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Gypsum plasterboards — Definitions, requirements and test methods

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 632 was prepared by Technical Committee RSB/TC 9, *Civil engineering and building materials*.

In the preparation of this standard, reference was made to the following standard:

1) BS EN 520:2004 +A1:2009, *Gypsum plasterboards — Definitions, requirements and test methods*

The assistance derived from the above source is hereby acknowledged with thanks.

Committee membership

The following organizations were represented on the Technical Committee on *Civil engineering standards and building materials* (RSB/TC 9) in the preparation of this standard.

ASTRIK International

CAMOSAG Ltd

Cleaner Production and Climate Innovation Centre (CPCIC)

Consulting Engineering Group (CEG Ltd)

HOSHAN LTD

Independent Experts

NPD Ltd

Rwanda Housing Authority (RHA)

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

Rwanda Transport development Agency (RTDA)

University of Rwanda – College of Science and Technology (UR-CST)

Rwanda Standards Board (RSB) – Secretariat

Gypsum plasterboards — Definitions, requirements and test methods

1 Scope

This Draft Rwanda Standard specifies characteristics, performance requirements and test methods for gypsum plasterboards intended to be used in building construction works and gypsum plaster boards intended for secondary manufacturing operations, including boards designed to receive either direct surface decoration or gypsum plaster.

This Standard does not apply to plasterboards which have been subjected to any secondary manufacturing operations such as insulating composite panels and plasterboards within lamination.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

RS ISO 535, *Paper and board — Determination of water absorptiveness — Cobb method*

RS ISO 536, *Paper and board — Determination of grammage*

ISO 717-1, *Acoustics — Rating of sound insulation in buildings and of building elements Part 1: Airborne sound insulation*

ISO 7892, *Vertical building elements — Impact resistance tests — Impact bodies and general test procedures*

RS ISO 10456, *Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values*

ISO 10140-2, *Acoustics — Laboratory measurement of sound insulation of building elements Part 2: Measurement of airborne sound insulation*

RS ISO 12572, *Hygrothermal performance of building materials and products — Determination of water vapour transmission properties*

RS ISO 16598, *Timber structures — Structural classification for sawn timber*

RS 540, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

RS 547, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

3 Terms and definitions

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

3.1

gypsum plasterboard
product composed of a plaster core encased in, and firmly bonded to strong durable paper liner to form a flat rectangular board. The paper surfaces may vary according to the use of the particular type of board and the core may contain additives to impart additional properties. The longitudinal edges are paper-covered and profiled to suit the application

3.2

edge

paper-covered longitudinal side

3.3

end

side transverse to the edges, showing exposed core

3.4

face

surface on which the paper extends continuously to cover the edges

3.5

back

surface opposite to the face

3.6

width

shortest distance between the edges of the board

3.7

nominal width (w)

width stated by the producer

3.8

length

shortest distance between the ends of the board

3.9

nominal length (l)

length stated by the producer

3.10

thickness

distance between the face and the back, excluding edge profiles

3.11

nominal thickness (t)

thickness stated by the producer

3.12

squareness (s)

rectangularity of the board

4 Types of gypsum plasterboards

4.1 General

The performance of the types of gypsum plasterboards defined below may be combined in one board in this case the letter identifying each type of performance satisfied shall be given in the designation.

4.2 Gypsum plasterboard Type A

plasterboard with a face to which suitable gypsum plasters or decoration may be applied. For the purposes of identification these boards are designated Type A

4.3 Gypsum plasterboard Type H (plasterboard with reduced water absorption rate)

types of boards which have additives to reduce the water absorption rate. They may be suitable for special applications in which reduced water absorption properties are required to improve the performance of the board.

For the purposes of identification, these boards are designated Type H1, H2 and H3, with different water absorption performance

4.4 Gypsum plasterboard Type E (gypsum sheathing board)

boards specially manufactured to be used as sheathing board in external walls. They are not intended to receive decoration. They are not designed to be permanently exposed to external weather conditions. This type of wallboard has reduced water absorption rate. They shall have a minimum water vapour permeability. For the purposes of identification these boards are designated Type E.

4.5 Gypsum plasterboard Type F (gypsum plasterboard with improved core adhesion at high temperature)

plasterboard with a face to which suitable gypsum plasters or decoration may be applied. These boards have mineral fibres and/or other additives in the gypsum core to improve core cohesion at high temperatures. For the purposes of identification these boards are designated Type F

4.6 Gypsum plasterboard Type P

boards which have a face intended to receive gypsum plaster or to be combined by collage with other materials in form of boards or panels. In case of boards intended to receive gypsum plaster, the edges are either square or round. For the purpose of identification these boards are designed Type P.

4.7 Gypsum plasterboard Type D (gypsum plasterboard with controlled density)

These boards have a controlled density, with a face to which suitable gypsum plasters or decoration may be applied. This enables improved performance in certain applications to be obtained. For the purposes of identification these boards are designated Type D

4.8 Gypsum plasterboard Type R (gypsum plasterboard with enhanced strength)

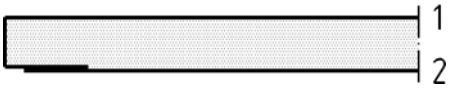
These boards for special applications where higher strength is required have both increased longitudinal and transverse breaking loads. They have a face to which suitable gypsum plasters or decoration may be applied. For the purposes of identification these boards are designated Type R

4.9 Gypsum plasterboard Type I (gypsum plasterboard with enhanced surface hardness)

boards which are used for applications where higher surface hardness is required. They have a face to which suitable gypsum plasters or decoration may be applied. For the purposes of identification these boards are designated Type I

4.10 Edge and end profiles of gypsum plasterboards

The paper-covered edges of gypsum plasterboard are square, bevelled, tapered, half-rounded or rounded, or a combination of each (see examples in Figures 1 to 6).

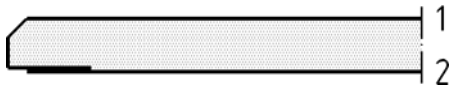


Key

1 face

2 back

Figure 1 — Square edge



Key

1 face

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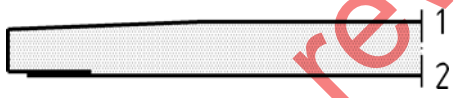
. Figure 2 — Bevelled edge

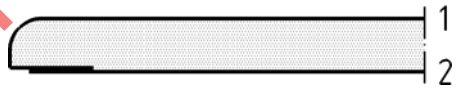


Key

1 face

2 back

Figure 3 — Tapered edge

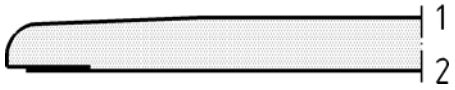


Key

1 face

2 back

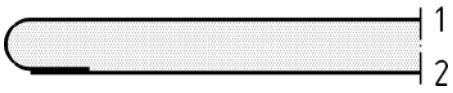
Figure 4 — Half-rounded edge



Key

1 face

2 back



Key

1 face

2 back

Figure 6 — Rounded edge

5 Requirements

5.1 Mechanical characteristics

5.1.1 Shear strength (strength of board/substructure connection)

A When the intended use of plasterboards is for stiffening timber framed building assemblies (i.e., walls, partitions, roof truss structures, etc.), the conventional shear strength of the plasterboard shall be determined in accordance with the test method described in 6.13.

NOTE It should be noted that this test does not measure the actual shear strength of the board but rather the strength of the board/substructure connection that is the relevant property for this application.

5.1.2 Flexural strength (expressed as flexural breaking load)

5.1.2.1 The flexural breaking load of gypsum plasterboard types A, D, E, F, H, I determined in accordance with the test method described in 6.7, shall not be less than the values given in Table 2. Additionally, no individual test shall demonstrate the product to be more than 10 % below the values given IN Table2.

Table 2— Flexural breaking load of gypsum plasterboards (Types A, D, E, F, H, I)

Thickness	Nominal board thickness mm	Flexural breaking load N	
		Transverse direction	Longitudinal direction
Common	9,5	160	400
	12,5	210	550
	15,0	250	650
Other thickness	t	$16{,}8 \cdot t$	$43 \cdot t$

5.1.2.2 The flexural breaking load of enhanced strength gypsum plasterboard type R, or combined determined in accordance with the test method described in 6.7, shall not be less than the values given in Table 3. Additionally, no individual test shall demonstrate the product to be more than 10 % below the values given in Table 3.

