The Building Test Centre
Fire Acoustics Structures

The Building Test Centre
British Gypsum
East Leake
Loughborough
Leics. LE12 6NP
Tel (0115) 945 1564
Fax (0115) 945 1562
Email btc.testing@saint-gobain.com
Website www.btconline.co.uk

Report Number **BTC 20236S**

A structural test report covering laboratory testing to BS 5234 Part 2: 1992, Annexes A, B, C, D, E, F, and G on a British Gypsum GypWall Quiet partition clad with a double layer of 15mm Gyproc SoundBloc. (UltraEMBOSSED™ profiles).

Test Dates: 7th and 8th September 2017

Customer: **British Gypsum**
East Leake
Loughborough
Leicestershire
LE12 6HX

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The Building Test Centre
British Gypsum
East Leake
Loughborough
Leics. LE12 6NP
Tel (0115) 945 1564
Fax (0115) 945 1562
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East Leake
Loughborough
Leics. LE12 6NP
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FOREWORD

The test sponsor was British Gypsum.

The test specimen was installed by John Gwynne and Sunny Rollings. The construction of the specimen took place between the 5th and 7th September 2017.

The Building Test Centre played no role in the design or selection of the materials comprising the test specimen.

REPORT AUTHORISATION

Report Author	Authorised by
Martin Lynch MIOA *Scientist*	**Jack Marriott** BSc (Hons) AMIOA *Scientist*

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Loughborough
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Website www.btconline.co.uk

TEST REPORT AMENDMENTS

Page	Amendments	Date

Report Amendments Author	Amendments Authorised by
Name *Role*	**Name** *Role*

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TEST CONSTRUCTION

A 3600mm high x 4600mm long twin-framed test specimen was constructed in the test aperture with one end of the partition fixed to the test rig and the other remaining free.

A door set, measuring 900mm x 2100mm, was incorporated into the partition 700mm from the fixed end.

Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channels were screw fixed to the head and base of the test aperture using 35mm British Gypsum Drywall Screws spaced at 600mm centres incorporating a 900mm opening for the door set.

Gypframe 48S50 'C' Studs were positioned at the fixed end and were screw-fixed to the side of the test aperture using 35mm British Gypsum Drywall Screws at 600mm centres.

Gypframe 48S50 'C' Studs were positioned between the head and base channel at 600mm centres. The stud at the free-end of the partition remained free.

A second framework using the same components and fixing details was located adjacent to the first framework by 40mm to create the twin frame and a final overall partition thickness of 200mm. The Gypframe 48S50 ‘C’ Studs were located at 600mm centres parallel with the first set of framework studs.

The studs were cross braced using Gypframe 99FC50 Fixing Channel at 1200mm centres and fixed twice to each stud using two 13mm British Gypsum Wafer Head Drywall Screws. The braces were staggered by 600mm between stud pairs.

The door jambs were braced from above the door opening using Gypframe 99FC50 Fixing Channel at 1200mm centres and fixed twice to each stud using two 13mm British Gypsum Wafer Head Drywall Screws.

The vertical framework at the door opening was formed as follows:

The vertical framework that contained the doorset was formed using Gypframe 48S50 'C' Studs and timber sub frame. The base channel was fixed to the aperture using two 1 ¾” woodscrews at the door opening and 150mm adjacent to the first row of fixings. A timber sub-frame was inserted into the web of the door jamb studs and extended 150mm above the head of the door frame.

The Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channel was extended 300mm beyond the door opening on either side. Each flange of the extended channel was cut at the jamb position and the 300mm over run was bent up through 90 degrees to cover the bottom of the jamb

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stud. The channel was fixed to the jamb stud twice either side using 13mm British Gypsum Wafer Head Drywall screws.

At the head of the door opening, Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channel was cut and bent to extend 150mm down the face of the studs. The channel and door jamb studs were fixed twice to each side using 13mm British Gypsum Wafer Head Drywall screws.

The exposed door jamb studs on each side of the opening were sleeved to full door height with Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channel section.

The vertical framework that did not contain the doorset was formed using Gypframe 48S50 'C' Studs. The Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channel was fixed to the test aperture base with two 1 ¾" woodscrews at the door opening and 150mm adjacent to the first row of fixings. The channel was fixed to the jamb stud on either side using 13mm British Gypsum Wafer Head Drywall screws.

At the head of the door opening, Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channel was cut and bent to extend 150mm down the face of the studs. The channel and door jamb studs were fixed twice to each side using 13mm British Gypsum Wafer Head Drywall screws.

A length of Gypframe 48S50 'C' Stud was positioned between the door head detail and the head of the partition to maintain 600mm stud centres above both door openings. The studs were cross braced using Gypframe 99FC50 Fixing Channel at 1200mm centres and fixed twice to each stud using two British Gypsum Wafer Head Drywall Screws. The braces were staggered by 600mm between stud pairs.

The framework was clad with a double layer of 15mm Gyproc SoundBloc on each side. The inner layer of boards was screw fixed around the perimeter of the board at 300mm centres using 25mm British Gypsum Drywall Screws.

The outer layer of boards was screw fixed around the perimeter of the board and intermediate stud positions at 300mm centres using 40mm British Gypsum Drywall Screws.

A horizontal joint was positioned at 2400mm from the base on the outer layer boards and at 1200mm from the base on the inner layer boards, on both faces of the specimen. A Gypframe GFS1 Fixing Strap was used behind the horizontal outer layer board joint.

At the door opening the vertical jambs were clad with an inner layer of 15mm plywood fixed to the studs using 25mm Gyproc Drywall Screws at 300mm centres and an outer layer of 15mm Gyproc SoundBloc fixed at 300mm centres using 40mm British Gypsum Drywall Screws.

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East Leake
Loughborough
Leics. LE12 6NP
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Fax (0115) 945 1562
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A doorframe, 100mm x 38mm (including stop), was fixed into position using two 90mm British Gypsum Drywall Screws at each point 50mm from the bottom of the casing and at 400mm centres thereafter. A Severe Duty door was fitted using 1½" No.10 countersunk wood screws.

All vertical joints were staggered between layers. The vertical and horizontal joints adjacent to the door were taped and filled on both sides using Gyproc joint tape and Gyproc joint filler.

A softwood architrave, 45mm x 18mm, was fixed to both sides of the partition with 50mm bright oval nails at 300mm centres into the timber doorframe. Bullnose softwood skirting was fixed to the base track and at stud positions on both sides of the partition using a pair of 40mm British Gypsum Drywall Screws at 600mm centres.

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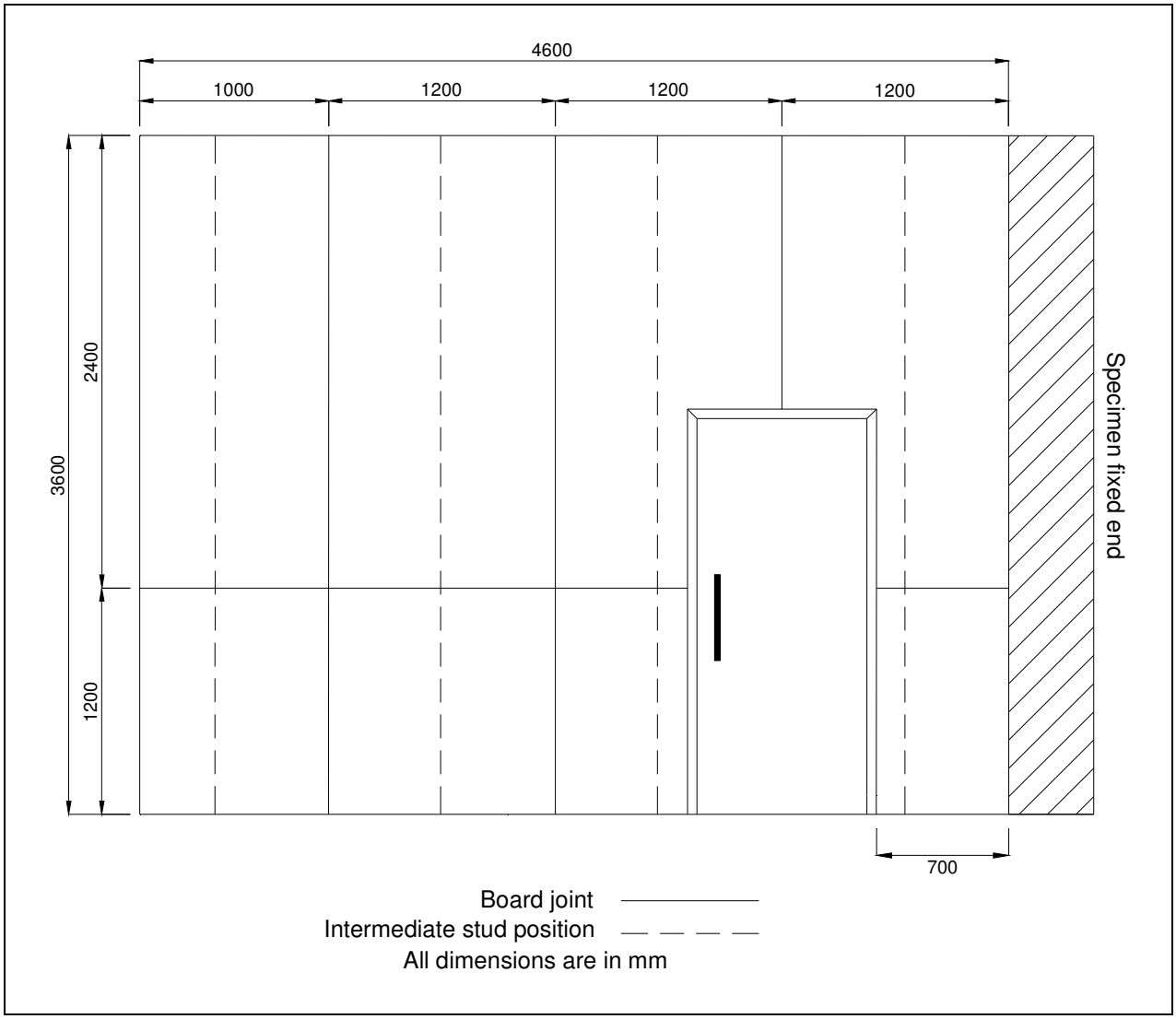

