

Technical performance and principles of system design

Robustness

Principles of robustness

Legislation and guidance

BS 5234: 1992 - Partitions (including matching linings)

BS 5234 comprises two parts - Part 1 code of practice for the design and installation, and Part 2 Specification for performance requirements for strength and robustness including methods of test in relation to end-use categories. The standard covers performance aspects such as stiffness, crowd pressure, impact resistance, anchorages and door slamming resistance.

HTM 60 - Ceilings in healthcare environments

HTM 60 sets out six performance categories. These categories relate user requirements to the physical and performance characteristics of different ceilings.

BS EN 13964: 2014 - Suspended ceiling - Requirements and test methods

Includes performance requirements for ceiling tiles and suspended ceiling grid systems (concealed and exposed). The standard covers issues such as the load span performance of grids.

Partition duty ratings

All our partition systems have a Duty Rating established in accordance with all the full requirements of BS 5234. These relate to the level of activity in adjacent spaces and the degree of care the partition is likely to receive. Grades are defined by the strength and robustness of a sample partition when tested by the methods described in BS 5234-2. A summary of performance criteria for grades of partitions is given in Annex B of the standard as listed in Table 7.

Table 7 - Duty ratings

Partition Duty	Category	Examples
Light	Adjacent space only accessible to persons with high incentive to exercise care. Small chance of accident occurring or misuse.	Domestic accommodation
Medium	Adjacent space moderately used, primarily by persons with some incentive to exercise care. Some chance of accident occurring or misuse.	Office accommodation
Heavy	Adjacent space frequently used by the public and others with little incentive to exercise care. Chance of accident occurring or misuse.	Public circulation areas, industrial areas
Severe	Adjacent space intensively used by the public and others with little incentive to exercise care. Prone to vandalism and abnormally rough use.	Major circulation areas, heavy industrial areas

The series of tests are designed to test the resistance to damage, both aesthetic and structural, from a range of impacts and load applications.

The tests are conducted at the maximum height for the partition system. BS 5234 itself does not have a method for establishing an acceptable maximum height, and the partition height must be established using a separate method - see maximum partition heights later. It is suggested within BS 5234 that the crowd pressure test may be suitable for evaluating heights up to 4200mm, but we would strongly advise against using this inconsistent approach and would never rely solely on BS 5234 for evaluating heights, especially above 4200mm.

Tests within BS 5234 include:

- Partition stiffness
- Resistance to damage from a small hard body impactor
- Resistance to damage from a large soft body impactor
- Resistance to perforation from a small hard body impactor
- Resistance to structural damage from a large soft body impactor
- Resistance to damage from door slamming

BS 5234 does not identify specific points of contact on a partition that should be impacted. However, we understand there are limiting points in terms of impact resistance. These are then subjected to the impact tests to ensure that the most onerous situation are assessed.

Optional tests are also detailed within the standard, but these are not used in the partition grading. These include:

- Resistance to damage from a crowd pressure load
- Lightweight anchorages pull down
- Lightweight anchorages pull out
- Heavyweight anchorages wall cupboard
- Heavyweight anchorages wash basin

Refer to section **Service Installations**, for information on fixing to drywall systems.

Important considerations

To achieve Heavy Duty or Severe Duty, the door detail needs to be reinforced otherwise the door opening will undergo too much deflection and damage during the onerous door slamming test.

To claim a partition duty, all tests must achieve the designated performance level. It is not possible, for example, for a partition lined with a single layer of

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Gyproc Regular (12.5mm) to achieve a duty rating better than Medium, because of the board's performance in the hard body perforation test. In the majority of cases, the type of board used will determine the maximum partition duty rating. Table 8 shows the maximum rating available based on a single layer board lining. In all cases, a double layer lining achieves Severe Duty.

Table 8 - Board type required to achieve a given duty rating

Board type	Maximum rating
12.5mm Gyproc Regular	Medium
15mm Gyproc Regular	Medium
12.5mm Gyproc FireStop	Medium
12.5mm Gyproc SoundBloc	Medium
12.5mm Glasroc X	Medium
15mm Gyproc FireStop	Heavy
15mm Gyproc SoundBloc	Heavy
15mm Gyproc DuraLine	Severe
12.5mm Gyproc Habito	Severe
15mm Gyproc Habito	Severe

The level of deflection and strength performance required to achieve Light Duty within BS 5234 is, in our opinion, unsuitable for any application. We do not offer any systems with a rating less than Medium Duty.