Table 3 — Flexural breaking load of enhanced strength gypsum plasterboards (Type R or combined)

Thickness	Nominal board thickness mm	Flexural breaking load N	
		Transverse direction	Longitudinal direction
Common	12,5	300	725
	15,0	360	870
Other thickness	t	$24 \cdot t$	$58 \cdot t$

4.1.2.3 The flexural breaking load of gypsum baseboards (type P) determined as described in 6.7, shall not be less than the values given in Table 4 In addition, no individual test shall demonstrate the product to be more than 10 % below the values given in Table 4.

Table 4 — Flexural breaking load of gypsum baseboards (Type P)

Nominal board thickness mm	Flexural breaking load N	
	Transverse direction	Longitudinal direction
9,5	125	180
12,5	165	235

5.1.3 Deflection under load

When required, the deflection under load shall be determined in accordance with the test method specified in 6.8.

5.2 Fire behaviour

5.2.1 Reaction to fire

Where subject to regulatory requirements, the plasterboard shall either be Classified Without Further Testing according to the provisions of Annex B or it shall be tested and classified according to RS 547.

Plasterboards tested according to RS 540 (SBI test) shall be mounted and fixed in accordance with Annex C or when the producer wishes to claim performance for a specific intended use, the mounting and fixing shall be representative of that intended use.

When required, the paper grammage shall be determined according to RS ISO 536.

5.2.2 Resistance to fire

When required, the fire resistance of a system including gypsum plasterboard shall be classified in accordance with (RS 547).

NOTE Resistance to fire is a characteristic dependent on an assembled system and not of the product in isolation.

5.3 Impact resistance

When required, the impact resistance of a system including gypsum plasterboard shall be determined in accordance with ISO 7892.

NOTE Impact resistance is a characteristic dependent on an assembled system and not of the product in isolation.

5.4 Water vapour permeability (expressed as water vapour resistance factor)

When the intended use of gypsum plasterboards is for moisture diffusion control, tabulated design values of water vapour resistance factor for gypsum plasterboards given in RS ISO 10456 may be used.

Alternatively, the water vapour resistance factor shall be determined using the method given in RS ISO 12572.

5.5 Air permeability

When the intended use of gypsum plasterboards is sheathing in external walls, a design value of 1,4 x 10-6 $m^3/m^2 \cdot s \cdot Pa$ may be used for air permeability of gypsum plasterboards.

When required, air permeability shall be determined in accordance with relevant applicable standard.

5.5.1 Direct airborne sound insulation

When required, the direct airborne sound insulation of a system including gypsum plasterboard shall be determined in accordance with ISO 10140-2 and ISO 717-1.

NOTE Direct airborne sound insulation is a characteristic dependent on an assembled system and not of the product in isolation.

5.6 Acoustic absorption

When plasterboards are intended to be used for acoustic conditioning, acoustic absorption shall be measured according to RS ISO 354.

NOTE Acoustic absorption is a characteristic dependent on an assembled system and not of the product in isolation.

5.7 Thermal resistance (expressed as thermal conductivity)

When the intended use of plasterboards is to contribute to thermal resistance in building construction works (walls, partitions, ceilings, etc.), the design values of thermal conductivity for gypsum plasterboards given in RS ISO 10456 may be used.

When required, thermal conductivity shall be determined in accordance with relevant applicable standards.

5.8 Regulated substances

Materials used in products shall not release any regulated substances in excess of the maximum permitted levels specified in a relevant document for the material or permitted in the national regulations of the member state of destination.

5.9 Dimensions and tolerances

5.9.1 Gypsum plasterboards (Type P)

5.9.1.1 Width

NOTE Common nominal widths are 400 mm, 600 mm, 900 mm and 1 200 mm. however other widths are also possible.

The width shall be measured as described in 6.2 and compared to the nominal width.

The tolerance shall be −8 mm.

5.9.1.2 Length

NOTE Common nominal lengths are 1 200 mm, 1 500 mm, 1 800 mm and 2 000 mm. however other lengths are also possible.

The length shall be measured as described in 6.3 and compared to the nominal length.

The tolerance shall be -6 mm.

5.9.1.3 Thickness

NOTE The nominal thicknesses are normally 9,5 mm and 12,5 mm.

The thickness shall be measured as described in 6.4 and compared to the nominal thickness.

The tolerance shall be ± 0,6 mm.

5.9.2 Gypsum plasterboards Types A, H, D, E, F, I, R or combined

5.9.2.1 Width

NOTE Common nominal widths are 600 mm, 625 mm, 900 mm, 1 200 mm and 1 250 mm. Other widths are also possible.

The width shall be measured as described in 6.2 and compared to the nominal width.
The tolerance shall be −4 mm for each individual measurement.

5.9.2.2 Length

The length shall be measured as described in 6.3 and compared to the nominal length.
The tolerance shall be −5 mm for each individual measurement.

5.9.2.3 Thickness

The nominal thickness shall be at least 6,0 mm.

The thickness shall be measured as described in 6.4 and compared to the nominal thickness.

Tolerances for nominal thicknesses below 18 mm shall be ±0,5 mm.

For boards of nominal thickness equal to or greater than 18 mm, the tolerance shall be ±0,04 X thickness in mm rounded to the nearest 0,1 mm.

The difference between individual thickness measurements on any individual board shall not exceed 0,8 mm.

NOTE Common nominal thicknesses are 9,5 mm, 12,5 mm and 15 mm. however other nominal thicknesses are also possible.

5.9.2.4 Squareness of ends

The deviation from squareness measured as described in 6.5 shall not exceed 2,5 mm per metre of width.

5.9.2.5 Edge and end profiles

The edge and end profiles may vary widely depending upon the jointing system and decorative and aesthetic considerations. The exception is the tapered edge and the half-rounded tapered edge profile.

For the tapered edge and the half-rounded tapered edge profile, when measured as described in 5.6, each individual reading shall be between the following limits:

- depth of taper: between 0,6 mm and 2,5 mm;
- width of taper: between 40 mm and 80 mm.

5.10 Additional requirements for gypsum plasterboards Types H1, H2, H3 (with reduced water absorption)

The surface water absorption of the board determined by the method described in 6.9.1 for the face of the board shall not be greater than the values shown in Table 5.

The total water absorption of boards, determined by the method described in 6.9.2, shall not be greater than the values shown in Table 5.

Table 5 — Water absorption classes

Water absorption classes	Surface water absorption g/m²	Total water absorption %
H1	180	≤ 5
H2	220	≤ 10
H3	300	≤ 25

5.11 Additional requirements for gypsum plasterboards Type E (sheathing boards)

This type of boards shall conform to type H1, H2 or H3 requirements.

The water vapour resistance factor of boards type E determined in accordance with the method described in RS ISO 12572 shall not be greater than 25.

5.12 Additional requirements for gypsum plasterboards Type F (with improved core cohesion at high temperature)

When a type F plasterboard (or combined) is subjected to the test described in 6.10, none of the 6 specimens shall break.

5.13 Additional requirements for gypsum plasterboards Type D (with controlled density)

The density of gypsum plasterboard type D (or combined) determined as described in 6.11, shall be at least 0,8 x 103 kg/m^3.

5.14 Additional requirements for gypsum plasterboards Type I (with enhanced surface hardness)

The surface hardness of gypsum plasterboard type I (or combined) is characterised by the diameter of the depression produced in the surface according to the test method described in 6.12.

The diameter of the depression shall not be greater than 15 mm.

6 Test methods

6.1 Sampling

Testing shall require three boards of each type and thickness on which tests as specified in 6.2 to 6.6 to be carried out.

Tests according to 6.7 to 6.12 shall be carried out on specimens cut out from the same three boards.

6.2 Determination of width

6.2.1 Principle

The width shall be measured at 3 positions along the length of the board.

6.2.2 Apparatus

A metal ruler or tape permitting readings to 1 mm.

6.2.3 Procedure

Take three measurements between the extremities of the boards (see Figure 7) to the nearest 1 mm, one near each end and one near the middle of the board.

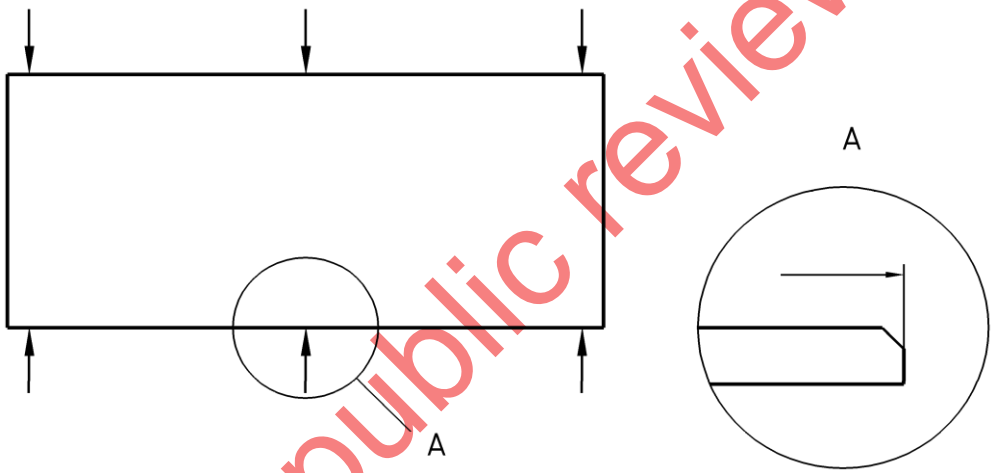


Figure 7 — Determination of width

6.2.4 Expression of results

Each measured value expressed in mm shall be recorded.