Figure 1. Side A elevation of the partition (inner layer)

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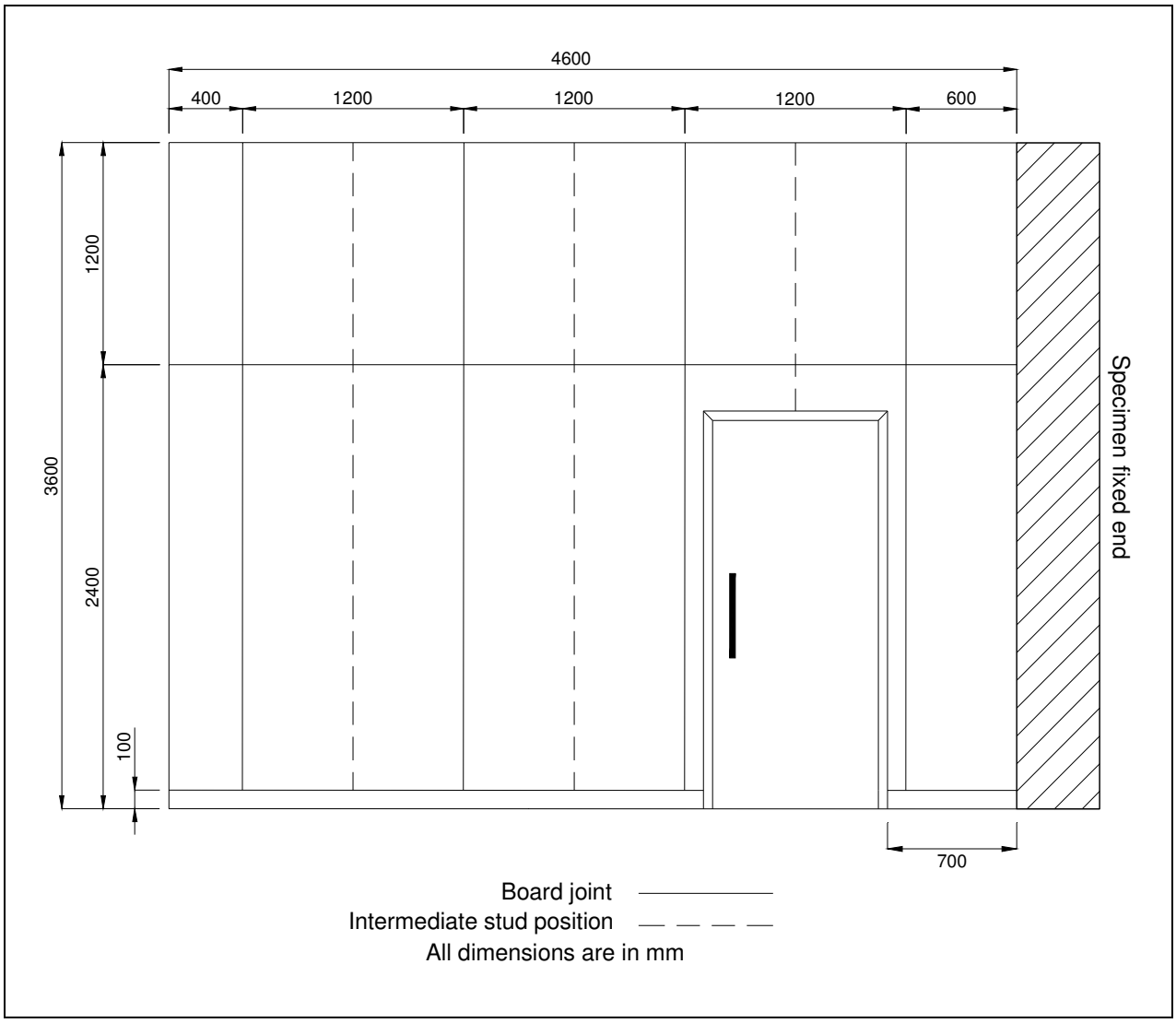

Figure 2. Side A elevation of the partition (outer layer)

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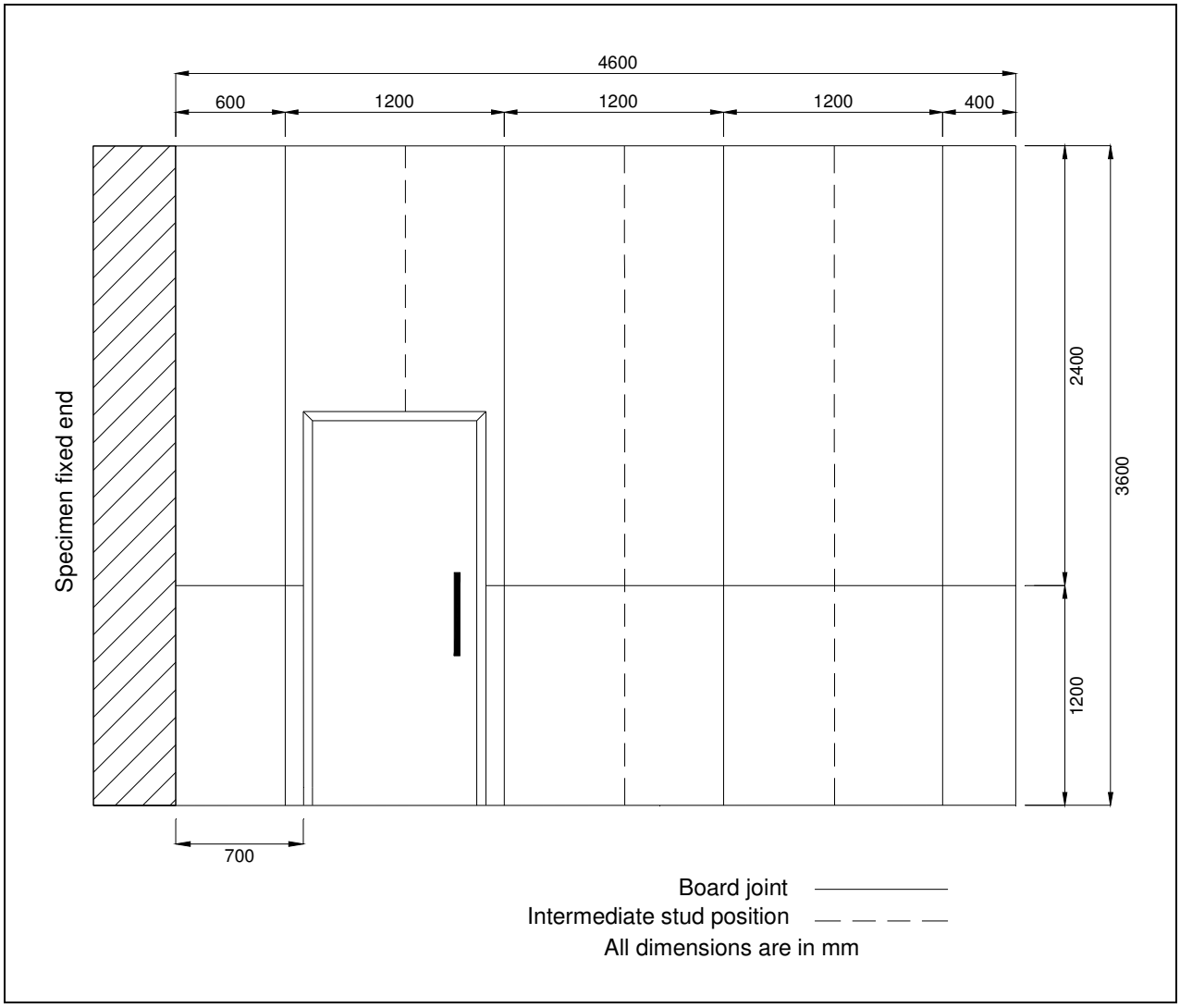