Maximum partition heights

As stated previously, BS 5234: Part 2: 1992 does not contain a consistent methodology for establishing the performance of a partition in terms of height. The industry has therefore adopted a methodology, which is based on the level of lateral deflection under a given uniformly distributed load (UDL). The criterion is that the maximum lateral deflection of the partition should not exceed $L/240$ (where L is the partition height) when the partition is uniformly loaded to 200Pa (Pa).

We utilise a UKAS accredited test laboratory to evaluate partition system heights against this performance criteria. The test evidence comes from a full-scale test procedure where the test specimen is subjected to a UDL and the induced lateral deflection is recorded. From this procedure, it is possible to establish the maximum height for a range of partition systems. Please see Table 9 for using **GypWall CLASSIC**, Table 10 and 11 for **GypWall HABITO** and Table 12 for **GypWall QUIET SF**.

When cutting Gypframe studs to suit partition height, it is not good practice to cut the stud through the location of a service cut-out.

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Table 9 - GypWall CLASSIC metal stud partition recommended maximum heights (mm) - based upon a limiting deflection of L/240 at 200 Pa

Stud	Boarding each side	600mm centres	600mm boxed	400mm centres	400mm boxed	300mm centres	300mm boxed
50 S 50	1 x 12.5mm	2500	2800	2900	3200	3100	3500
	1 x 15mm	2800	3000	3100	3300	3300	3600
	2 x 12.5mm	3400	3600	3600	3800	3800	4000
	2 x 15mm	3700	3800	3900	4000	4000	4200
70 S 50	1 x 12.5mm	3600	3900	4000	4300	4300	4700
	1 x 15mm	3800	4100	4200	4500	4500	4900
	2 x 12.5mm	4600	4800	4900	5100	5100	5400
	2 x 15mm	4900	5100	5100	5300	5300	5600
70 AS 50	1 x 12.5mm	3800	4200	4300	4700	4600	5100
	1 x 15mm	4000	4400	4500	4800	4700	5200
	2 x 12.5mm	4700	5000	5000	5300	5300	5700
	2 x 15mm	5000	5200	5300	5600	5500	5900
70 I 70	1 x 12.5mm	4600	-	5100	-	5600	-
	1 x 15mm	4700	-	5300	-	5700	-
	2 x 12.5mm	5300	-	5700	-	6100	-
	2 x 15mm	5500	-	5900	-	6300	-
92 S 50	1 x 12.5mm	4500	4800	4900	5400	5300	5800
	1 x 15mm	4700	5000	5200	5600	5500	6000
	2 x 12.5mm	5700	5900	6000	6300	6200	6600
	2 x 15mm	5900	6100	6200	6500	6400	6800
92 AS 50	1 x 12.5mm	4700	5100	5200	5700	5700	6200
	1 x 15mm	4900	5300	5400	5700	5800	6400
	2 x 12.5mm	5800	6100	6200	6500	6500	6900
	2 x 15mm	6000	6300	6400	6700	6700	7000
100 I 80	1 x 12.5mm	6000	-	6800	-	7400	-
	1 x 15mm	6100	-	6900	-	7500	-
	2 x 12.5mm	6800	-	7400	-	7900	-
	2 x 15mm	6900	-	7500	-	8000	-
150 S 50	1 x 12.5mm	6200	6800	6900	7600	7500	8300
	1 x 15mm	6500	7000	7200	7800	7700	8400
	2 x 12.5mm	7600	8000	8100	8600	8500	9100
	2 x 15mm	7900	8200	8300	8800	8700	9300
150 I 90	1 x 12.5mm	8400	-	9500	-	10400	-
	1 x 15mm	8500	-	9600	-	10500	-
	2 x 12.5mm	9100	-	10100	-	10900	-
	2 x 15mm	9400	-	10300	-	11100	-

In all GypWall CLASSIC system, for heights below 4200mm, the appropriate Gypframe Standard Channel can be used. It is recommended that for heights between 4200mm and 8000mm, the Gypframe Deep Channel is used. Gypframe Extra Deep Channel is used for heights above 8000mm. Additional consideration needs to be given if there is a deflection head requirement.