6.3 Determination of length

6.3.1 Principle

The length shall be measured at 3 positions across the width of the board.

6.3.2 Apparatus

A metal ruler or tape permitting readings to 1 mm.

6.3.3 Procedure

Take three measurements between the extremities of the board (see Figure 8) to the nearest 1 mm, one near each edge end and one near the middle of the board.

Figure 8 — Determination of length

6.3.4 Expression of results

Each measured value expressed in mm shall be recorded and compared to the nominal length of the board.

6.4 Determination of thickness

6.4.1 Principle

The thickness of the board shall be measured at 6 points near to one end of the board.

6.4.2 Apparatus

A micrometer, dial gauge, or callipers with an anvil diameter not less than 10 mm and permitting readings to 0,1 mm.

6.4.3 Procedure

Take six measurements (see Figure 9) to the nearest 0,1 mm across one end at approximately equal intervals across the width and at least 25 mm from the end and 100 mm from the edges. For boards of nominal width not greater than 600 mm, three measurements shall be sufficient.

Dimensions in millimetres

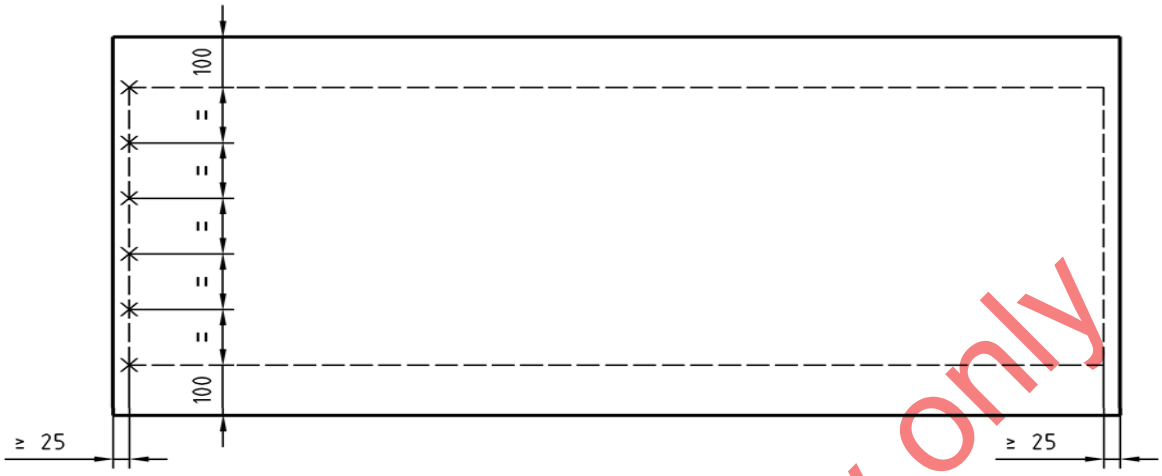


Figure 9 — Determination of thickness

6.4.4 Expression of results

Record to the nearest 0,1 mm the average of the values obtained for each board.

6.5 Determination of squareness of ends

6.5.1 Principle

Two boards shall be compared with each other and the squareness measured.

6.5.2 Apparatus

A metal ruler or tape permitting readings to 1 mm.

6.5.3 Procedure

Place one board on top of another so that they coincide along one edge and at one corner (circled in Figure 10).

Measure to the nearest 1 mm the distance Δ_1 (see Figure 10) between the ends of the opposite edges.

Turn the top board over so that the same ends are together as for the first measurement and ensure that the corner of the top board coincides with that corner of the lower board used in the first measurement (circled in Figure 10).

Measure the new distance Δ_2 between the ends of the opposite edges.

There are three boards, so one shall be used twice.

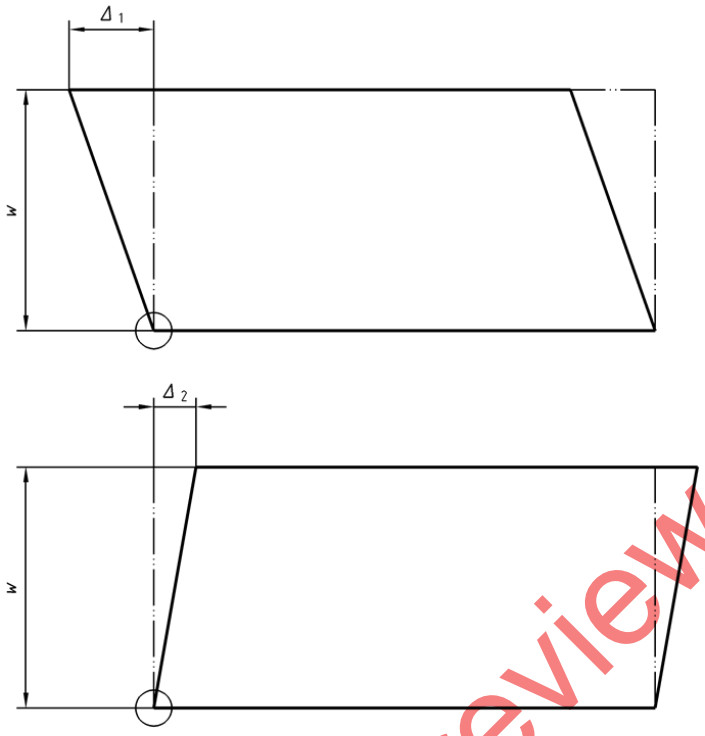


Figure 10 — Determination of squareness of ends

6.5.4 Expression of results

The squareness is characterised for one of the boards by the half sum $\frac{\Delta_1+\Delta_2}{2w}$ and for the other by the half difference $\frac{\Delta_1-\Delta_2}{2w}$ expressed in millimetres per metre.

6.6 Determination of taper profile

6.6.1 Taper width

6.6.1.1 Principle

A flat metal ruler shall be applied to the face of the board and over the taper area.

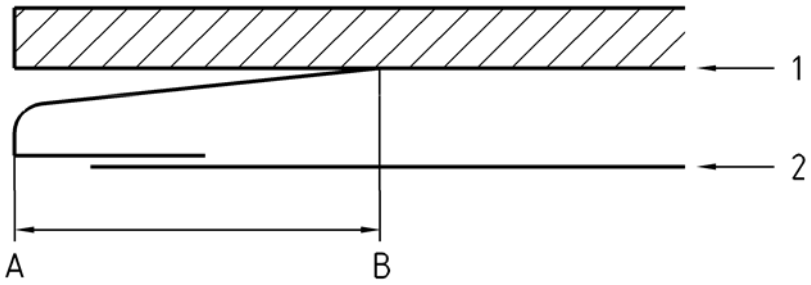
6.6.1.2 Apparatus

A flat metal ruler at least 250 mm long permitting readings to 1 mm.

6.6.1.3 Procedure

Measure the taper width on each edge (300 ± 50) mm from each end.

Determine the taper width (AB) by applying a metal rule to the face of the board parallel to the end as shown in Figure 12 for tapered edge boards and in Figure 11 for half-rounded tapered edge boards.

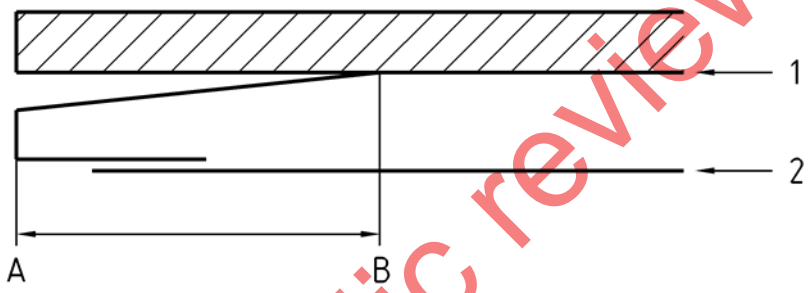


Key

1 face

2 back

Figure 11 — Determination of taper width - Half-rounded tapered edge



Key

1 face

2 back

Figure 12 — Determination of taper width - Tapered edge

6.6.1.4 Expression of results

Record the distance in millimetres between the edge of the board (point A) and the point B at which the ruler touches the face of the board as the taper width (two measurements on each board).