Figure 3. Side B elevation of the partition (inner layer)

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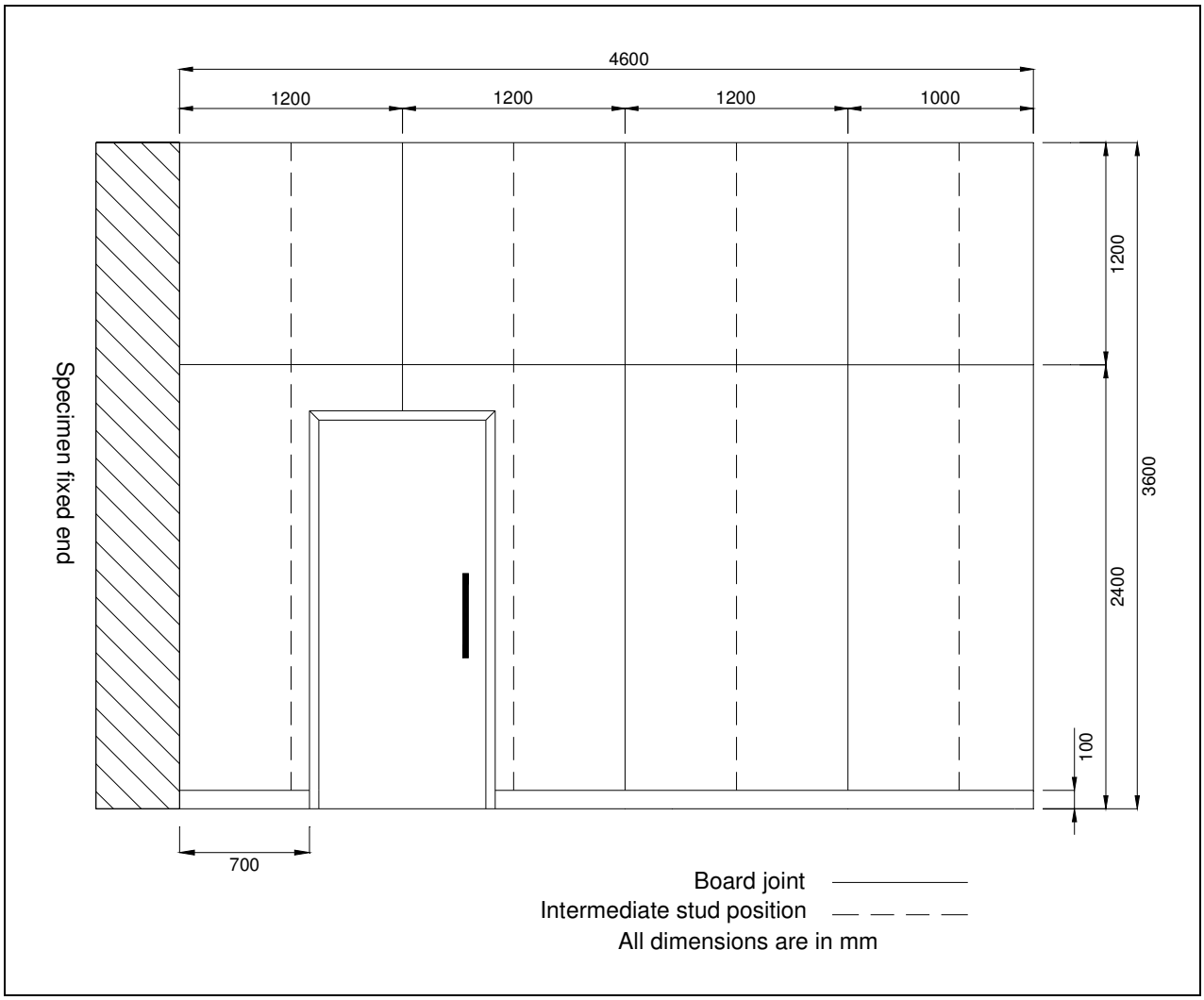

Figure 4. Side B elevation of the partition (outer layer)

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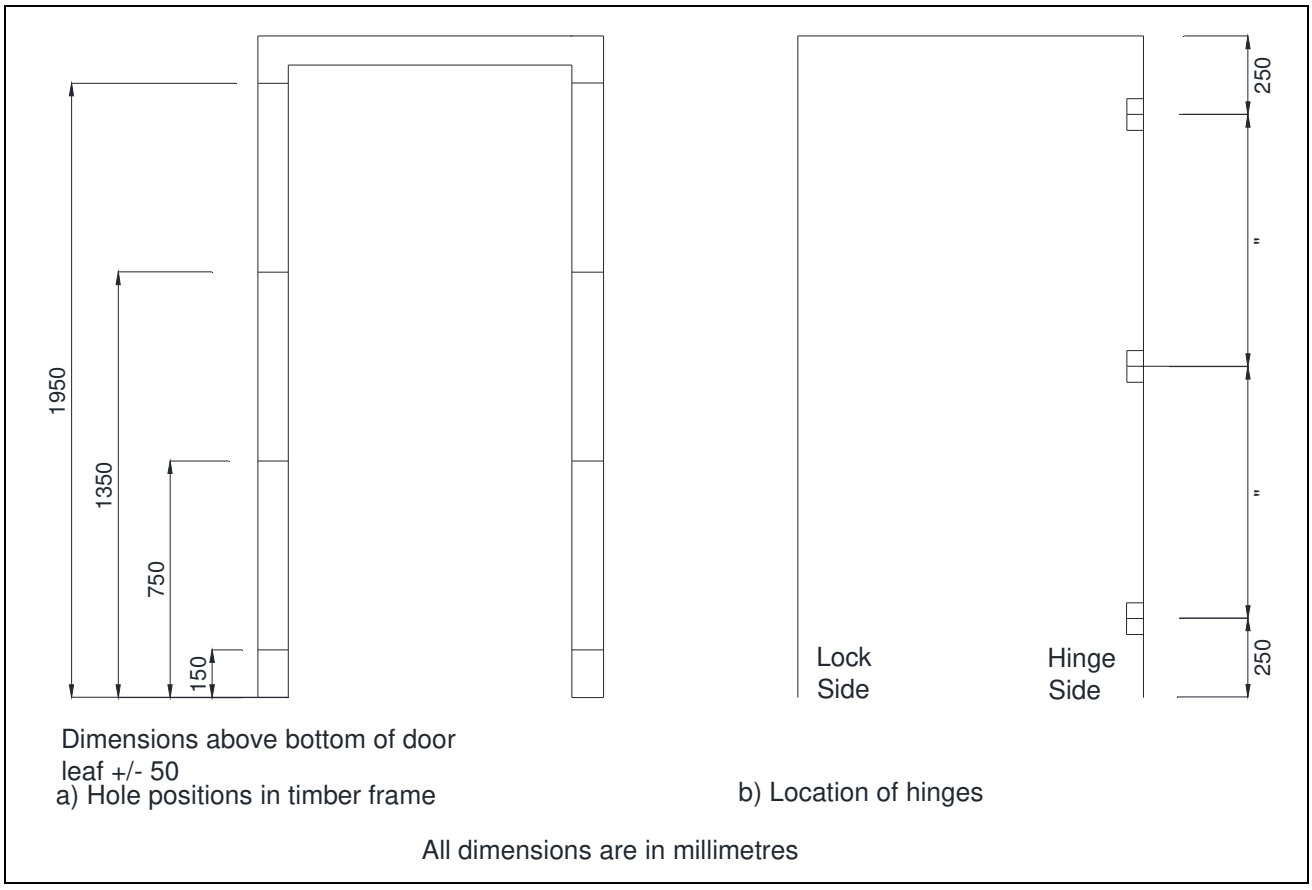

