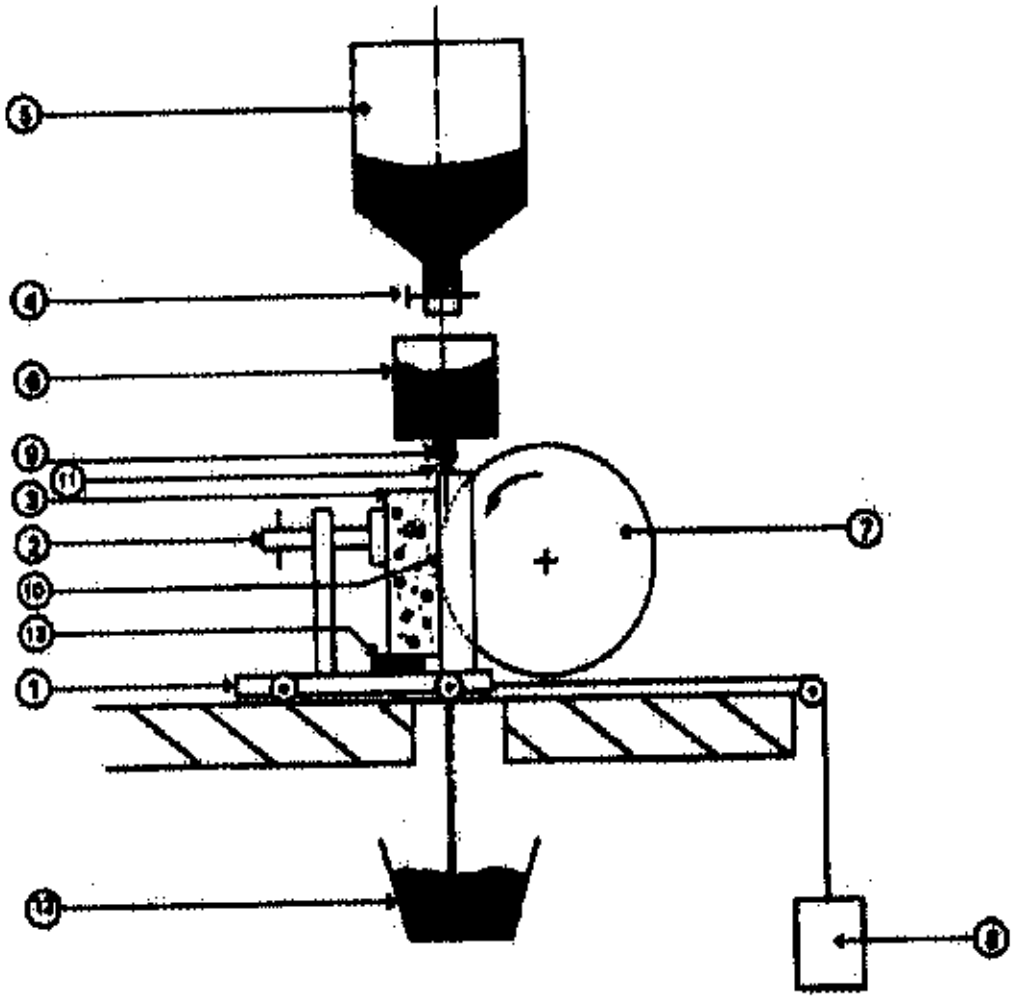
5-6-1-2 Abrasive material

The abrasive required for this test consists of a material comprising fused white fused alumina with a grit size of 80 in accordance with ISO 8486-1. It shall not be used more than three times.

5-6-1-3 Apparatus

The wearing machine (see Figure 4) is essentially made of a wide abrasion wheel, a storage hopper with one or two control valves to regulate the output of the abrasive material, a flow guidance hopper, a clamping trolley and a counterweight.

When two valves are used, one shall be used to regulate the rate of flow and can be permanently set while the other is used to turn the flow on and off.



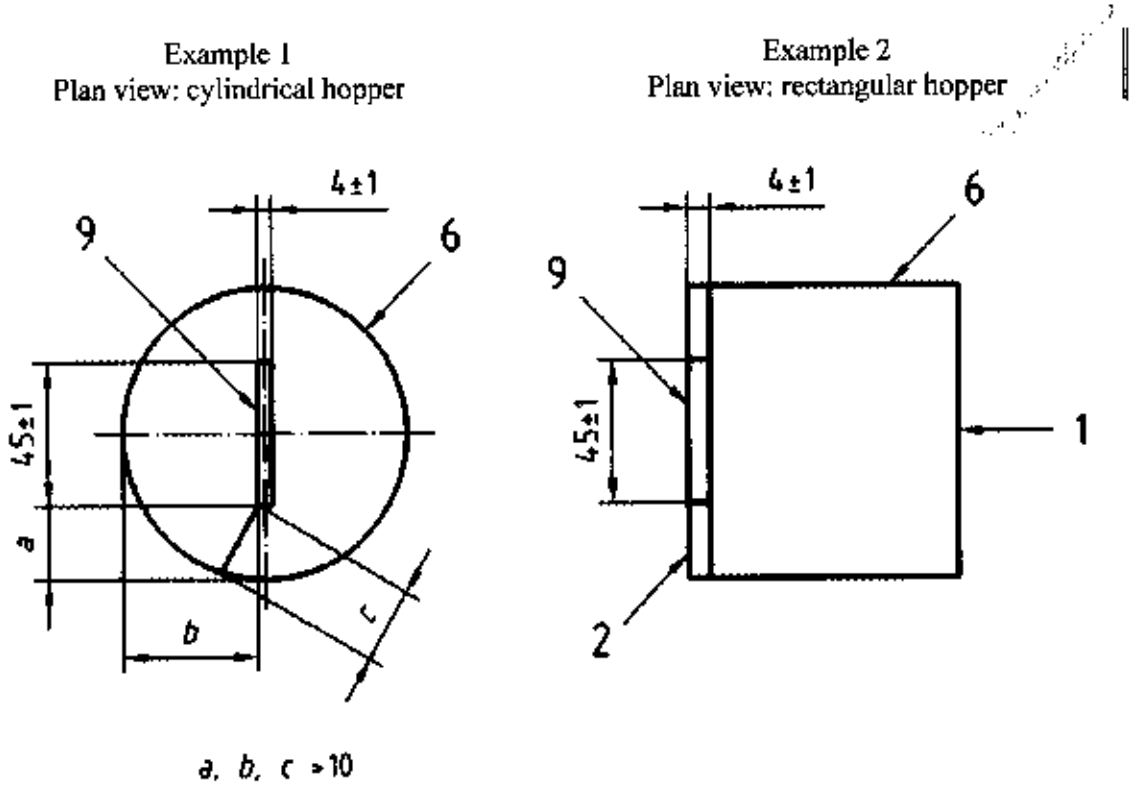
Key
1: Clamping trolley
2: Fixing screw
3: Specimen
4: Control valve
5: Storage hopper
6: Flow guidance hopper
7: Wide abrasion wheel
8: Counterweight
9: Slot
10: Groove
11: Abrasive material flow
12: Abrasive collector
13: Wedge

Figure 4 — Principle of wearing machine

The wide abrasion wheel shall be made of steel E360 in accordance with EN 10083-2. The hardness of the steel shall be between 203 HB and 245 HB. Its diameter shall be (200 ± 1) mm and its width shall be (70 ± 1) mm. It shall be driven to rotate 75 revolutions in (60 ± 3) s.