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Table 10 - GypWall HABITO metal 'C' stud and AcouStud 'AS' partition recommended maximum heights (mm) for single and multiple layers of Gyproc Habito - based upon a limiting deflection of L/240 at 200 Pa

Stud	Boarding each side	600mm centres	600mm boxed	400mm centres	400mm boxed	300mm centres	300mm boxed
50 S 50	1 x 12.5mm	3900	4000	4000	4200	4200	4400
	1 x 15mm	4200	4300	4300	4400	4400	4600
	2 x 12.5mm	5100	5100	5200	5300	5300	5400
	2 x 15mm	5400	5500	5500	5600	5600	5700
70 S 50	1 x 12.5mm	4700	4800	4900	5200	5100	5400
	1 x 15mm	4800	5000	5100	5300	5300	5600
	2 x 12.5mm	6200	6300	6300	6500	6500	6700
	2 x 15mm	6500	6600	6600	6600	6800	6900
70 AS 50	1 x 12.5mm	4800	5000	5000	5300	5300	5600
	1 x 15mm	4900	5100	5200	5500	5400	5800
	2 x 12.5mm	6300	6400	6400	6600	6600	6800
	2 x 15mm	6600	6700	6700	6900	6900	7100
92 S 50	1 x 12.5mm	5900	6100	6200	6500	6400	6800
	1 x 15mm	6100	6300	6300	6600	6600	6900
	2 x 12.5mm	7100	7200	7300	7500	7500	7700
	2 x 15mm	7400	7500	7600	7800	7800	8000
92 AS 50	1 x 12.5mm	6000	6300	6300	6700	6600	7000
	1 x 15mm	6200	6400	6500	6800	6800	7200
	2 x 12.5mm	7200	7300	7400	7600	7600	7900
	2 x 15mm	7500	7600	7700	7900	7900	8200
150 S 50	1 x 12.5mm	8000	8300	8400	8900	8900	9400
	1 x 15mm	8200	8500	8600	9100	9000	9500
	2 x 12.5mm	8800	9100	9200	9600	9600	10000
	2 x 15mm	9100	9400	9500	9900	9800	10300

In all GypWall HABITO system, for heights below 4200mm, the appropriate Gypframe Standard Channel can be used. It is recommended that for heights between 4200mm and 8000mm, the Gypframe Deep Channel is used. Gypframe Extra Deep Channel is used for heights above 8000mm. Additional consideration needs to be given if there is a deflection head requirement.

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Table 11 - GypWall HABITO metal 'C' stud and AcouStud 'AS' partition recommended maximum heights (mm) for Gyproc Habito & Gyproc Regular plasterboard - based upon a limiting deflection of L/240 at 200 Pa

Stud	Board lining (on each side)		600mm centres	600mm boxed	400mm centres	400mm boxed	300mm centres	300mm boxed
	Regular	Habito						
50 S 50	12.5mm	12.5mm	4300	4400	4400	4600	4600	4700
	15mm	12.5mm	4300	4400	4400	4600	4600	4700
	12.5mm	15mm	4500	4600	4600	4700	4700	4900
	15mm	15mm	4700	4800	4800	4900	4900	5000
70 S 50	12.5mm	12.5mm	5100	5300	5400	5600	5500	5800
	15mm	12.5mm	5100	5300	5400	5600	5500	5800
	12.5mm	15mm	5300	5400	5500	5700	5600	5900
	15mm	15mm	5400	5500	5600	5800	5700	6000
70 AS 50	12.5mm	12.5mm	5200	5400	5500	5700	5700	6000
	15mm	12.5mm	5200	5400	5500	5700	5700	6000
	12.5mm	15mm	5300	5500	5600	5800	5800	6100
	15mm	15mm	5400	5600	5700	5900	5900	6100
92 S 50	12.5mm	12.5mm	6500	6700	6800	7000	7000	7300
	15mm	12.5mm	6500	6700	6800	7000	7000	7300
	12.5mm	15mm	6600	6800	6900	7100	7100	7400
	15mm	15mm	6800	6900	7000	7200	7200	7500
92 AS 50	12.5mm	12.5mm	6600	6800	6900	7200	7200	7500
	15mm	12.5mm	6600	6800	6900	7200	7200	7500
	12.5mm	15mm	6700	6900	7000	7300	7300	7600
	15mm	15mm	6800	7000	7100	7400	7300	7700
150 S 50	12.5mm	12.5mm	8800	9100	9200	9600	9500	10000
	15mm	12.5mm	8800	9100	9200	9600	9500	10000
	12.5mm	15mm	8900	9200	9300	9700	9600	10100
	15mm	15mm	9000	9300	9400	9800	9700	10200

¹ Whilst Gyproc Habito is typically used as the outer layer plasterboard in multiple layer systems due to its superior impact resistance, these boards can be interchanged without downgrading the maximum heights indicated in this table.