Figure 5. Fixing positions of the door frame

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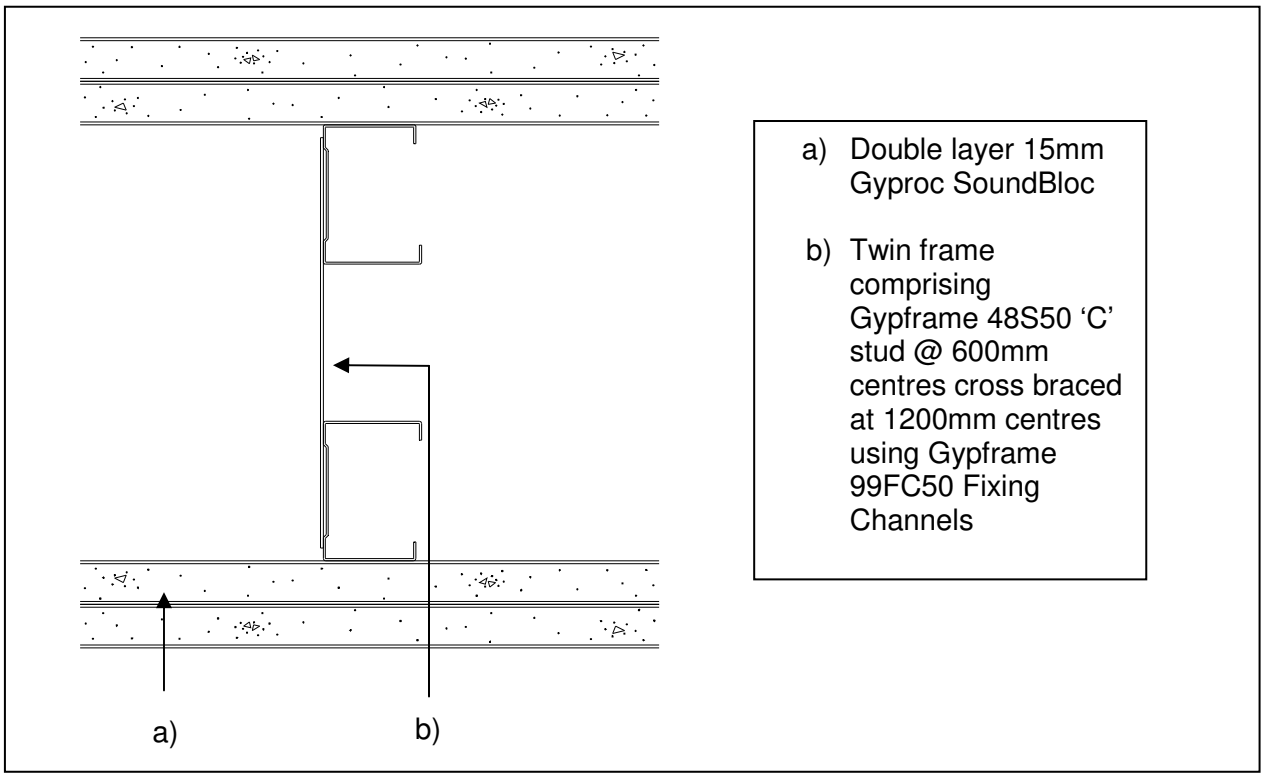

Figure 6. Horizontal cross section view of the partition

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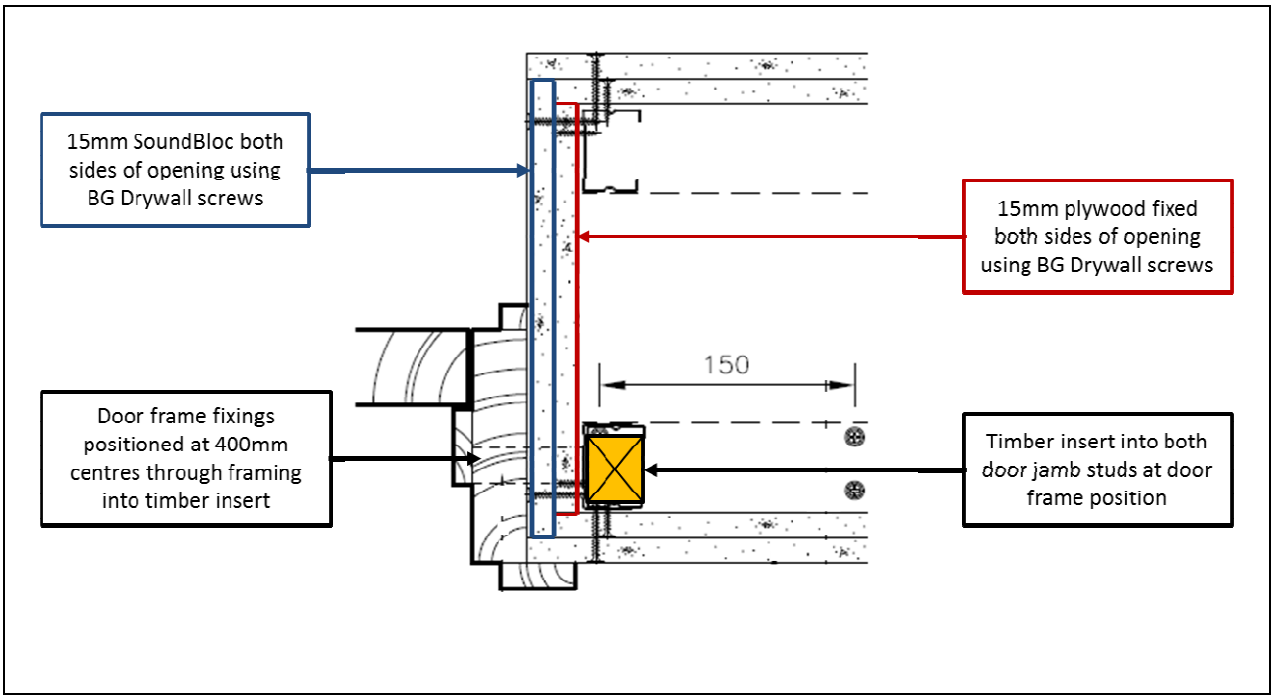

Figure 7. Horizontal cross section view of the door opening in the partition

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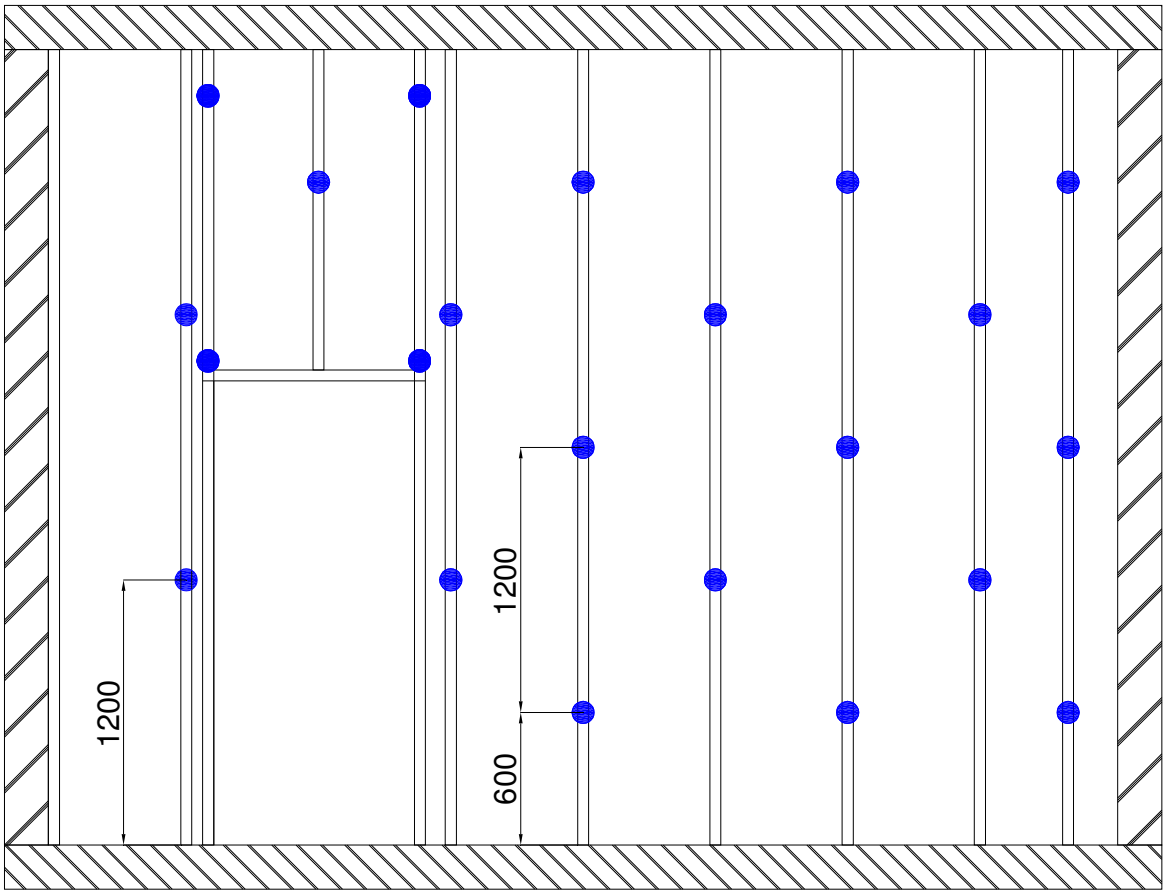