A mobile clamping trolley is mounted on bearings and forced to move forwards to the wheel by a counterweight. The storage hopper containing the abrasive material feeds a flow guidance hopper. The flow guidance hopper may be cylindrical and shall have a slotted outlet (see Figure 5, example 1). The length of the slot shall be (45 ± 1) mm and the width shall be (4 ± 1) mm. The body of the flow guidance hopper shall be at least 10 mm bigger than the slot in all directions. In the case of a rectangular hopper with at least one of the sides inclined down to the length of the slot, these dimensional limitations are not necessary (see Figure 5, example 2).

Dimensions in millimeters

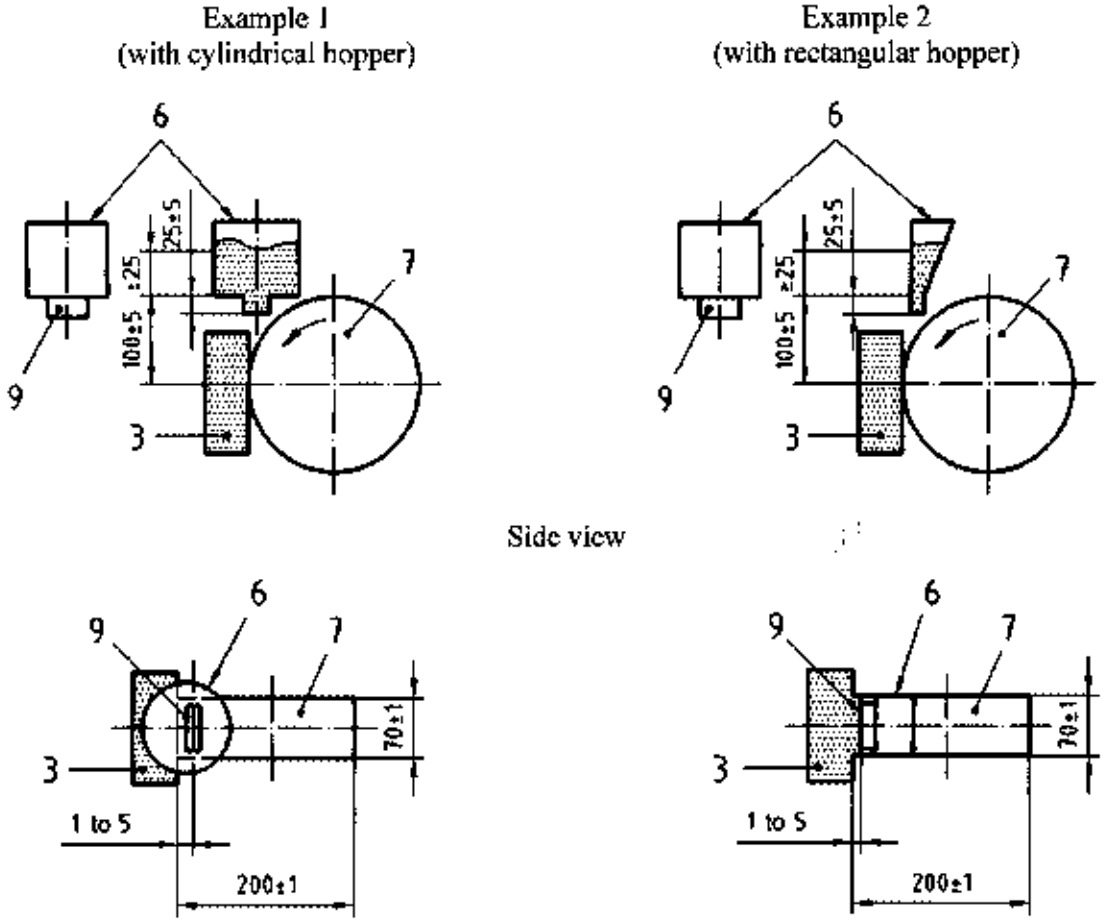


Key
1: Inclined side
2: Vertical side
6: Flow guidance hopper
9: Slot

Figure 5 — Position of slot in the base of the flow guidance hopper

The distance of the fall between the slot and the axle of the wide abrasion wheel shall be (100 ± 5) mm and the flow of the abrasive shall be (1-5) mm behind the leading edge of the wheel (see Figure 6).

Dimensions in millimeters



Key
3: Specimen
6: Flow guidance hopper
7: Wide abrasion wheel
9: Slot

Figure 6 — Position of slot relative to wide abrasion wheel

The flow of the abrasive material from the flow guidance hopper shall be at least at a minimum rate of 2,5 L per minute onto the wide abrasion wheel. The flow of abrasive shall be constant and the minimum level of the abrasive in the flow guidance hopper shall be 25 mm (see Figure 6).
Useful utensils for measuring the results are a magnifying glass, preferably equipped with a light, a steel ruler and a digital calliper.

5-6-1-4 Calibration

The apparatus shall be calibrated after grinding 400 grooves or every two months whichever is the lesser and every time there is a new operator, a new batch of abrasive, or a new abrasion wheel.
The abrasive flow rate shall be verified by pouring the material from a height of approximately 100 mm into a pre-weighed rigid container with a smooth rim, of height (90 ± 10) mm and of known volume when filled to the top, this shall be approximately 1 L. As the container fills up, the pourer shall be raised to maintain approximately the 100 mm fall. When the container is filled, the top shall be struck off level and weighed to determine the mass of abrasive for a known volume, i.e. the density.