6.6.2 Taper depth

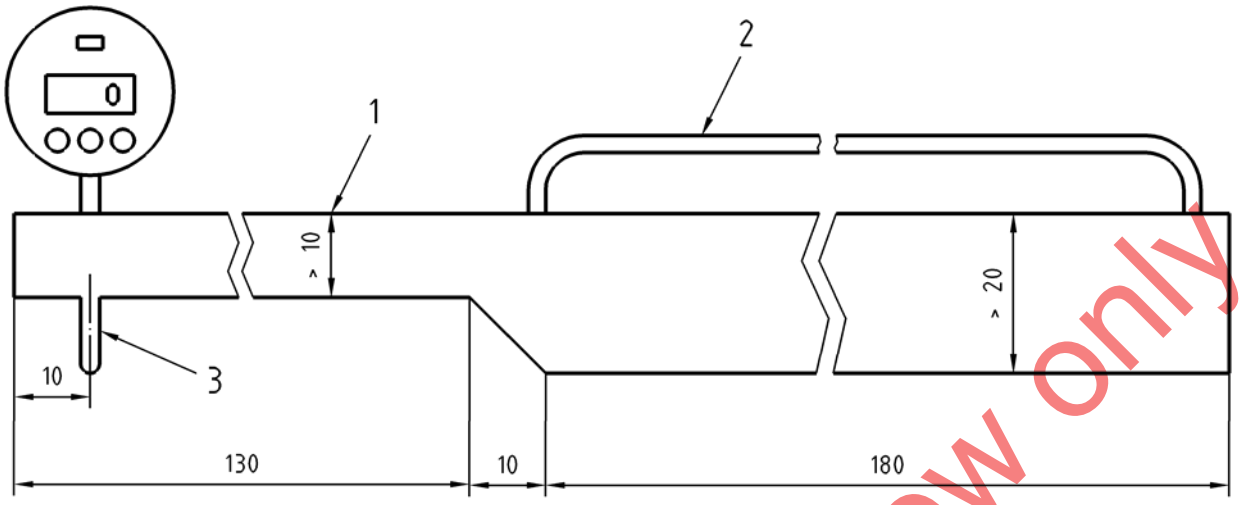
6.6.2.1 Principle

The taper depth shall be measured with a special gauge.

6.6.2.2 Apparatus

A dial gauge mounted on a special measuring device as shown in Figure 13 permitting readings to 0,01 mm.

Dimensions in millimetres



Key

1 width to be 25 mm minimum

2 grip

3 diameter 2 mm to 5 mm with hemispherical tip

Figure 13 — Device for determination of taper depth

6.6.2.3 Procedure

Measure the taper depth on each edge (300 ± 50) mm from each end. Place the board on a flat surface. Place the measuring device on the face of the board, with the gauge 150 mm from the edge and adjust the scale to zero.

Move the device towards the edge and take the reading (10 ± 1) mm from the edge, for the tapered edge board and (20 ± 1) mm from the edge for the half-rounded tapered edge board.

6.6.2.4 Expression of results

Record each measurement of taper depth to the nearest 0,1 mm.

6.7 Determination of flexural strength (flexural breaking load)

6.7.1 Principle

The flexural strength of plasterboards shall be characterised by the flexural breaking load.

Specimens (400 x 300) mm cut off the boards shall be subjected to a load which is increased at a controlled rate until failure occurs.

6.7.2 Apparatus

A loading machine capable of being read to 2 % and capable of applying the necessary load with a rate of (250 ± 125) N/min.

6.7.3 Procedure

6.7.3.1 Preparation of specimens

Cut two specimens from each board measuring [(400 ± 1,5) x (300 ± 1,5)] mm with all edges square from each board (as shown in Figure 14).

One specimen is taken in the longitudinal direction (designated L) and the other in the transverse direction (designated T) (see Figure 14).

Cut the specimens at least 100 mm from ends and edges of the board, except in the case of boards of less than 600 mm width where the distance from the edge may be reduced and shall be equal on either side of the sample.

Dry the specimens to constant mass at (40 ± 2) °C and perform the test within 10 min of removal from the drying oven.

NOTE Constant mass is defined as two successive weighing 24 h apart, differing by less than 0,1 %.

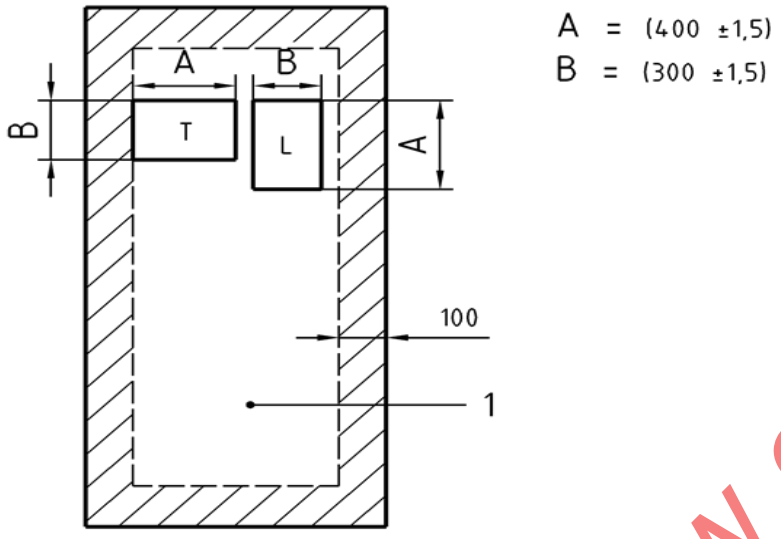
6.7.3.2 Testing

Place each specimen into the loading machine, face down in the case of longitudinal specimens and face up in the case of transverse specimens, on two parallel supports rounded to a radius between 3 mm and 15 mm, with the centres (350 ± 1) mm apart.

Apply the load at a rate of (250 ± 125) N/min at the centre ± 2 mm of the span parallel to the supports, by means of a platen with a rounding radius between 3 mm and 15 mm. Record each failure value to the nearest 1 Newton.

The time from the application of the load to the failure of the specimen shall exceed 20 s.

Dimensions in millimetres



Key

1 zone for sampling other specimens

Figure 14 — Sampling of specimens for determination of flexural breaking load (example for a 1 200 mm wide board)

6.7.4 Expression of results

Record each individual value and calculate the flexural breaking load as the mean of the 3 longitudinal specimen values (L) or of the three transverse specimen values (T).

6.8 Determination of deflection under load

The test shall be the same as the one used for flexural breaking load but a continuous record of deflection produced by the applied load shall be made.

Calculate the mean deflection under load of the 3 longitudinal specimens (L) and also the 3 transverse specimens (T) as the average of the recorded values for any given load.

6.9 Determination of water absorption

6.9.1 Surface water absorption

6.9.1.1 Principle

The surface of a conditioned specimen shall be exposed to water at (23 ± 2) °C for a fixed time and the increase in mass shall be determined.

6.9.1.2 Apparatus

6.9.1.2.1 Balance, permitting readings to 0,01 g.

6.9.1.2.2 Clock or **watch,** permitting readings to 1 min.

6.9.1.2.3 Cobb apparatus, in accordance with ISO 535 with a cylinder height of 25 mm.

6.9.1.3 Procedure

Cut two specimens measuring [125 ± 1,5) x (125 ± 1,5)] mm from each board, one for a test on the face and the other for a test on the back. Condition the specimens to constant mass at (23 ± 2) °C and (50 ± 5) % relative humidity and carry out the test immediately.

Weigh a specimen to within 0,01 g and place it in the Cobb apparatus (100 cm^2) which has previously been conditioned at (23 ± 2) °C, with the side to be exposed to the water tap uppermost. Fill the ring of the apparatus with water at (23 ± 2) °C until the test surface of the specimen is covered by 25 mm of water.

Leave the specimen for 2 h ± 2 min in the apparatus and then pour the water out of the apparatus and remove the specimen.

Immediately remove excess water by blotting with dry absorbent paper and re-weigh the specimen to the nearest 0,01 g.

6.9.1.4 Expression of results

Calculate the difference (in grams) between the dry mass and the wet mass of each specimen.

Calculate for the face and for the back the average difference in mass and multiply this by 100. Record this value as the surface absorption of the face or of the back of the gypsum plasterboard expressed in g/m^2.