Figure 8. Gypframe 99FC50 Fixing Channel cross brace layout for twin frame partition.

The descriptions of individual components making up the test specimen were provided by the customer and were checked for accuracy wherever possible.

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Loughborough
Leics. LE12 6NP
Tel (0115) 945 1564
Fax (0115) 945 1562
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TEST MATERIALS

Plasterboard

i) Nominally 2400mm (long) x 1200mm (wide) x 15mm (thick) Gyproc SoundBloc manufactured by British Gypsum, ex East Leake.

Surface density:	13.8kg/m^2
Average thickness:	14.9mm
Board Code:	16 226 17 21:03
	16 226 17 21:03
	16 226 17 20:53

The surface densities were calculated using the actual weight and size of a selection of the boards used in the test specimen.

Frame components

i) 0.5mm thick Gypframe 48S50 'C' Studs.
ii) 0.5mm thick Gypframe 50FEC50 Folded Edge Standard Floor and Ceiling Channel.
iii) Gypframe 99FC50 Fixing Channel.
iv) Gypframe GFS1 Fixing Strap.

All metal components supplied by British Gypsum.

Fasteners

i) 25mm British Gypsum Drywall Screws.
ii) 35mm British Gypsum Drywall Screws.
iii) 40mm British Gypsum Drywall Screws.
iv) 13mm British Gypsum Wafer Head Drywall Screws.
v) 90mm British Gypsum Drywall Screws.
vi) 1½" No. 10 Countersunk Wood Screws.
vii) 1¾" No. 10 Countersunk Wood Screws.
viii) 50mm bright oval nails.

All fasteners supplied by British Gypsum.

Door components

i) 60kg Severe Duty door supplied by The Building Test Centre.
ii) A doorframe, 100mm x 38mm (including stop) supplied by British Gypsum.

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East Leake
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Leics. LE12 6NP
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Miscellaneous components

i) Gyproc Joint Tape.
ii) Gyproc Joint Filler.
iii) 100mm x 19mm bullnose softwood skirting board.
iv) 45mm x 18mm softwood architrave.
v) 29mm x 45mm timber sub-frame.
vi) 15mm thick plywood.

All Miscellaneous components supplied by British Gypsum.

Where measurements could not be taken, then weight and dimensions were provided by the customer or the manufacturer e.g. from material labelling. Material information was recorded according to procedure AP070 vs 1.0.

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East Leake
Loughborough
Leics. LE12 6NP
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Fax (0115) 945 1562
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ENVIRONMENTAL CONDITIONS

Environmental conditions during installation and testing:

Date range	5th to 8th September 2017
Temperature range	18.2 – 19.6°C
Relative Humidity or range	54.9 – 69.8%

The specimen should be installed, conditioned and tested in an atmosphere between 10°C and 30°C and between 30% and 75% relative humidity.

TEST RESULT

Classification grade SEVERE DUTY was achieved in accordance with BS 5234: Part 2: 1992

LIMITATIONS

The results only relate to the behaviour of the specimen of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential structural performance of the element in use.

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TEST SEQUENCE AND SUMMARY SHEET

SUMMARY OF TESTS FOR GRADE COMPLIANCE						
Requirement Tested	Test Annex	Load Position	Grade Performance achieved Pass/Fail			
			LD	MD	HD	SD
Determination of partition stiffness	A	on stud				Pass
		between studs				Pass
Determination of surface damage by small hard body impact	B					Tested*
Resistance to damage by impact from a large soft body	C	on stud				Pass
		between studs				Pass
Determination of resistance to perforation by small hard body impact	D					Pass
Determination of resistance to structural damage by multiple impacts from a large soft body	E	between studs				Pass
		on stud				Pass
Determination of the effects of door slamming	F					Pass
GRADE achieved				Severe Duty		

* As this is indicative (without pass or fail criteria) the term “tested” is shown against the appropriate level of performance. Sponsors and specifiers should ascertain if surface damage is acceptable.

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Fax (0115) 945 1562
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OPTIONAL TESTS ON PARTITION SYSTEM			
Requirement Tested	Test Annex	Performance Level	Pass / Fail
Determination of resistance to crowd pressure	G	1.5KN/m	Pass

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Leics. LE12 6NP
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Fax (0115) 945 1562
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APPENDIX A - TEST DATA

Annex A – Determination of partition stiffness (on stud)

Test Date: 7th September 2017

Test Code: BTC 20236/A/1/S

Test Procedure: AP071 vs 1.1

Conditions: Temperature: 19.1°C
Relative Humidity: 64.8%

TEST DATA		
Load (N)	Deflection (mm)	Observations
0	0	-
100	1	No visible damage
200	1	No visible damage
300	2	No visible damage
400	3	No visible damage
500	4	No visible damage
Max. Deflection	4	-
Residual Deformation	0.6	After 5 minutes

Further details are available from The Building Test Centre.

For details of load positions refer to figure A.1.

For details of the test apparatus used refer to figure A.2.

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Annex A – Determination of partition stiffness (between studs)

Test Date: 7th September 2017

Test Code: BTC 20236/A/2/S

Test Procedure: AP071 vs 1.1

Conditions: Temperature: 19.3°C
Relative Humidity: 63.9%

TEST DATA		
Load (N)	Deflection (mm)	Observations
0	0	-
100	1	No visible damage
200	2	No visible damage
300	3	No visible damage
400	4	No visible damage
500	5	No visible damage
Max. Deflection	5	-
Residual Deformation	0.3	After 5 minutes

Further details are available from The Building Test Centre.

For details of load positions refer to figure A.1.

For details of the test apparatus used refer to figure A.2.