The abrasive shall be run through the wearing machine for (60 ± 1) s and collected below the abrasion wheel in a pre-weighed container of at least 3 L capacity. The filled container shall be weighed and from the density determined above, the rate of abrasive flow can be verified as more than or equal to 2,5 L per minute. The apparatus shall be calibrated against a reference sample of "Boulonnais Marble"[1] according to EN ISO 21920-3 and using the procedure in clause 5-6-1-6 and the counterweight adjusted so that after 75 revolutions of the wheel in (60 ± 3) s the length of the groove produced is (20,0 ± 0,5) mm. The counterweight shall be increased or decreased to increase or decrease the groove length, respectively. The clamping trolley/counterweight assembly shall be checked for undue friction. The groove shall be measured using the procedure in clause 5-6-1-7 to the nearest 0,1 mm and the three results averaged to give the calibration value. An alternative material may be used for the reference sample if a good correlation is established with a reference sample of "Boulonnais Marble". At every calibration of the apparatus the squareness of the sample supports shall be checked. The groove on the reference sample shall be rectangular with a difference between the measured length of the groove at either side not exceeding 0,5 mm. If necessary check that:

- the sample has been held square to the wheel.
- the clamping trolley and the slot from the flow guidance hopper are parallel to the wheel axle.
- the flow of abrasive is even across the slot.
- the friction in the trolley/counterweight assembly is not undue.

5-6-1-5 Preparation of the specimen

The test specimen shall be a whole product or a cut piece measuring at least (100 × 70) mm incorporating the upper face of the unit. The test piece shall be clean and dry. The upper face, to be tested, shall be flat within a tolerance of ± 1 mm measured in accordance with clause 5-4 in two perpendicular directions, but over 100 mm. If the upper face is outside this tolerance, it shall be ground to produce a smooth flat surface within tolerance. Immediately before testing, the surface to be tested shall be cleaned with a stiff brush and covered with a surface dye to facilitate measuring the groove (e.g. painting with a marker pen).

5-6-1-6 Procedure

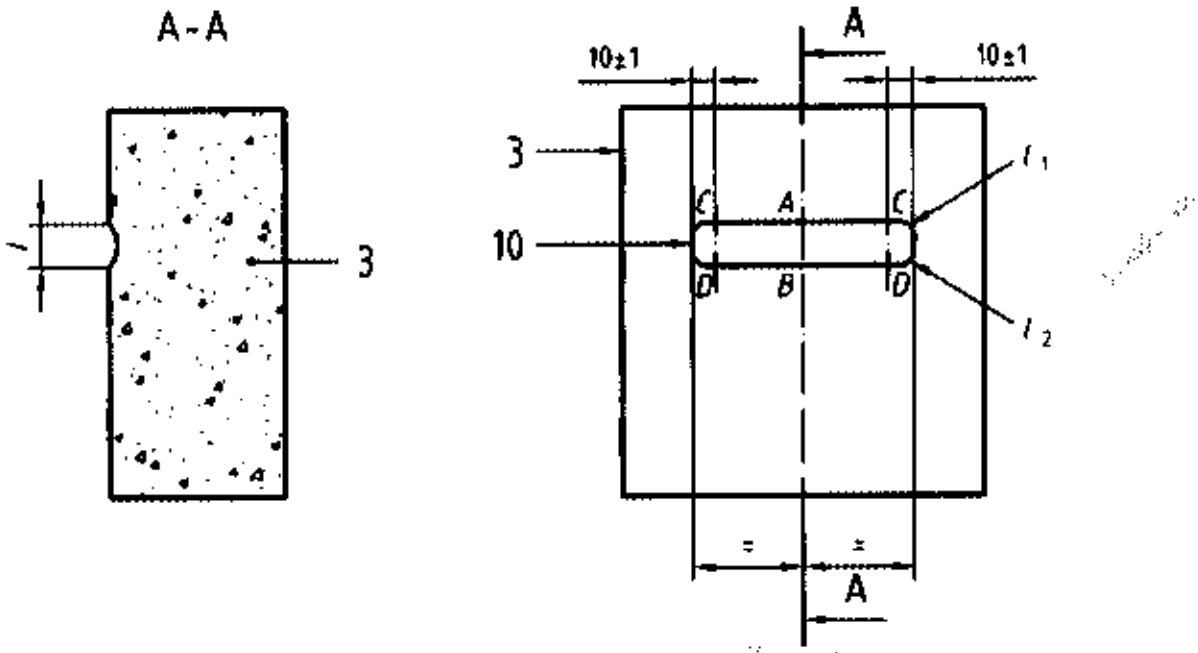
Fill the storage hopper with dry abrasive material, moisture content not exceeding 1,0 %. Move the clamping trolley away from the wide abrasion wheel. Position the specimen on it so that the groove produced is at least 15 mm from any edge of the specimen and fix the specimen on a wedge to let the abrasive flow pass under it. Place the abrasive collector beneath the wide abrasion wheel. Bring the specimen into contact with the wide abrasion wheel, open the control valve and simultaneously start the motor so that the wide abrasion wheel achieves 75 revolutions in (60 ± 3) s. Visually check the regularity of the flow of the abrasive material during the test. After 75 revolutions of the wheel, stop the abrasive flow and the wheel. Whenever possible, two tests shall be performed on each specimen.

5-6-1-7 Measuring the groove

Place the specimen under a big magnifying glass nominally at least 2 times magnification and preferably equipped with a light to facilitate the measuring of the groove. With a pencil with a lead diameter of 0,5 mm and hardness 6H or 7H, draw the external longitudinal limits (l_1 and l_2) of the groove using a ruler (see Figure 7). Then draw a line (A B) in the middle of the groove perpendicular to the centreline of the groove. Position a digital calliper with square tips on the points A and B to the inside edge of the longitudinal limits (l_1 and l_2) of the groove and measure and record the dimension to the nearest ± 0,1 mm. Repeat the measurement (10 ± 1) mm from the ends of the groove (C D) to give three readings

[1] The "Boulonnais Marble" reference is: Lunel demi-clair, thickness: 5 cm, c/passe 2 faces ground with a diamond grit size 100/120, rugotest class N7 (Ra 1,6 μ m) in accordance with ISO 4288.

Dimensions in millimeters



Section A-A Face view

Key
3: Specimen
10: Groove

Figure 7 — Example of a tested specimen showing a groove

Note: Some surface dyes can be removed above the groove by action of the abrasive. This should be ignored in producing line l_1 which should be drawn where the sample surface is abraded.

5-6-1-8 Test result

The result is the dimension corrected by a calibration factor and then rounded to the nearest 0,5 mm. The calibration factor is the arithmetic difference between 20,0 and the recorded calibration value. For example, if the calibration value is 19,6 mm and the dimension is 22,5 mm, the result is 22,5 + (20,0 - 19,6) = 22,9 mm, rounded to 23,0 mm. If two grooves have been cut in a specimen, the larger value shall be taken as the result.