6.9.2 Total water absorption

6.9.2.1 Principle

Conditioned specimens (as in 5.9.1.3) are immersed in water at (23 ± 2) °C and the percentage increase in mass is determined.

6.9.2.2 Apparatus

a) Balance permitting readings to 0,1 g;

b) water bath at (23 ± 2) °C large enough to hold the specimen.

6.9.2.3 Procedure

Cut a specimen measuring [(300 ± 1,5) x (300 ± 1,5)] mm from each board, approximately half-way between the edges and at least 150 mm from the ends.

Condition the specimens to constant mass at (23 ± 2) °C and (50 ± 5) % relative humidity, weigh to the nearest 0,1 g and carry out the test immediately.

Immerse the specimen in a water bath at (23 ± 2) °C covered with 25 mm to 35 mm of water for 2 h ± 2 min.

Place the specimen horizontally but not resting flat on the bottom of the container.

After removal from the bath, wipe excess water from the surface and edges of the specimen and weigh immediately to the nearest 0,1 g.

6.9.2.4 Expression of results

Calculate increase in mass of each specimen as a percentage of the initial mass. Record the average percentage increase in mass as the water absorption of the gypsum plasterboard.

6.10 Determination of core cohesion at high temperature

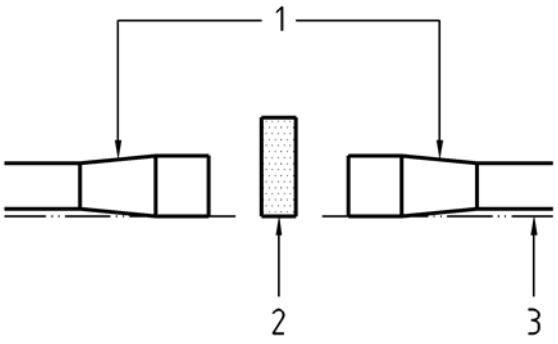
6.10.1 Principle

A bending moment shall be applied to a specimen that is heated between two burner flames. On heating, the bending moment causes the sample to deflect. When deflection is complete the specimen shall be examined for breakage.

6.10.2 Apparatus

6.10.2.1 Meker burners

The nozzle diameter shall be (29 ± 1) mm with a gas orifice diameter of (0,75 ± 0,05) mm.



Key

1 burners

2 specimen

3 alignment

Figure 15 — Alignment of specimens with respect to burners

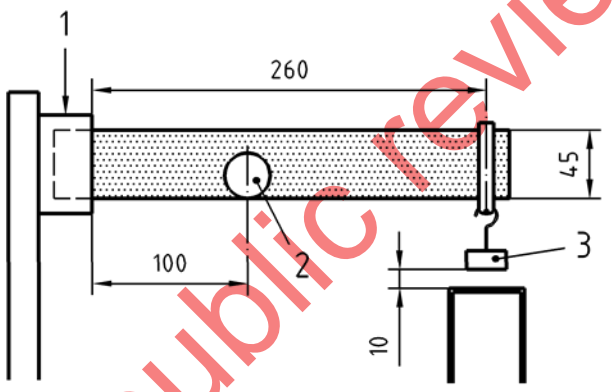
6.10.2.2 Thermocouples

Insulated chromelalumel (Type K) with a diameter of 1,5 mm.

6.10.2.3 Mounting device

Any form of device capable of supporting the specimen with weight in the horizontal plane.

Dimensions in millimetres



Key

1 Mounting sleeve

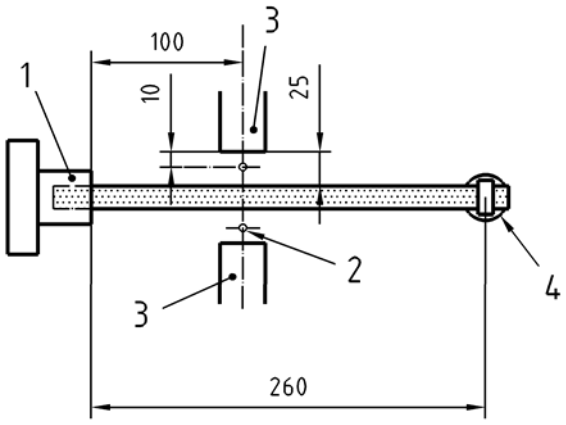
2 Burner

3 Load

Figure 16 — Side view of the apparatus for determination of core cohesion

6.10.2.4 Specimen support

The specimen shall be mounted between the burners with its long edge horizontal and its short edge vertical. The lower long edge of the board and the lowest point of the burner nozzles shall be aligned (see Figure 15). The midpoint of the burner nozzle is (100 ± 1) mm from the point of support. For 12,5 mm nominal board a load of (300 ± 10) g is suspended from the specimen at a point (260 ± 1) mm from the point of support. The distance through which the part of the specimen between the burners and the load may deflect is limited to (10 ± 1) mm (see Figures 16 and 17). For boards of greater nominal thickness (t) the load is increased proportionately (i.e., to $300\frac{t}{12.5}$) and rounded to the nearest 50 g.



Key

1 mounting sleeve

2 thermocouple

3 burners

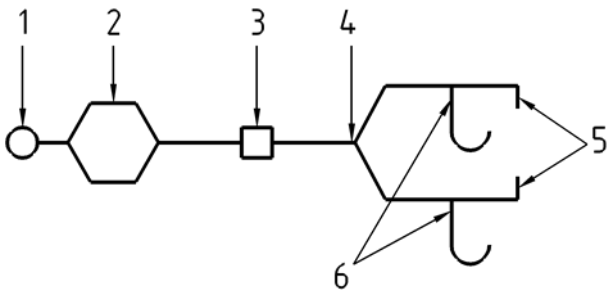
4 load

Figure 17 — Top view of apparatus for determination of core cohesion

6.10.2.5 Heating system

Two propane Meker burners shall be mounted with their nozzles facing each other and each nozzle (25 ± 1) mm from the specimen. The axes of the burners shall be aligned to within 1 mm. The thermocouples shall be placed (10 ± 1) mm from each burner and aligned with the top of the burners (see Figure 17). Commercial propane gas shall be supplied to each burner from a single source via a tube with a Y fitting. A reducing valve with a manometer and a flowmeter shall be installed in the line between the source and the Y fitting. Gas pressure valves shall be placed on each supply line (see Figure 18). The burners shall be operated with the air ports fully open.

Dimension in millimetres



Key

1 gas supply

2 reducing valve and manometer

3 flow meter

4 Y-fitting

5 burners

6 pressure control valves

Figure 18 — Diagram of the gas supply line

6.10.3 Procedure

Cut six specimens (300 ± 5) mm long by (45 ± 1) mm wide with the long edge of the specimen parallel to the edge of the board (two specimens from each board, see 6.7.3.1). Place one specimen in the supporting device ensuring that the short edge is vertical. The distance between the bottom of the load and the platform shall be (10 ± 1) mm. The lower long edge shall be aligned with the lowest point of the burner nozzle (see Figure 16). Apply the load to the unsupported end of the specimen.

The point of application of the load shall be (260 ± 1) mm from the limit of the mounting device. Light the burners. Adjust the gas flow to give a temperature of (1 000 ± 50) °C on each thermocouple.

When the load reaches the platform or after 15 min (whichever is the sooner) examine the specimen for cohesion.

Repeat the procedure on each specimen.

6.10.4 Expression of results

If any of the specimens breaks (separates into two or more pieces) the board is deemed to have failed.

6.11 Determination of density

6.11.1 Principle

The density shall be calculated from the measured mass and the dimensions of the specimen.

6.11.2 Apparatus

a) Metal rule or tape permitting readings to 1 mm;

b) micrometer, dial gauge, or callipers with an anvil diameter not less than 10 mm and permitting readings to 0,1 mm; and

c) balance permitting readings to 0,1 g.

6.11.3 Procedure

Prepare six specimens as described in 6.7.3.1. Weigh the specimens to 0,1 g.

Measure the specimen dimensions according to 6.2, 6.3 and 6.4.

6.11.4 Expression of results

Calculate the density of each specimen by dividing the mass (in kg) by the volume (in m^3) determined from the measured dimensions of the specimen. The density is the average of the six individual results rounded to 0,1 x 103 kg/m^3.

6.12 Determination of surface hardness of the board

6.12.1 Principle

The surface damage caused by a small steel sphere dropped from a predetermined height shall be measured.

6.12.2 Apparatus

6.12.2.1 Steel sphere, with a diameter of 50 mm and a mass of (510 ± 10) g.

6.12.2.2 Rigid, flat and horizontal table, large enough to support the whole surface of the specimen with an inertia sufficient to withstand the impact (e.g., steel table with a thickness of 20 mm).