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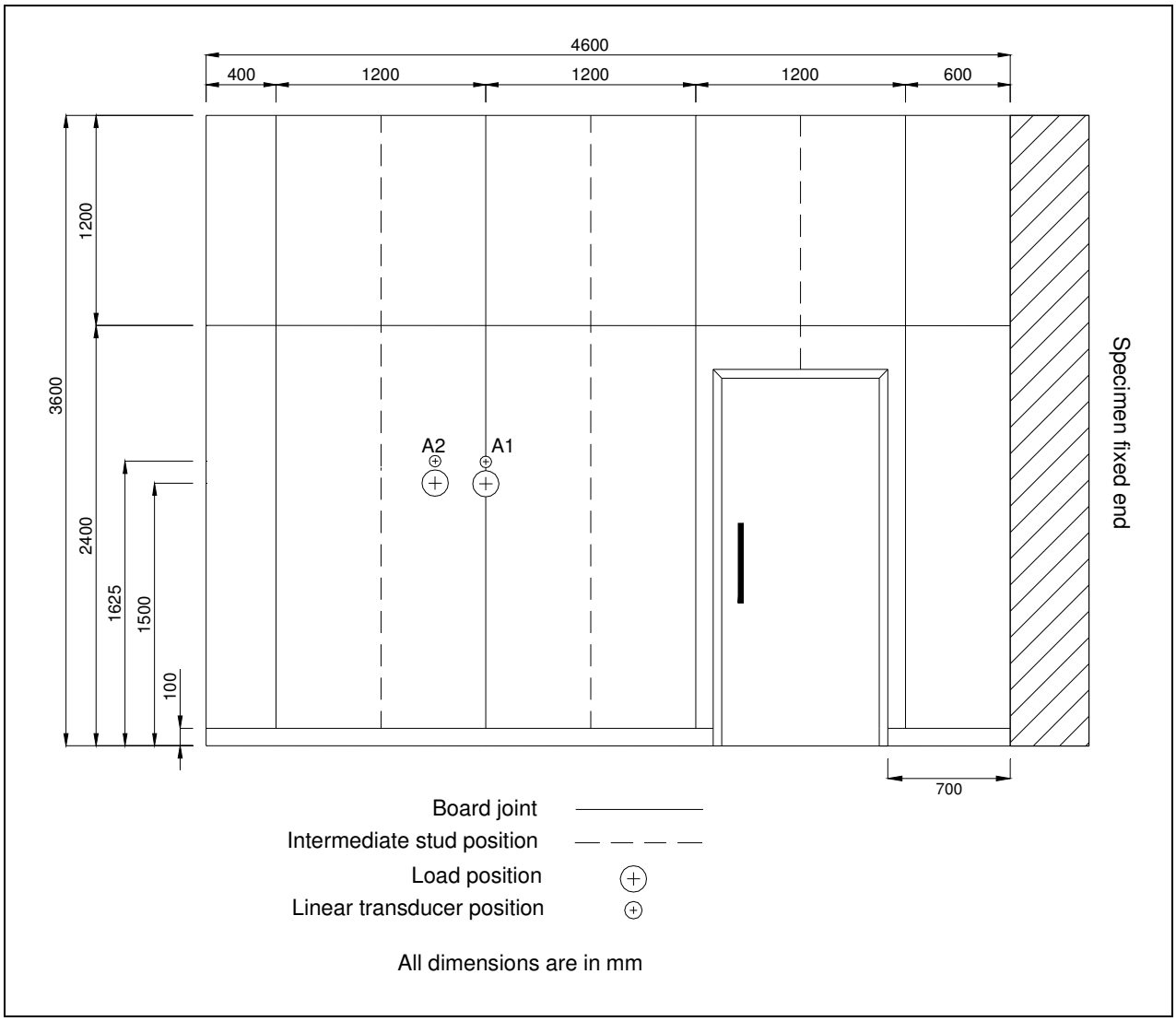

Figure A.1. Load positions for Annex A – Determination of partition stiffness (Side A)

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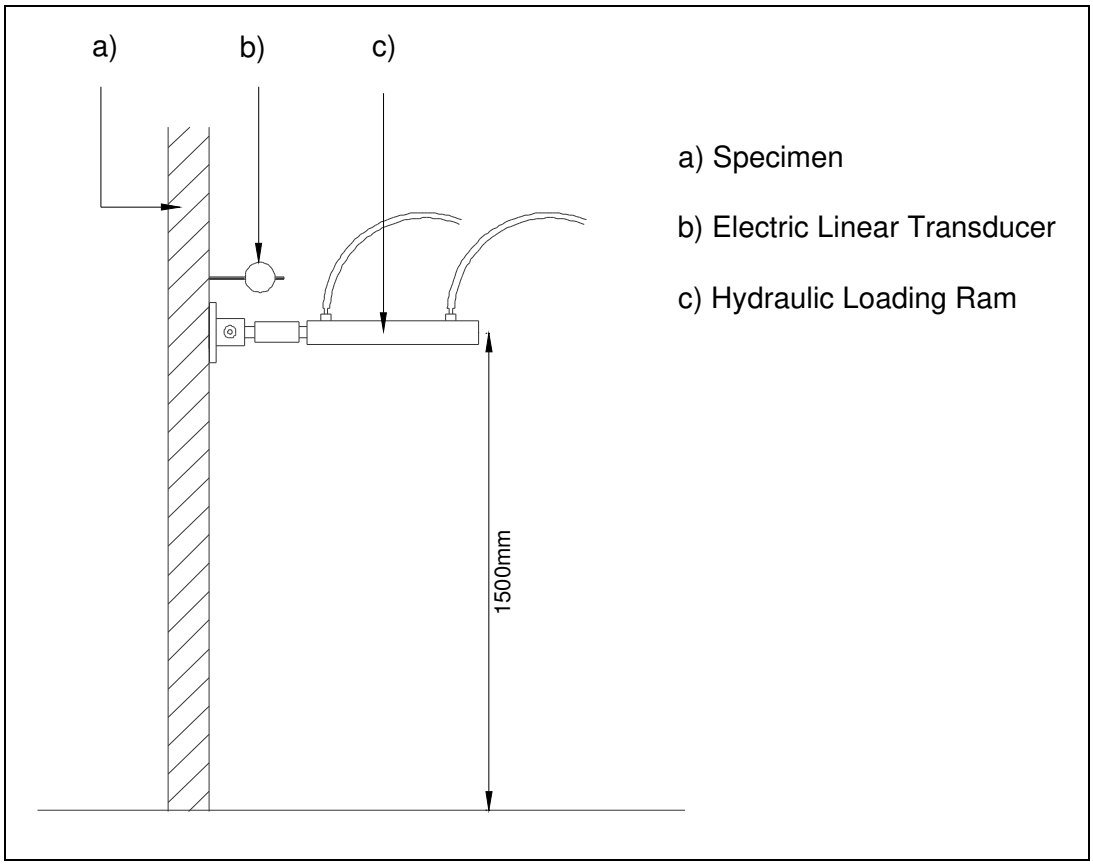

Figure A.2. Apparatus for Annex A - Determination of partition stiffness

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Annex B – Determination of surface damage by small hard body impact

Test Date: 7th September 2017

Test Code: BTC 20236/B/S

Test Procedure: AP072 vs 1.1

Impact Energy: 10Nm

Conditions: Temperature: 19.6°C
Relative Humidity: 54.9%

TEST DATA				
	Positions			
Indent No.	X (mm)	Y (mm)	Indent Depth (mm)	Damage
1	1750	800	1.2	Small Indent
2	1800	800	0.8	Small Indent
3	1850	800	0.8	Small Indent
4	1950	800	1.1	Small Indent
5	2050	800	1.1	Small Indent
6	2150	800	1.1	Small Indent
7	2250	800	1.0	Small Indent
8	2350	800	1.4	Small Indent
9	2400	800	1.2	Small Indent
10	2450	800	1.7	Small Indent

Further details are available from The Building Test Centre.

For details of impact positions refer to figure B.1 and photograph B.1.

For details of the damage caused by the test refer to photograph B.2.

For details of the test apparatus used refer to figure B.2.

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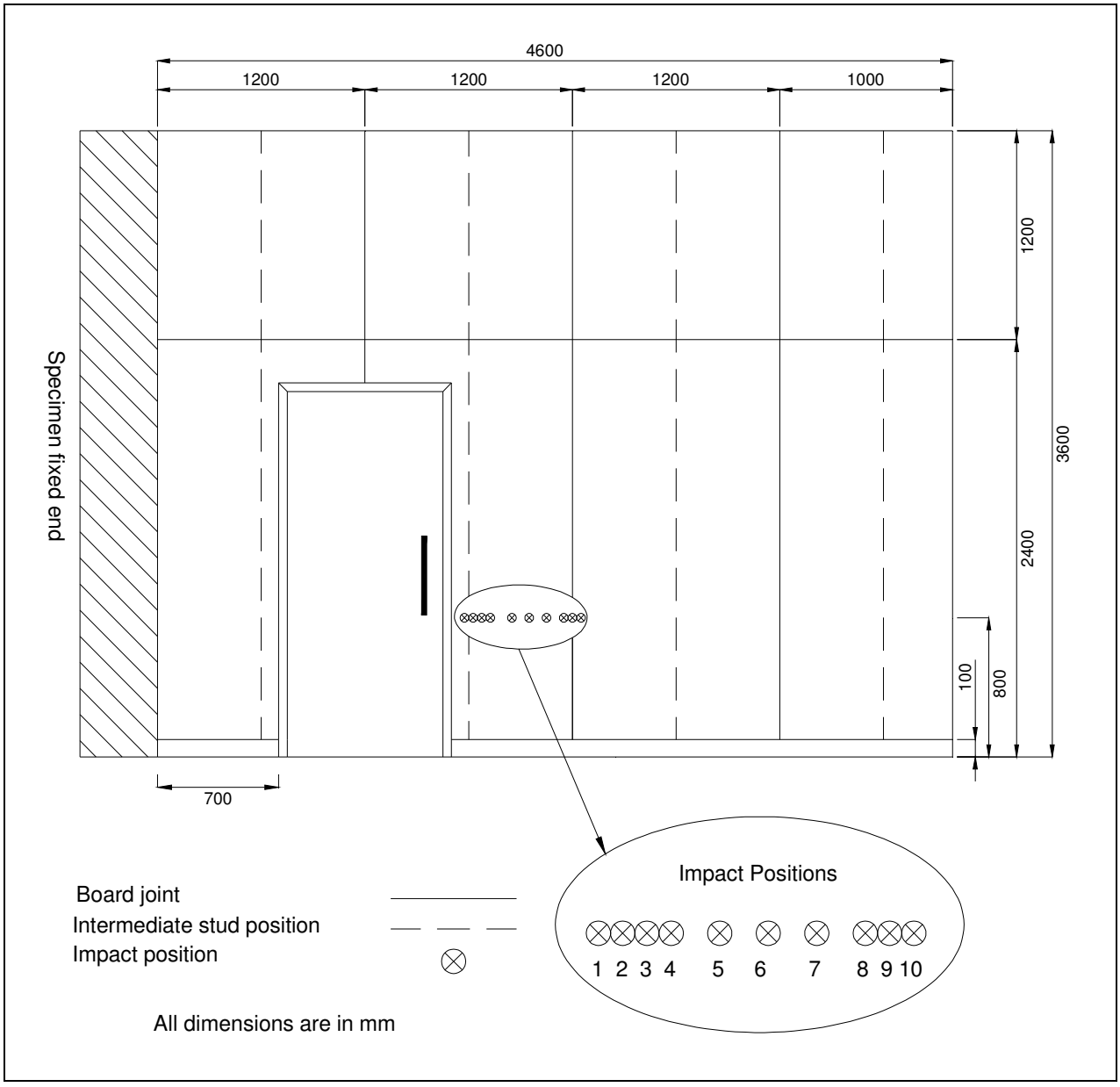