5-6-1-9 Test report

The test report shall include the length(s) of the groove(s).

5-6-2 Böhme test method

5-6-2-1 Principle

Square sheets or cubes are placed on the Böhme disk abrader, on the test track of which standard abrasive is strewn, the disk being rotated and the specimens subjected to an abrasive load of 294 N for a given number of cycles (see clause 5-6-2-5).

The abrasive wear is determined as the loss in specimen volume.

5-6-2-2 Abrasive material[2)]

The standard abrasive used shall be an artificial corundum designed to produce an abrasive wear of 1,10 mm to 1,30 mm when testing standard granite specimens and of 4,20 mm to 5,10 mm when testing standard limestone specimens. Compliance with these requirements, the homogeneity of the material and the uniformity of bulk density and grading of the abrasive shall be checked.

[2)] Source where information can be obtained: Materialprüfungsamt Nordrhein-Westfalen, Marsbruchstrasse 186, D-44287 Dortmund, Germany.

5-6-2-3 Apparatus

5-6-2-3-1 Thickness measuring device

To establish the reduction in thickness, a dial gauge, the plunger of which shall have a spherical bearing and an annular contact face of 8 mm outside and 5 mm inside diameter, and a measuring table, shall be used.

5-6-2-3-2 Disk abrader

The Böhme disk abrader as shown in Figure 8 consists essentially of a rotating disk with a defined test track to receive the abrasive, a specimen holder and a loading device.

Rotating disk: The rotating disk shall have a diameter of approximately 750 mm and be flat and positioned horizontally. When loaded, its speed shall be (30 ± 1) revolutions per minute. The disk shall be provided with a revolution counter and a device that switches off the disk automatically after 22 revolutions.

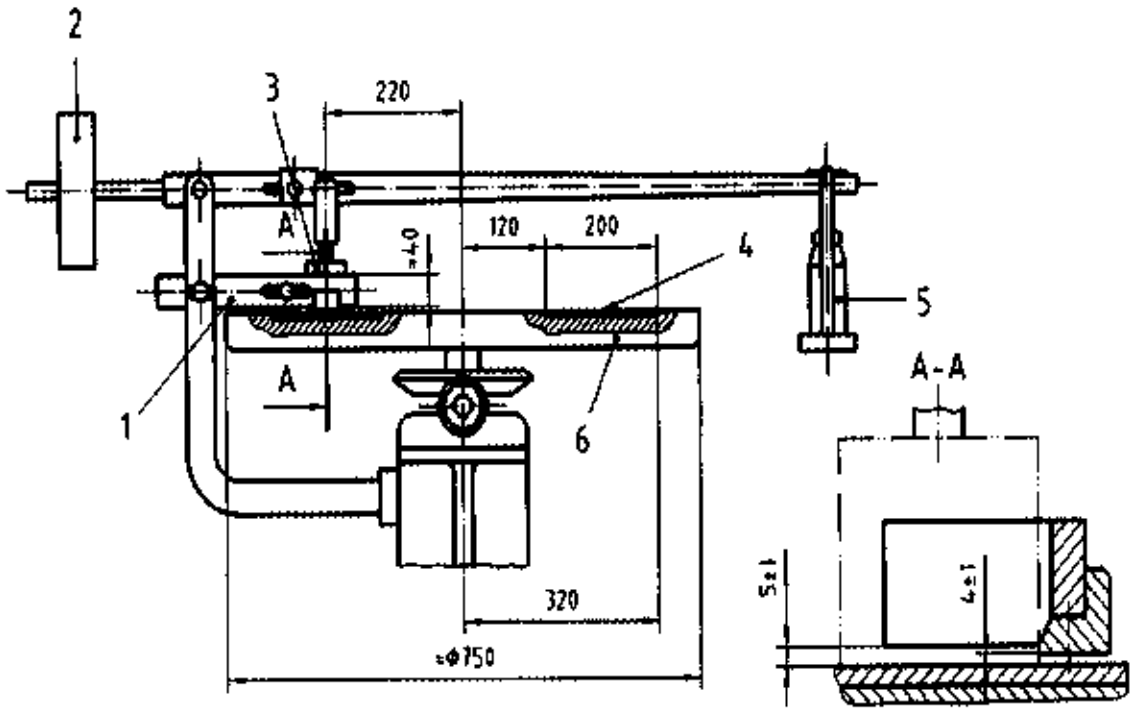
Test track: The test track shall be annular, with an inside radius of 120 mm and an outside radius of 320 mm (i.e. be 200 mm wide), and be replaceable.

The track shall be made of cast iron with a perlitic structure, a phosphorus content not exceeding 0,35 % and a carbon content of more than 3 %. The track shall have a Brinell hardness of 190 HB to 220 HB 2,5/187,5 (as defined in ISO 6506-1), determined as the mean from measurements taken at not less than ten points along the edge of the track. The track surface is subject to wear in service; the resulting reduction in thickness shall not exceed 0,3 mm and any grooves shall not be deeper than 0,2 mm. If these values are exceeded, the track shall be replaced or refinished. When the track has been refinished three times, its hardness shall be determined anew.

Specimen holder: The specimen holder shall consist of a U-frame approximately 40 mm high, with a clear distance of (5 ± 1) mm from the test track. The frame shall be positioned so that the centreline distance between specimen and disk is 220 mm and the angle bead of the specimen holder, which supports the specimen, is located at a distance of (4 ± 1) mm above the disk. The mounting of the specimen holder shall ensure that, during testing, no vibration occurs.

Loading device: The loading device shall consist of a lever of two arms of different length, a loading weight and a counterweight, the lever being pivoted with as little friction as possible and positioned almost horizontally during the test. The system shall be designed to ensure that the load is transferred vertically via the plunger to the centre of the specimen. The self-weight of the lever is balanced by the counter-weight and the scale to receive the loading weight. The force acting on the specimen results from the loading weight multiplied by the leverage ratio, the mass of the weight being selected to produce a test force of (294 ± 3) N (corresponding to 5,88 N/cm^2 or about 0,06 N/mm^2), which shall be verified by calculation.