6.12.2.3 Carbon paper.

6.12.2.3 Graduated rule, permitting readings to 0,5 mm.

6.12.2.4 Support for the steel sphere.

6.12.3 Procedure

6.12.3.1 Preparation of specimen

Cut one specimen measuring 300 mm x 400 mm from the board to be tested. Condition the specimen to constant mass at (40 ± 2) °C.

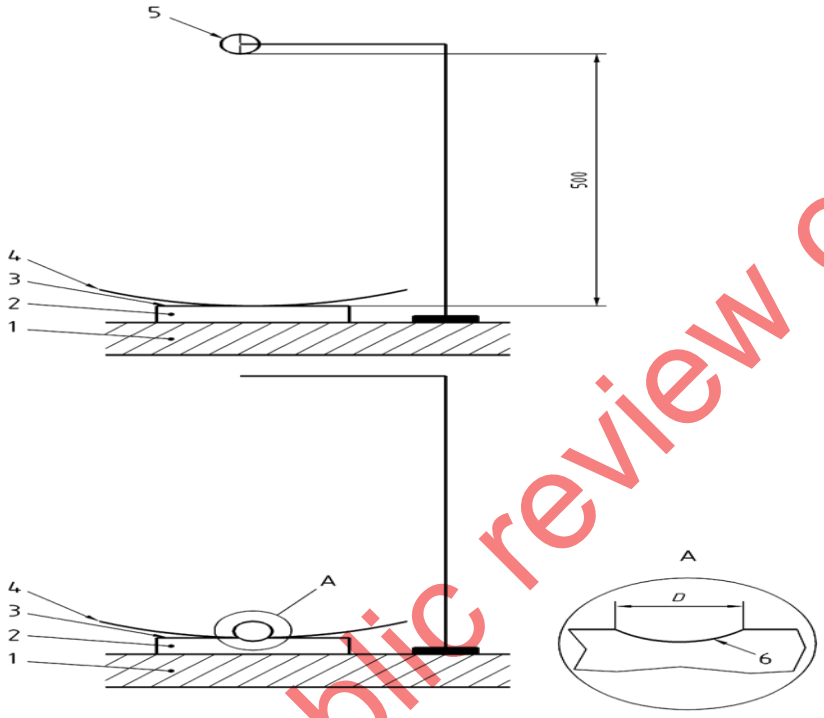
6.12.3.2 Testing

Place the specimen, face up, on the rigid table and cover it with the carbon paper (see Figure 19); then place the sphere between the clamps of the support with a distance of (500 ± 5) mm from the board surface to the underside of the sphere (see Figure 19).

Let the sphere fall down onto the board (see Figure 19). Then take off the carbon paper and measure to the nearest mm, the diameter of the coloured impact onto the board (see Figure 19).

Repeat this test, three times on the same specimen.

Dimensions in millimetres



Key

1 rigid table

2 specimen (board)

3 face of the board

4 carbon paper

5 steel sphere

6 coloured impact

Figure 19 — Surface hardness test procedure

6.12.4 Expression of results

Calculate for each specimen the average of the three measured values to the nearest mm.

The surface hardness of the board shall be characterised by this average value.

6.13 Determination of shear strength (strength of board/substructure connection)

6.13.1 Principle

Two plasterboard sample pieces are fixed on each side of two timbers.

The wood pieces are pulled apart using suitable tensile testing machine and the force required to induce failure is determined.

6.13.2 Apparatus

6.13.2.1 **Conditioning room,** at (23 ± 2) °C and (50 ± 5) % relative humidity.

6.13.2.2 **Tensile testing machine,** with a capacity of 5 kN permitting readings to 10 N.

6.13.2.3 **Metal rule or tape,** permitting readings to 1 mm.

6.13.2.4 **Timber of Class S 16,** in accordance with ISO 16895 having a maximum moisture content of 14 %.

6.13.2.5 **Trumpet headed screws,** with a length equal to the board thickness plus at least 20 mm and a head diameter of 8,0 mm ± 0,2 mm with a shank diameter of 3,8 mm ± 0,2 mm (outer diameter including the threads).

6.13.3 Procedure

Cut 4 board samples 600 mm by 170 mm in the longitudinal direction (L) in the sampling zone of each board (see Figure 14) (12 samples in total). Condition samples at (23 ± 2) °C and (50 ± 5) % of relative humidity to constant mass.

Construct a specimen by fixing a sample on either side of the two pieces of wood using the screws. The distance from the axis of the screws to the cut edge of the board shall be (15 ± 1) mm (see Figure 20).

The penetration of the fastener screws shall be carefully controlled to avoid early cracks in the samples and with the top of the head just below the surface of the board.

Place the specimen in the testing machine.

Load at a deformation rate of 10 mm/min ± 20 % until the breaking load is reached.

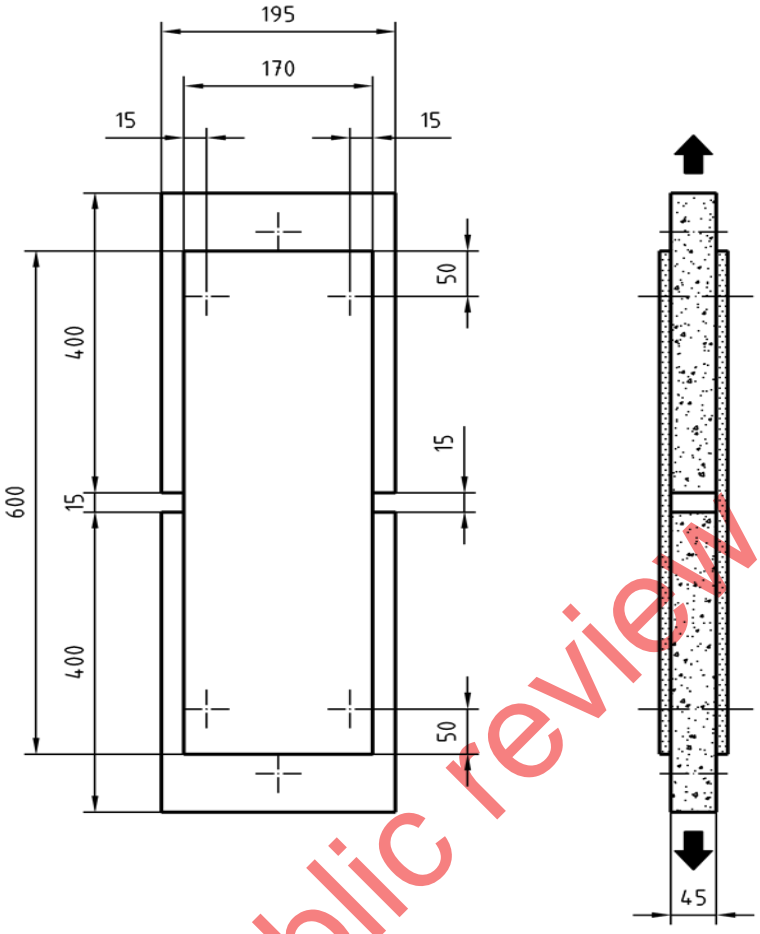


Figure 20 — Specimen for determination of conventional shear strength

Record:

— type and thickness of the board;

— breaking load (B) in Newtons.

Repeat the procedure for the remaining 5 specimens.

6.13.4 Expression of results

Calculate the breaking load per fastener (b) for each of the six specimens by dividing the measured breaking load by 4:

$$b = \frac{B}{4}$$

The conventional shear strength of the board expressed in Newtons shall be the average of the 6 values calculated above.

6.14 Determination of paper grammage

When required, the paper grammage shall be determined according to RS ISO 536.

7 Designation of plasterboards

Gypsum plasterboards shall be designated as follows:

a) by the wording "gypsum plasterboard";

b) by type letter:

- A;
- D;
- E;
- F;
- H (1, 2 or 3);
- I;
- P;
- R;

NOTE 1 Types D, E, F, H, I, R may be combined as appropriate6). Types A and P cannot be combined.

NOTE 2 The designation letters should be given in alphabetical order.

c) by reference to this document;

d) by the dimensions in millimetres in the following order:

- width;
- length;
- thickness;

e) by edge profile:

— square;

— bevelled;

— tapered;

— half-rounded;

— half-rounded tapered;

— rounded;

— special purpose.

EXAMPLES OF DESIGNATION:

Gypsum plasterboard A / DRS 632- 1200 / 2400 / 9,5 / tapered edge.

Gypsum plasterboard FH2 / DRS 632 - 1250 / 3000 / 12,5 / half-rounded tapered edge.