In addition, these systems were tested for maximum heights using Gyproc Regular plasterboard as the additional board type. Where increased levels of fire and / or acoustic performance is required, then other board types may be used in lieu of Gyproc Regular board, along with Gyproc Habito, without downgrading the maximum heights indicated in this table.

In GypWall HABITO systems, for heights below 4200mm, the appropriate Gypframe Standard Channel can be used. It is recommended that for heights between 4200mm and 8000mm, the Gypframe Deep Channel is used. Gypframe Extra Deep Channel is used for heights above 8000mm. Additional consideration needs to be given if there is a deflection head requirement.

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Table 12 - GypWall QUIET SF metal stud partition with Gypframe RB1 Resilient Bars **one side - recommended maximum heights (mm), based on a limiting deflection of L/240 at 200 Pa**

Stud	Boarding each side	600mm centres	600mm boxed	400mm centres	400mm boxed	300mm centres	300mm boxed
50 S 50	2 x 12.5mm	3000	3200	3300	3500	3500	3800
	2 x 15mm	3200	3400	3400	3600	3600	3900
70 S 50	2 x 12.5mm	4000	4300	4400	4700	4600	5000
	2 x 15mm	4200	4400	4500	4800	4800	5100
70 I 70	2 x 12.5mm	4800	-	5400	-	5800	-
	2 x 15mm	5000	-	5500	-	5900	-
92 S 50	2 x 12.5mm	5000	5300	5300	5700	5700	6100
	2 x 15mm	5100	5400	5500	5800	5800	6200
100 I 80	2 x 12.5mm	6300	-	7000	-	7600	-
	2 x 15mm	6400	-	7100	-	7700	-
150 S 50	2 x 12.5mm	6800	7200	7400	8000	7900	8600
	2 x 15mm	6900	7400	7500	8100	8000	8700
150 I 90	2 x 12.5mm	8700	-	9700	-	10600	-
	2 x 15mm	8800	-	9800	-	10600	-

Table 13 - GypWall QUIET SF metal stud partition with Gypframe RB1 Resilient Bars **both sides - recommended maximum heights (mm), based on a limiting deflection of L/240 at 200 Pa**

Stud	Boarding each side	600mm centres	600mm boxed	400mm centres	400mm boxed	300mm centres	300mm boxed
50 S 50	2 x 12.5mm 2 x 15mm	2500	2700	2800	3100	3100	3400
70 S 50	2 x 12.5mm 2 x 15mm	3200	3600	3700	4100	4100	4500
70 I 70	2 x 12.5mm 2 x 15mm	4300	-	5000	-	5500	-
92 S 50	2 x 12.5mm 2 x 15mm	4000	4400	4500	5000	5000	5600
100 I 80	2 x 12.5mm 2 x 15mm	5700	-	6600	-	7200	-
150 S 50	2 x 12.5mm 2 x 15mm	5700	6300	6500	7200	7200	8000
150 I 90	2 x 12.5mm 2 x 15mm	8100	-	9200	-	10200	-

In all systems, for heights below 4200mm the appropriate standard (C) Gypframe Floor and Ceiling Channel can be used. It is recommended that for heights between 4200mm and 8000mm, the Deep Flange (DC) Gypframe Floor and Ceiling Channel is used and the Extra Deep Flange (EDC) is used for heights above 8000mm

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Assessing acoustic performance of GypWall CLASSIC with reduced stud centres

Reducing the centres of the metal studs within GypWall partition systems can have a detrimental effect on the sound insulation performance of the system.

The effect may vary depending on the precise specification, e.g. board type, number of board layers, stud size and type, insulation within stud cavity.

For guidance on a particular specification please contact the Gyproc Technical Team.

Movement

Deflection of upper floor and roof slabs can cause appreciable stress in partitions. Where such deflection is likely to occur, the partition to structural soffit junction detail must be designed to accommodate movement, whilst still complying with any fire or acoustic performance requirements. Typical deflection head details for fire-rated GypWall partition systems are given in the relevant partition and wall system sections within this book. Additional attention to detailing will be required to optimise sound insulation performance. The deflection head details included in the Building acoustics section shows a good practice solution incorporating steel angles, either side of the head and sealed to the structure, which results in only a 1dB, up to 2dB loss in performance.