Dimensions in millimeters



Key
1: Specimen holder
2: Counterweight
3: Specimen
4: Test track
5: Loading weight
6: Rotating disk

Figure 8 — Principle of Böhme disk abrader

5-6-2-4 Preparation of specimens

Use square slabs or cubes with an edge length of (71 ± 1,5) mm as specimens. The contact face and the opposite face of the specimen shall be parallel and flat. For determining the reduction in thickness as described in clause 5-6-2-6, the opposite face shall, if appropriate, be ground parallel or otherwise machined so as to be parallel. Generally, the specimens shall be dried to constant mass at a temperature of (105 ± 5) °C, pregrinding of the contact face by four cycles (see clause 5-6-2-5) being usually required.

Note: For the exceptional case of testing specimens in the wet or water-saturated condition (see note to clause 5-6-2-5), the specimens will be immersed for not less than seven days and wiped with a damp cloth or sponge prior to each weighing so that all specimens appear equally damp.

One specimen each shall be taken from no less than three different samples or work pieces of the same type. Prior to testing, determine the density of the specimen, ρ_B, by measurements, to the nearest 0,1 mm, and by weighing, to the nearest 0,1 g. In the case of multi-layer specimens, determine the density for specimens taken separately from the wearing layer, such specimens also being ground prior to testing where necessary.

5-6-2-5 Procedure

Prior to the abrasion test and after every four cycles, weigh the specimen to an accuracy of 0,1 g. Pour 20 g of standard abrasive on the test track. Clamp the specimen into the holder and, with the test contact face facing the track, load centrally with (294 ± 3) N. Start the disk, taking care that the abrasive on the track remains evenly distributed over an area defined by the width of the specimen.

Test the specimen for 16 cycles, each consisting of 22 revolutions. After each cycle, clean both disk and contact face, and turn the specimen progressively through 90° and pour new abrasive on the track as described in clause 5-6-2-2. When testing damp or water-saturated specimens, prior to each cycle, the track shall be wiped with a lightly damp sponge and moistened before being strewn with abrasive. From the start of the test, water shall be caused to drip, at a rate of approximately 13 ml of water (corresponding to 180 drops to 200 drops) per minute onto the track from a container with an adjustable pivoting nozzle. The drops shall fall through a distance of approximately 10 cm on the middle of the track at a point 30 mm in front of the specimen. When testing in accordance with this method, care shall be taken to ensure that the abrasive is continuously returned to the effective area of the track (see clause 5-6-2-3).

5-6-2-6 Determination of results

Calculate the abrasive wear after 16 cycles as the mean loss in specimen volume ΔV, from the equation:

$$\Delta V = \frac{\Delta m}{\rho_R} \quad \text{..... (2)}$$

Where :

ΔV: loss in volume after 16 cycles in cubic millimeters.

Δm: loss in mass after 16 cycles in grams.

ρ_R: density of the specimen or, in the case of multi-layer specimens, the density of the wearing layer in grams per cubic millimeter.

5-6-2-7 Test report

Report the abrasive wear to the nearest whole number of $cm^3/50\ cm^2$.

5-7 Slip resistance: Method for the determination of unpolished slip resistance value (USRV)

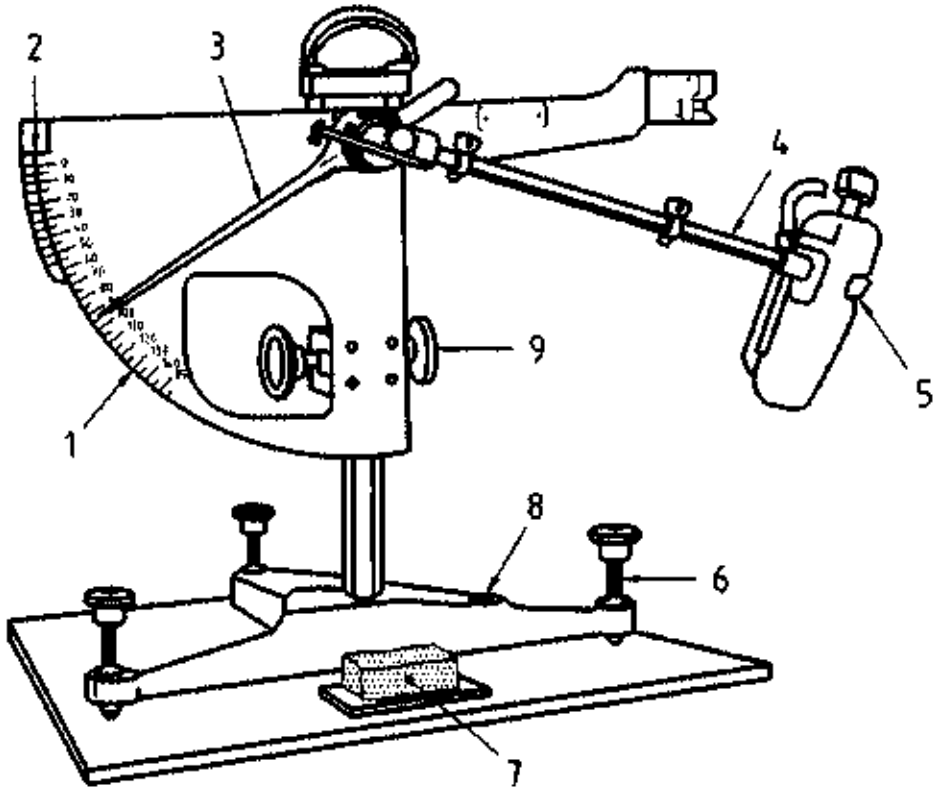
5-7-1 Principle

The measurement of USRV on the specimen is made using the pendulum friction test equipment to evaluate the frictional properties of the specimen. The pendulum friction test equipment incorporates a spring loaded slider made of a standard rubber attached to the end of the pendulum. On swinging the pendulum, the frictional force between the slider and test surface is measured by the reduction in length of the swing using a calibrated scale.