Gypsum plasterboard DFH 2 / DRS 32- 1250 / 3000 / 12,5 / rounded edge.

8 Marking, labelling and packaging

Gypsum plasterboards complying with this document shall be clearly marked on the board or on the accompanying label or on the packaging or on the accompanying commercial documents (e.g., a delivery note) with the following items:

— reference to this document;

— name, trademark or other means of identification of the producer of the plasterboard;

— date of production;

— means of identifying the plasterboards and relating them to their designation according to Clause 7.

Annex A
(normative)

Sampling procedure for testing

A.1 General

The required number of plasterboards to determine the compliance with specification should be sampled from a delivery consignment of boards.

The appropriate consignment size should be agreed between representatives of any involved parties who should have the opportunity to be present at the time of sampling.

A.2 Sampling procedure

NOTE The choice of the method of sampling should be as defined in A.2.1 and A.2.2 as appropriate.

A.2.1 Random sampling

Whenever practically possible, the random sampling method should be used, in which every plasterboard in the consignment has an equal chance of being selected for the sample.

Three boards of each type should be selected from positions throughout the consignment without any consideration given to the condition or quality of the selected boards.

NOTE In practice, random sampling is normally only convenient either when the boards forming the consignment are being moved in a loose (unpacked) form from one place to another or when they have been split into a large number of small stacks awaiting installation.

A.2.2 Representative sampling

A.2.2.1 General

When random sampling is impracticable or not convenient, e.g., when the boards form a large stack or stacks with ready access to only a limited number of boards, a representative sampling procedure should be used.

A.2.2.2 Sampling from a stack

The consignment should be divided into at least three real or imaginary sections, each of a similar size. One board should be selected at random from within each section in order to give the required number of samples as indicated in 6.1.

NOTE It will be necessary to remove some sections of the stack or stacks in order to gain access to boards within the body of such stacks when taking samples.

A.2.2.3 Sampling from a consignment formed of banded or wrapped packs

At least three packs should be selected at random from the consignment. The packaging around each of the

selected packs should be removed and one board should be sampled at random from within each pack in order to give the required number of samples without any consideration given to the condition or quality of the selected boards.

Annex B
(normative)

Conditions for reaction to fire classification of gypsum plasterboards

B.1 Introduction

Boards complying with the limits given in the table below are classified in the accordance with Standards shown for the end use applications stated.

Gypsum plasterboard	Nominal board thickness (e) (mm)	Gypsum core		Paper grammage [a] (G) (g/m^2)	Substrate	Class [b] (excluding floorings)
		Density (M) (kg/m^3)	Reaction to fire class			
Conforming to DRS 632 (except perforated boards)	$6,5 \leq e < 9,5$	$M \geq 800$	A1	$G \leq 220$	Any wood-based product with density ≥ 400 kg/m^3 or any product of at least class A2-s1, d0	A2-s1, d0
				$220 < G \leq 320$		B-s1, d0
	$e \geq 9,5$	$M \geq 600$		$G \leq 220$	Any wood-based product with density ≥ 400 kg/m^3 or any product of at least class A2-s1, d0 or any insulating product of at least class E-d2 mounted according to method 1	A2-s1, d0
				$220 < G \leq 320$		B-s1, d0

[a] Determined according to RS ISO 536 and with no more than 5 % organic additive content.

[b] Classes as RS 547.

B.2 End use application

B.2.1 General

The gypsum plasterboards shall be mounted and fixed using one of the three following methods.

B.2.2 (Method 1) Mechanically fixed to a supporting substructure

The gypsum boards, or (in the case of multi-layer systems) at least the outermost layer of boards, shall be mechanically fixed to a metal substructure or to a timber substructure.

When the substructure provides supporting members in one direction only, the maximum span between the supporting members shall not exceed a dimension equal to 50 times the thickness of the gypsum boards.

When the substructure includes supporting members in two directions, the maximum span in either direction shall not exceed a dimension equal to 100 times the thickness of the gypsum boards.

The mechanical fixings shall be screws, staples or nails, which shall be fixed through the thickness of the gypsum boards into the substructure at centres not exceeding 300 mm measured along the length of each supporting member.

Behind the gypsum boards may be an air space, or an insulating product. The substrate may be:

a) any wood-based product with density ≥ 400 kg/m^3 or any product of at least class A2-s1, d0 in case of gypsum boards of ≥ 6,5 mm and < 9,5 mm nominal thickness and ≥ 800 kg/m^3 core density; or

b) any wood-based product with density ≥ 400 kg/m^3 or any product of at least class A2-s1, d0 in case of gypsum boards of ≥ 9,5 mm nominal thickness and ≥ 600 kg/m^3 core density; or

c) any insulating material of at least class E-d2 in case of gypsum boards of ≥ 9,5 mm nominal thickness and ≥ 600 kg/m^3 core density.

Each joint between adjoining gypsum boards shall have a gap width ≤ 4 mm. This provision applies for any joint regardless of that the joint is or is not supported directly by a substructure supporting member and regardless of that the joint is or is not filled with a jointing material.

In cases (a) and (b) each joint between adjoining gypsum boards, which is not supported directly by a substructure supporting member and which has a gap width > 1 mm, shall be fully filled with a jointing material

In case (c) all joints between adjoining gypsum boards shall be fully filled with a jointing material (Method 2) Mechanically fixed to a solid wood-based substrate

The gypsum boards shall be mechanically fixed to a solid wood-based substrate with density ≥ 400 kg/m^3.

There shall be no cavity between the gypsum boards and the substrate.

The mechanical fixings shall be screws, staples or nails. The distance between the mechanical fixings shall correspond to the rules given above for method 1.

Each joint between adjoining gypsum boards shall have a gap width ≤ 4 mm and may remain unfilled.

B.2.3 (Method 3) Mechanically fixed or bonded to a solid substrate (dry lining system)

The gypsum boards shall be fixed directly to a solid substrate with a reaction to fire classification of at least class A2-s1, d0.

The gypsum boards may be fixed using screws or nails fixed through the thickness of the gypsum boards into the

solid substrate or may be bonded to the substrate using “dabs” of a gypsum-based adhesive.

In either case the screw or nail fixings or the adhesive “dabs” shall be positioned at maximum 600 mm vertical and horizontal centres.

All joints between adjoining gypsum boards may remain unfilled.

Annex C
(normative)
Mounting and fixing in the test according to RS 540 (SBI test)

C.1 Introduction

When the conditions (e.g., thickness of the board, gypsum core, paper grammage, etc.) stated in Annex B do not apply or if regulatory demands require the testing of the reaction to fire behaviour of gypsum plasterboard assemblies on substrates other than those of at least Class A2-s, d0, the following rules for mounting and fixing shall apply.

C.2 General applications

The gypsum plasterboards shall be mounted and fixed using the following method. This provides the most onerous conditions and the resultant classification shall be applied to all end use applications. Results obtained for a given thickness of board apply for all thicker boards.

The boards shall be mechanically fixed to a metal sub-structure as shown in Figures C.1a to C.1c.

The structure shall be vertical steel studs with a web width of 70 mm to 80 mm and a metal thickness of 0,5 mm to 0,6 mm positioned as shown in Figure C.1b.

The mechanical fixings shall be screws, which shall be fixed through the thickness of the boards into the sub-structure at (300 ± 30) mm centres measured along the length of each supporting member.

Both vertical and horizontal joints shall be included positioned as shown in Figure C.1a. All joints between adjoining boards shall be butted and unfilled.

The cavity formed behind the boards by the sub-structure shall be filled with a non-fire-resistant treated polyurethane (PUR) of (35 ± 5) kg/m^3 density. The thickness shall be 10 mm to 15 mm less than the web width.

A 40 mm air gap shall be left between the PUR and the calcium silicate boards.