Where linings (partitions, wall linings and ceilings) cross a movement joint in a structural wall, floor or roof slab, they should be provided with a movement joint at the same point, and be capable of the same range of movement as the wall, floor or roof joint. A range of movement / control joint beads are available in the market that provide a range of movement capabilities.

Environmental conditions

Temperature

Gyproc plasterboards and Glasroc specialist boards should not be used where the temperature will exceed 49°C for prolonged periods. Continued exposure to high temperatures and/or multiple exposure for short periods, results in the gradual continued calcination of the gypsum and loss of its inherent properties. Gyproc plasterboards and Glasroc specialist boards can be subjected to freezing conditions without risk of damage. Typically site temperatures across the Middle East are below 49°C, especially in shaded areas. Contact the Gyproc Technical Team for further guidance.

Moisture

Gyproc plasterboards should not be used in continuously damp conditions nor in buildings that are not weathertight. However, Moisture Resistant grade board, M2TECH grade board, Aquaroc FC board and Glasroc specialist boards are all suitable for use in intermittently damp conditions or sheltered external situations in conjunction with an appropriate decorative finish. Glasroc specialist boards are also suitable for external applications with suitable renderings.

Relative humidity (RH)

In moderate humidity situations, i.e. 40% to 70% RH, no special precautions need to be taken when using Gyproc plasterboards, other than those necessary to prevent interstitial condensation.

Intermittently high relative humidity, i.e. above 70% RH, requires special treatment to the face of the plasterboards, and only moisture resistant grade plasterboards or Glasroc specialist boards should be used. When using non-MR plasterboards, intermittent exposure to RH levels above 70% during the construction phase may be acceptable should the RH levels again return back to below 70%. Prolonged continuous exposure above 70% however, which may be several days, could actually delaminate the paper, expand or bubble the gypsum core or even bow the boards should they be stored incorrectly. Should any of these symptoms be apparent, then the boards would need to be replaced.

Special environments - swimming pools and similar environments

Ceiling lining

Gyproc products and systems are regularly specified for ceilings in and around swimming pool halls and similar areas. With regard to ceiling specifications attention to detail is critical. The following guidance should be considered:

- The boards to be used should be Gyproc MR, M2TECH or Glasroc specialist boards or Aquaroc FC. They should be screw-fixed to a framed system at their recommended centres.
- The surface of the board should be finished using Gyproc's recommended methods, and they must be set and dry before applying decoration.
- The decoration should take the form of a suitable moisture impervious finish supplied by others.
- Penetrations in the ceiling linings and perimeters should be avoided where possible. All service penetrations must be sealed using a moisture resistant sealant (even though the recommended plasterboards are moisture resistant it is unwise to allow moisture to gain access to the core of the board).
- The air in the indoor pool area should be conditioned such that condensation will not form on the surface of the boards.
- In situations where there is a risk of condensation occurring within the ceiling cavity, it must be mechanically ventilated or the decorative finish must be impervious to water vapour. This will minimise the risk of condensation forming on 'cold' surfaces in the cavity, which could then come in to contact with the unprotected back face of the plasterboard lining.

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- It is good practice to protect the cut ends of Gypframe metal components using suitable material to prevent corrosion.
- Ensure that the Gypframe metal frame is totally encapsulated by suitable Gyproc board and waterproof finishing systems by Saint-Gobain Weber

Wall lining

Gyproc boards (including MR grade) are not suitable for use as wall linings in areas such as communal showers and public pool halls. Moisture Resistant grade board, M2TECH grade board, Aquaroc FC boards and Glasroc specialist boards can be considered for use in adjacent areas of wall lining and in most domestic situations but attention to detail is critical and, in addition to the guidance given above for ceiling linings, the following additional guidance should be considered.

- The lining boards must be lifted clear from any floor where free water is possible and a suitable skirting detail must be employed which will not allow water penetration
- In extreme moisture environments, Glasroc X must be used in conjunction with a tanking system
- Important guidance is given within BS 5385-1: 2009 and BS 5385-4: 2009, within which gypsum plasterboard and gypsum plaster are deemed unsuitable backgrounds for tiling in 'frequently wetted' areas. 'Frequently wetted' areas include communal showers and pool halls.

Ceilings - general

EN 13964: 2004 includes class definition relating to exposure conditions and maximum deflection. The standard Gyproc MF ceiling lay-out is capable of complying with deflection class 2 and exposure class A, however the system can be modified to meet classes 1 and B. Contact the Gyproc Technical Team for further guidance.