5-7-2 Apparatus

5-7-2-1 Pendulum friction test

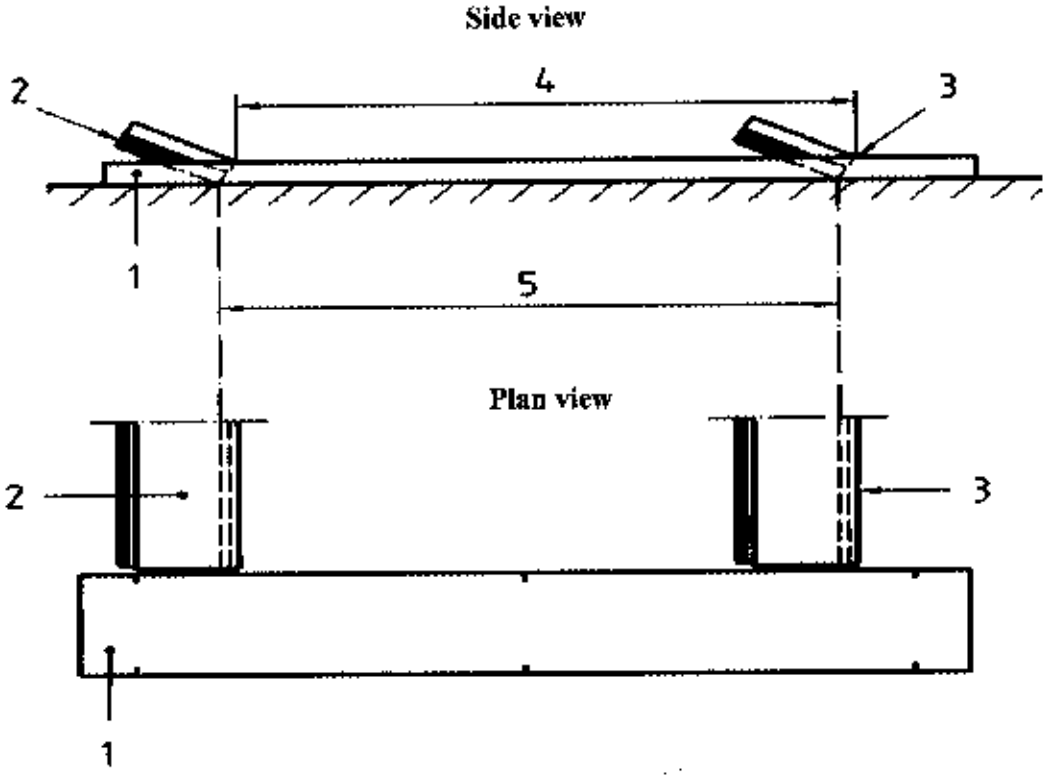
5-7-2-1-1 The pendulum friction test equipment shall be manufactured as shown in Figure 9. All bearings and working parts shall be enclosed as far as possible, and all materials used shall be treated to prevent corrosion under wet conditions.



Key
1: C scale (126 mm sliding length)
2: F scale (76 mm sliding length)
3: Pointer
4: Pendulum
5: Rubber slider
6: Levelling screw
7: Test specimen holder
8: Spirit level
9: Vertical adjustment screw

Figure 9 — Pendulum friction test equipment

5-7-2-1-2 The pendulum test equipment shall have the following features:
1) a spring loaded rubber coated slider as specified in clause 5-7-2-1-4 to clause 5-7-2-1-10. It shall be mounted on the end of a pendulum arm so that the sliding edge is (510 ± 1) mm from the axis of suspension;
2) means of setting the support column of equipment vertical;
3) a base of sufficient mass to ensure the equipment remains stable during the test;
4) means of raising and lowering the axis of suspension of the pendulum arm so that the slider can:
- swing clear of the surface of the specimen; and
- be set to traverse a surface over a fixed length of (126 ± 1) mm. A gauge with this distance marked is required as shown in Figure 10.



Key
1: Gauge
2: Slider
3: Reference edge
4: Sliding length measured
5: Actual sliding length

Figure 10 — Sliding length gauge

5) means of holding and releasing the pendulum arm so that it falls freely from a horizontal position.
6) a pointer of nominal length 300 mm, balanced about the axis of suspension, indicating the position of the pendulum arm throughout its forward swing and moving over the circular scale. The mass of the pointer shall be not more than 85 g;
7) the friction in the pointer mechanism shall be adjustable so that, with the pendulum arm swinging freely from a horizontal position, the outward tip of the pointer may be brought to rest on the forward swing of the arm at a point (10 ± 1) mm below the horizontal. This is the 0 reading.
8) a circular C scale, calibrated for a sliding length of 126 mm on a flat surface, marked from 0 to 150 at intervals of five units.

5-7-2-1-3 The mass of the pendulum arm, including the slider, shall be (1,50 ± 0,03) kg. The centre of gravity shall be on the axis of the arm at a distance of (410 ± 5) mm from the axis of suspension.

5-7-2-1-4 The slider shall consist of a rubber pad (76,2 ± 0,5) mm wide; (25,4 ± 1,0) mm long (in the direction of swing) and (6,4 ± 0,5) mm thick, the combined mass of slider and base shall be (32 ± 5) g.

5-7-2-1-5 The slider shall be held on a rigid base with a centre pivoting axis which shall be mounted on the end of the pendulum arm in such a way that, when the arm is at the lowest point of its swing with the trailing edge of the slider in contact with the test surface, the plane of the slider is angled at (26 ± 3) degrees to the horizontal. In this configuration the slider can turn about its axis without obstruction to follow unevenness of the surface of the test specimen as the pendulum swings.

5-7-2-1-6 The slider shall be spring-loaded against the test surface. When calibrated, the static force on the slider as set by the equipment calibration procedure shall be (22,2 ± 0,5) N in its median position. The change in the static force on the slider shall be not greater than 0,2 N per millimetre deflection of the slider.

5-7-2-1-7 The initial resilience and hardness of the slider shall comply with Table 3, and shall have a certificate of conformity including the name of the manufacturer and date of manufacture. A slider shall be discarded when the IRHD value measured in accordance with ISO 7619 fails to comply with the requirements of the table or not later than three years after manufacture.

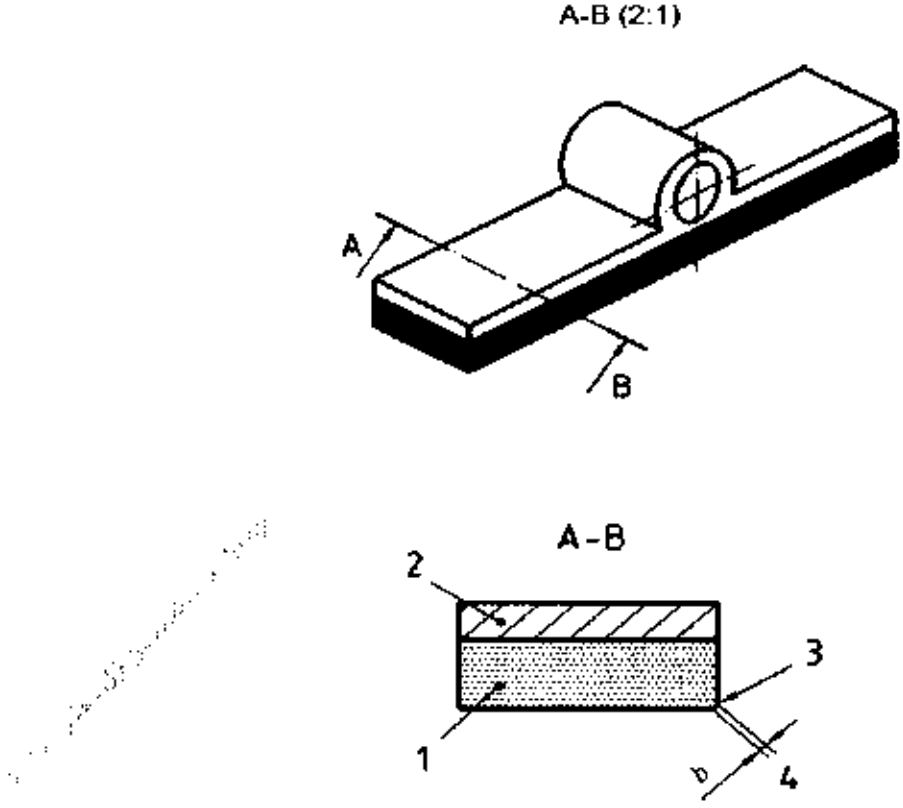
Table 3 — Properties of the slider rubber at 20 °C