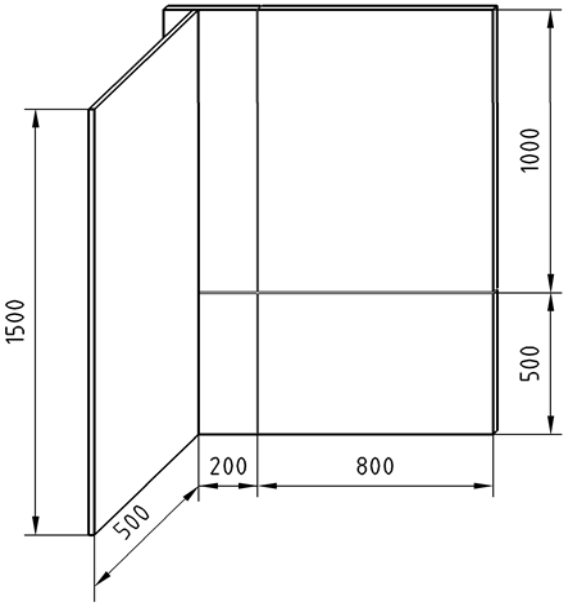


Figure C.1 a) — Joints

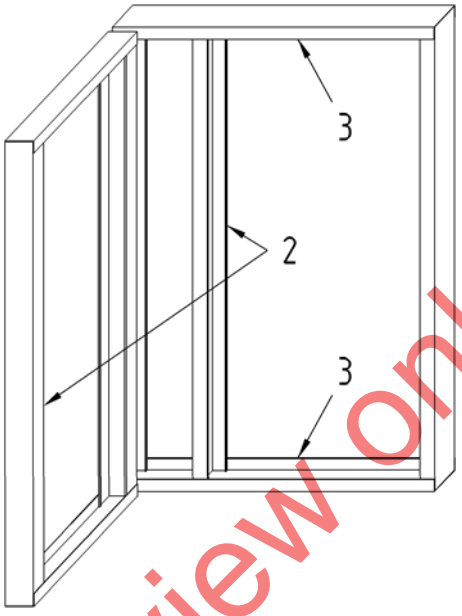


Figure C.1 b) — Sub-structure

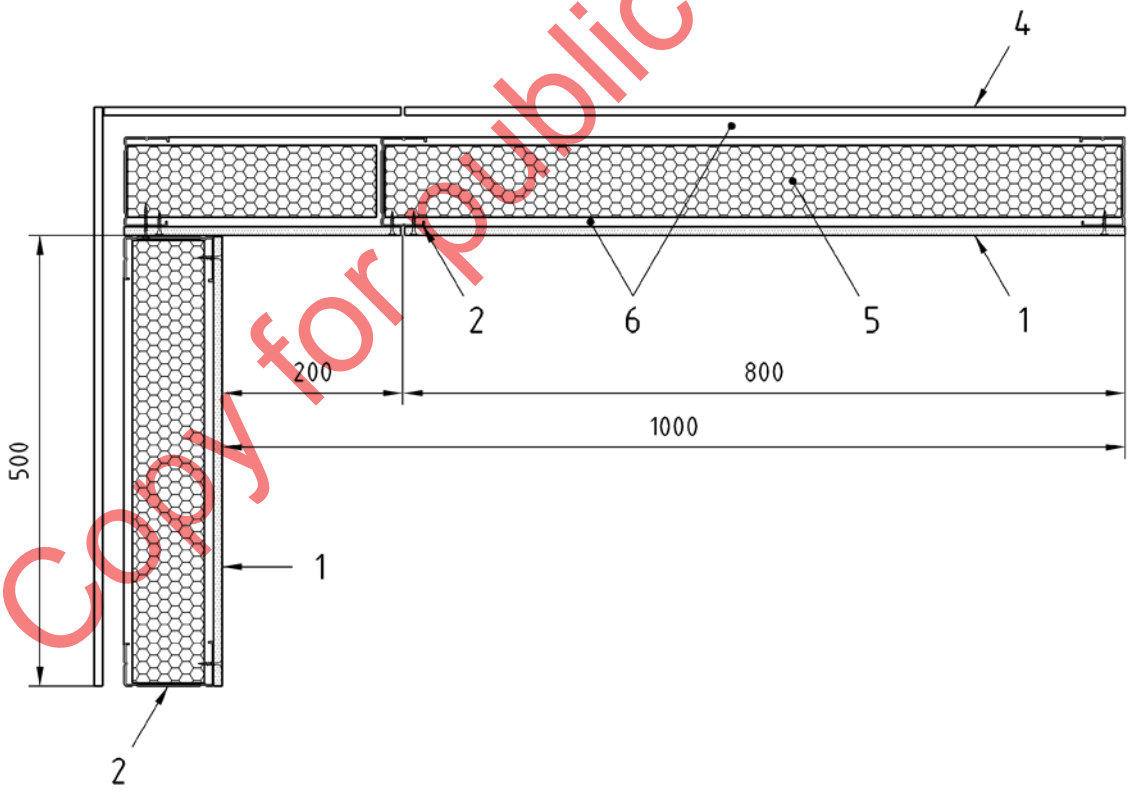


Figure C.1 c) — Mechanical fixings

Key

1 gypsum plasterboard

2 metal stud

3 U-channel

4 calcium silicate baseboard

5 PUR panel

6 air gap

Figure C.1 — Mounting and fixing of plasterboard to a metal sub-structure

C.3 Limited applications regarding joint filling

The gypsum plasterboards shall be mounted and fixed and the cavity shall be filled in the same way as described in C.2 above, but the joints shall be treated with jointing materials.

The results obtained shall apply to all end use applications provided the joints are treated with jointing materials. Results obtained for a given thickness of board shall apply for all thicker boards.

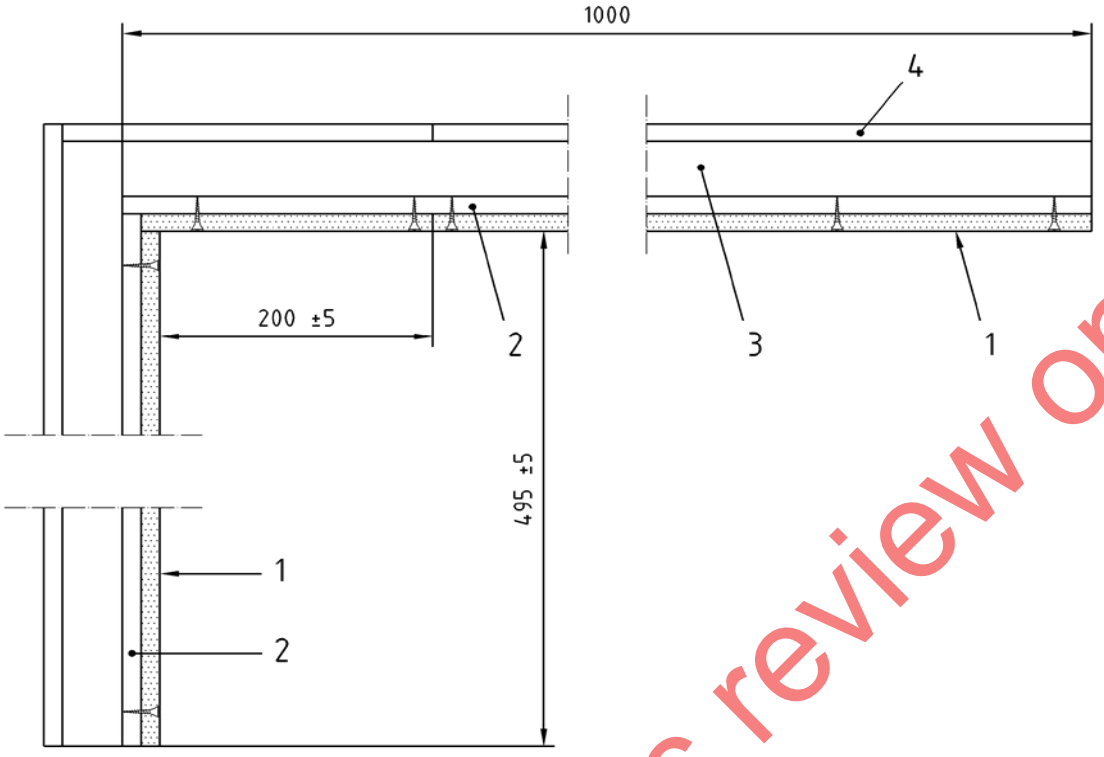
C.4 Limited applications regarding wood-based substrates

The gypsum plasterboards shall be mounted and fixed using the following method. The resultant classification may be applied to any wood-based substrate with a density of at least 350 kg/m^3 as stated below and also any end use substrate of Class A1 and A2. Results obtained for a given thickness of board shall apply for all thicker boards. The boards shall be mechanically fixed to a (15 to 20) mm ± 2 mm thick non-fire resistant treated continuous timber background, with a density of (350 ± 50) kg/m^3 (see Figures C.1a and C.2).

The mechanical fixings shall be screws, which shall be fixed through the thickness of the boards into the substrate at 300 mm ± 30 mm centres around all perimeters of the boards.

Both vertical and horizontal joints shall be included positioned as shown in Figure C.1a. All joints between adjoining boards shall be butted and unfilled.

Dimensions in millimetres



Key

1 gypsum plasterboard

2 timber sheet

3 air gap

4 calcium silicate baseboard

Figure C.2 – Plasterboard fixing in wood based substrates

Bibliography

[1] RS ISO 9001, *Quality management systems — Requirements*

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