Figure B.1. Impact positions for Annex B - Determination of surface damage by small hard body impact (Side B)

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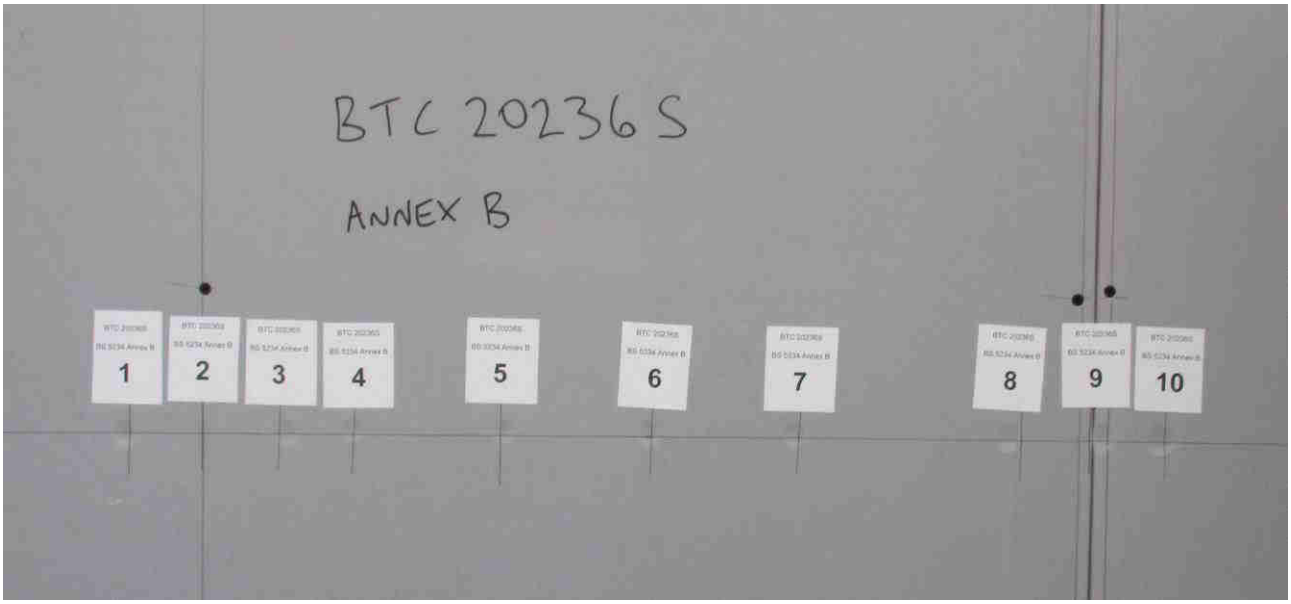

Photograph B.1. Specimen at the end of Annex B - Determination of surface damage by small hard body impact

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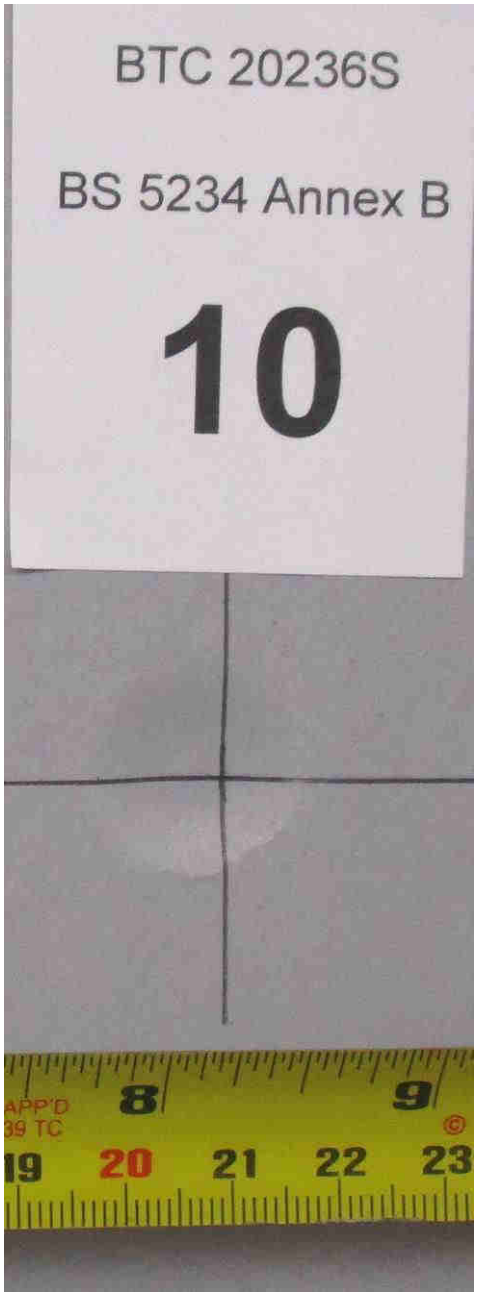

Photograph B.2. Example of damage caused by the Annex B Determination of surface damage by small hard body impact.

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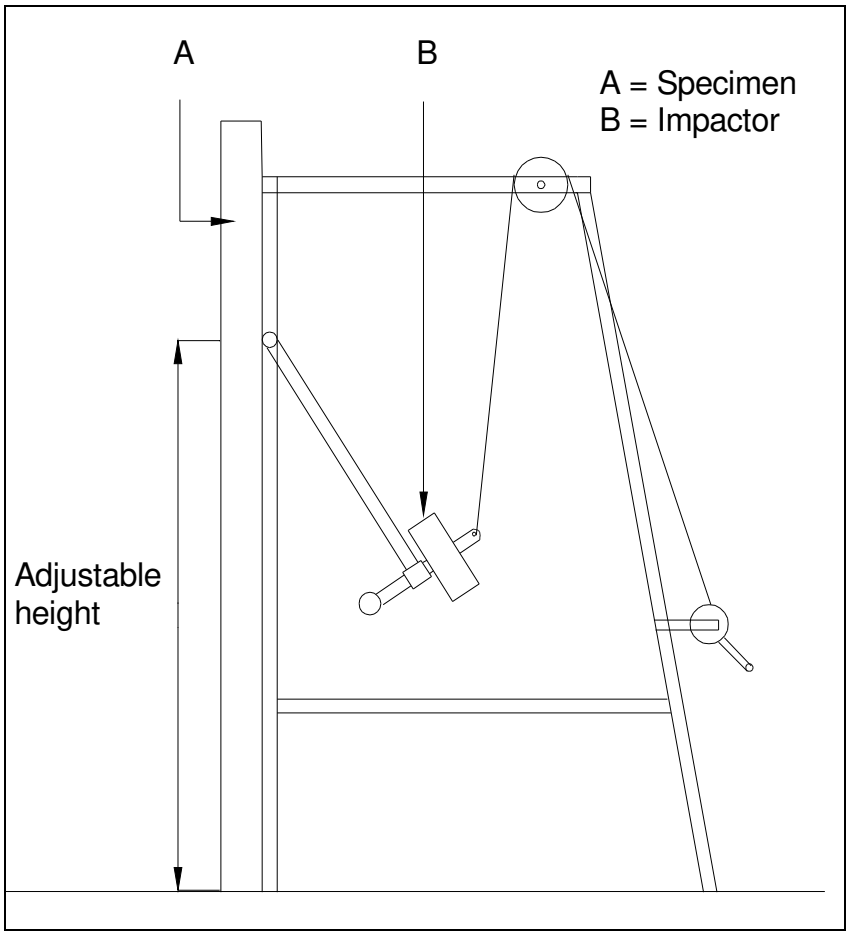

Figure B.2. Apparatus used for small hard body impact test.