Resilience (%) [a]	66 to 73
Hardness (IRHD) [b]	53 to 65
[a] Lüpke rebound test in accordance with ISO 4662. [b] International Rubber Hardness Degrees in accordance with JS 508 ISO 48.	

5-7-2-1-8 The edges of the slider shall be square and clean-cut, and the rubber free from contamination by, for example, abrasive or oil. The slider shall be stored in the dark at a temperature in the range 5 °C to 20 °C.

5-7-2-1-9 Before using a new slider, it shall be conditioned to produce a minimum width of striking edge of 1 mm as shown in Figure 11.

This shall be achieved by setting up the tester and carrying out five swings on a dry surface with a friction value above 40 on the C scale followed by a further 20 swings on the same surface after wetting.



Key
1: Rubber slider
2: Aluminium backing
3: Striking edge
4: Worn width

Figure 11 — Slider assembly illustrating the maximum wear or striking edge

5-7-2-1-10 The slider shall be discarded when the width of the striking edge as shown in Figure 11 exceeds 3 mm or becomes excessively scored or burred. The slider can be reversed to expose a new edge, which will need to be conditioned.

5-7-2-2 Potable water at (20 ± 2) °C in a container for wetting the surfaces of the test specimen and slider.

5-7-3 Calibration

The apparatus shall be recalibrated at least annually.

5-7-4 Sampling

Obtain a representative sample of five units. If the sample to be tested has plan dimensions less than (86 × 42) mm, larger specimens of the same materials, production processes and surface finish shall be tested and this shall be noted in the test report.

Note: In the case of large units, representative samples will be cut from them for test.

5-7-5 Procedure

Keep the friction test equipment, and slider, in a room at a temperature of (20 ± 2) °C for at least 30 min before the test begins. Immediately prior to testing with the friction tester, immerse the sample in water at (20 ± 2) °C for at least 30 min. Place the friction tester upon a firm level surface and adjust the levelling screws so that the pendulum support column is vertical. Then raise the axis of suspension of the pendulum so that the arm swings freely, and adjust the friction in the pointer mechanism so that when the pendulum arm and pointer are released from the right-hand horizontal position, the pointer comes to rest at the zero position on the test scale. Before using a new slider, condition it using the method described in clause 5-7-2-1-9. Discard any slider that exceeds the requirements given in clause 5-7-2-1-10. Rigidly locate the test specimen with its longer dimension lying in the track of the pendulum, and centrally with respect to the rubber slider and to the axis of the suspension of the pendulum. Ensure that the track of the slider is parallel to the long axis of the specimen across the sliding distance. Adjust the height of the pendulum arm so that in traversing the specimen the rubber slider is in contact with it over the whole width of the slider and over the specified swept length. Wet the surfaces of the specimen and the rubber slider with a copious supply of water, being careful not to disturb the slider from its set position. Release the pendulum and pointer from the horizontal position, catch the pendulum arm on its return swing. Record the position of the pointer on the scale. Perform this operation five times, rewetting the specimen each time, and record the mean of the last three readings. Relocate the specimen after rotating through 180° and repeat the procedure.

5-7-6 Calculation of unpolished slip resistance value USRV

When the slider is used over a swept length of 126 mm, calculate the pendulum value of each specimen as the mean of the two recorded mean values measured in opposite directions to the nearest 1 unit on the C scale. The USRV is the mean pendulum value obtained on the 5 specimens.

5-7-7 Test report

The test report shall include the following information:

- the mean pendulum test value of each specimen.
- the mean USRV of the sample.

5-8 Water absorption

5-8-1 Objective

The method serves to determine the water absorption per unit area (absorption capacity) under atmospheric pressure and the dry bulk density.

5-8-2 Principle

To determine the dry bulk density, the samples are weighed and measured after drying. The determination of the density of samples with asymmetrical thickness is done by the water displacement method.

The side faces of the samples shall be sealed (so as to be water-impermeable) and the capillary water absorption per unit area is measured within a fixed period via the surface (suction face) of the sample. The samples are, thereafter, completely immersed under water and stored to achieve constant mass. The absolute water absorption in % (absorption capacity) is to be determined from the absolute quantity of water taken up under atmospheric pressure and the dry mass of the samples.

5-8-3 Sampling

The surface of the sample (testing area) shall be plane and be at least 100 cm^2. The thickness of the samples depends on the thickness of the floor tiles which shall be maintained even when the floor tiles are cut into halves.

5-8-4 Apparatus and materials

- Potable water with a temperature of (20 ± 2) °C;
- paraffin wax or similar for sealing the side faces (so as to be water-impermeable);
- a brush;
- a soft, absorbent cloth;
- a measuring gauge or narrow slider;
- a precision balance reading in grams;
- a drying oven with a controllable temperature range (105 ± 5) °C;
- a flat based vessel or basin for storage in water.

5-8-5 Preparation of the test specimens

Remove all dust, flashing, etc. with a stiff brush. Dry the specimen at a temperature of (105 ± 5) °C until it reaches constant mass. This is considered to be achieved when the mass of the sample does not change more than 0,1 % within 24 h. The drying time shall be at least 24 h. The samples are cooled down to room temperature prior to weighing. The mass finally established is the decisive dry mass m_d. Then the measurements (length = L, width = W and height = H) of the specimens are made and expressed in cm.

5-8-6 Procedure

The side faces of the samples are sealed (so as to be water-impermeable) and weighed again (m_{d_s}).

After that the specimen is immersed with the upper face down 2 mm to 10 mm deep in a water bath at (20 ± 2) °C. To avoid air accumulating under the sample, it is immersed in a slanting position (starting with one edge). The depth of the immersion is fixed either by means of spacers or a grid adjustable in height placed in the water bath. The sample is taken out of the water without wetting the back and any water adhering to the upper face is removed with a moist sponge after (24 ± 0,5) h. After weighing ($m_{h,24h}$), the sample is immersed under a layer of water of 25 mm to 50 mm deep until constant mass is reached (change of mass 0,1 % in 24 h) and at least for 24 h. The sample is weighed ($m_{h,c}$) after adhering water drops have been removed with a moist sponge.

5-8-7 Calculation of the results

5-8-7-1 Capillary water absorption per unit area under atmospheric pressure

The capillary water absorption is calculated using the formula:

$$W_{24h} = \frac{m_{h,24h} - m_{d,s}}{S} \quad \text{..... (3)}$$

where:

$W_{24\,h}$: capillary water absorption per unit under atmospheric pressure after 24 h (g/cm^2).

$m_{h,24h}$: mass of sample after 24 h capillary water suction over the testing area S (g).

$m_{d,s}$: dry mass of sample sealed (g).

S: surface (suction face) of sample (cm^2).

5-8-7-2 Absolute water absorption or absorption capacity. The absolute water absorption is calculated using the formula:

$$W_{m,a} = \frac{m_{h,c} - m_{d,s}}{m_{d,s}} \times 100 \quad \text{..... (4)}$$

where:

$W_{m,a}$: water absorption capacity based on mass (mass %.)

$m_{h,c}$: mass of the sample waterlogged under atmospheric pressure (g).

$m_{d,s}$: dry mass of sample (g).

5-8-8 Test report

The test report shall include the following details:

a) marking of sample (type, date of production, number of batch, …etc);

b) date of testing;

c) date of test report;

d) surface (suction area) of sample;

e) capillary water absorption per unit area after 24 h;

f) water absorption capacity based on mass %.

6- Evaluation of conformity and compliance criteria

6-1 General

The compliance of terrazzo tiles with the requirements of this Jordanian standard and with the declared values for the tiles shall be demonstrated by carrying out:

- type testing of the tiles (see clause 6-2).

-factory production control by the manufacturer (see clause 6-3). In addition, compliance with this Jordanian Standard may be assessed by third party certification of the units or by customer acceptance testing in accordance with clause 5 (e.g. in case of dispute).

6-2 Type testing of the tiles

6-2-1 Age for type testing

The age of tiles for type testing shall be at least 28 days.

6-2-2 Initial type testing

Initial type testing shall be performed to show conformity with this Jordanian standard. Tests previously performed in accordance with the provisions of this Jordanian standard (same product, same characteristic(s), same or more demanding test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account. In addition, initial type testing shall be performed at the beginning of the production of a new tile type (unless a member of the same family) or at the beginning of a new method of production (where this may affect the stated properties). Sampling for initial type testing shall be representative of normal production.

Note: Products can be grouped into families where it is considered that the selected property is common to all products within that family.

The type tests shall be the reference tests given in this Jordanian standard. When the manufacturer's testing equipment is reliably calibrated, type testing is normally carried out with that equipment.

The results of the initial type tests shall be recorded and available for inspection.

6-2-3 Further type testing

Whenever a change occurs in the raw materials, the proportions used or the production equipment or process, which would change significantly some or all the properties of the finished tiles, the type tests shall be repeated for the selected property.

Note: Examples of major changes:

1) change from river gravel to crushed rock aggregates or change of cement type or class;

2) partial substitution of cement by additions.

6-3 Factory production control

The manufacturer shall establish, document and maintain a factory production control system to ensure that the tiles placed on the market will conform with the specified or declared values.

The factory production control system shall consist of procedures, regular inspection and tests and the utilisation of the results to control raw and other incoming materials, equipment, the production process and the product. The results of inspections requiring action and the results of tests shall be recorded. The action to be taken when control values or criteria are not met shall be given.

7- Marking and labeling

The following particulars relating to tiles supplied in accordance with this Jordanian standard shall be marked clearly on the delivery note, invoice, manufacturer's or supplier's certificate or brochure supplied with the consignment of tiles:

a) identification of the producer;
b) identification of this Jordanian standard;
c) indication of date of production;
d) identification of marking, on each package or at least 3 % of the units;
e) identification of the product;
f) format and classes if applied.

Annex NA
(Normative)
National technical modifications

Table NA-1 in this annex illustrates the technical deviations from the European standard EN 13748-1/2004 + A1:2005 "Terrazzo tiles, Part 1: Terrazzo tiles for internal use".
Single vertical bars (|) are used to indicate the applicable technical modifications of the European Standard which are changed.
Technical deviations are cross-referenced to the clause of the international/regional/national standard together with reasons for these deviations.

Table NA – 1 – List of technical modifications

No.	Clause	Modification	Explanation
1	2 + 4-1-2	Substitution of "EN 197-1" by "JS 30-1" and "JS 115"	to confirm with the updated published Jordanian Standard.
	2 + 4-1-3	Substitution of "EN 12620" by "JS 2065"	
	2 + 4-1-5	Substitution of "EN 934-2" by "JS 2133-2"	
2	4-2-4-2	Change the minimum mean value of the breaking strength to be 4,00 Mpa.	Decision of the technical committee based on a statistical Study
3	4-2-4-2	Change the minimum value of any individual result of the breaking strength to be 3,00 MPa.	
4	4-2-4-3	Deleting the clause 4-2-4-3 and	Decision of the technical committee to unify the requirements of breaking strength, as the assessment of the pass/fail requirement is done based on the breaking strength.
5		Omitting the change 5 in EN 13748-1:2004/A1:2005	Decision of the technical to avoid the misuse of the addition of a class with no requirements, which depends only on the installation requirement
6	4-2-6-2	Change the first point in clause from "when tested in accordance with the method described in clause 5-8, none of the individual results of the total water absorption shall be more than 8 % in mass;"to be "- when tested in accordance with the method described in clause 5-8, the average of the three specimens shall not be more than 8 % and none of the individual results of the total water absorption shall be more than 9 % by mass "	Decision of the technical committee based on a statistical Study

Table NA – 1 – List of technical modifications (cont.)

No.	Clause	Modification	Explanation
7	5-8-5 and 5-8-6	Change the drying Period to be " at least 24 h)"	Confirming the decision mentioned in the previous edition, as experience has shown that the method of examination does not require three days.