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Annex C – Resistance to damage by impact from a large soft body (on stud)

Test Date: 8th September 2017

Test Code: BTC 20236/C/1/S

Test Procedure: AP073 vs 5.1

Impact Energy: 100Nm

Conditions: Temperature: 18.2°C
Relative Humidity: 68.9%

Impact Energy (Nm)	Permanent Deformation (mm)	Damage
100	0.5	No visible damage

Further details are available from The Building Test Centre.

For details of impact positions refer to figure C.1.

For details of the test apparatus used refer to figure C.2.

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East Leake
Loughborough
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Annex C – Resistance to damage by impact from a large soft body (between studs)

Test Date: 8th September 2017

Test Code: BTC 20236/C/2/S

Test Procedure: AP073 vs 5.1

Impact Energy: 100Nm

Conditions: Temperature: 18.4°C
Relative Humidity: 68.5%

Impact Energy (Nm)	Permanent Deformation (mm)	Damage
100	0.0	No visible damage

Further details are available from The Building Test Centre.

For details of impact positions refer to figure C.1.

For details of the test apparatus used refer to figure C.2.

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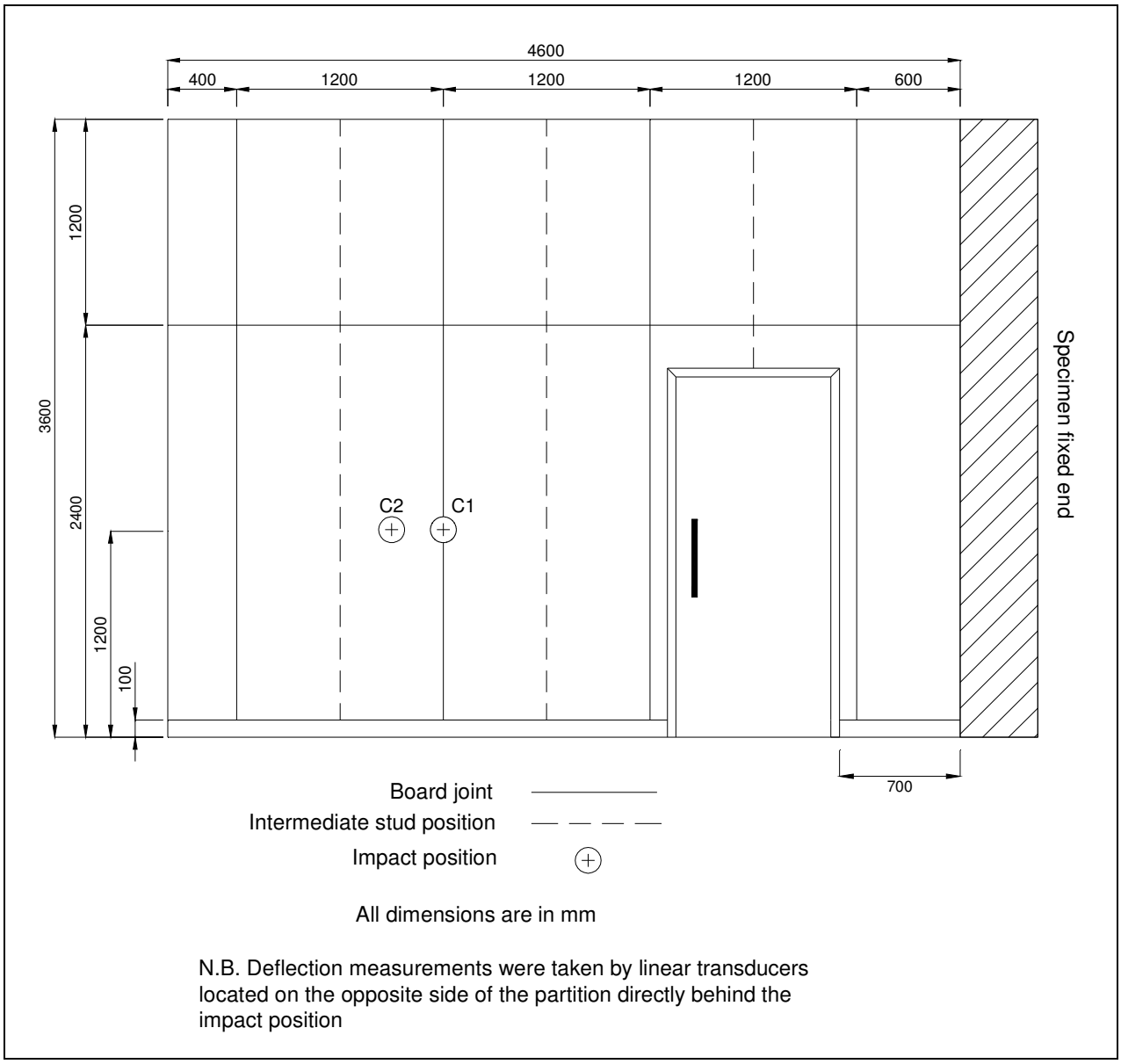

Figure C.1. Impact positions of Annex C - Resistance to damage by impact from a large soft Body (Side A)

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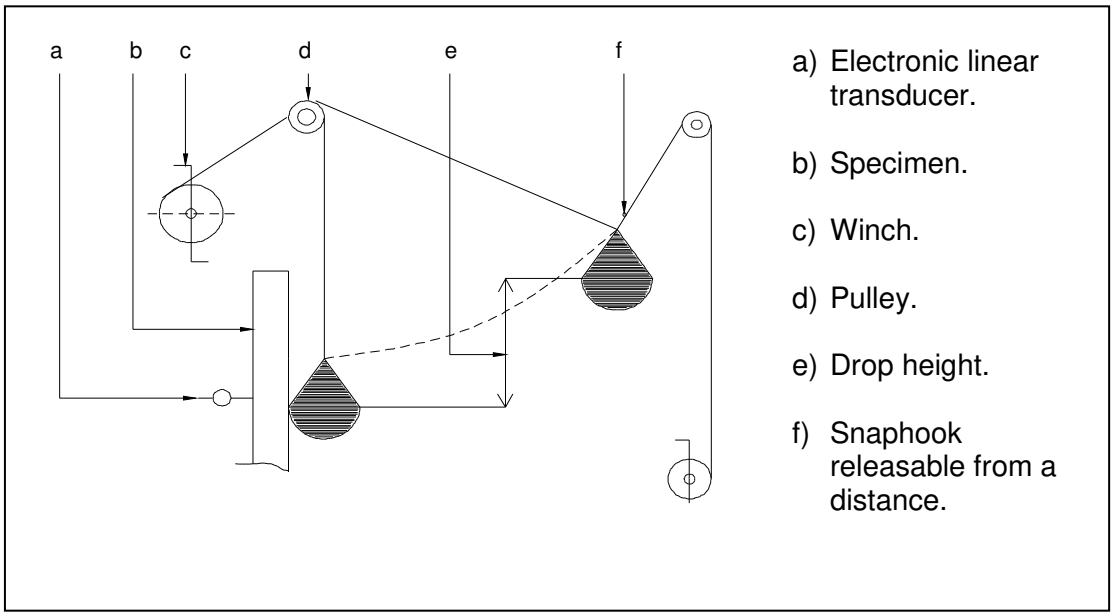

Figure C.2. Apparatus for large soft body impact test

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Fire Acoustics Structures

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Annex D – Determination of resistance to perforation by small hard body impact

Test Date: 8th September 2017

Test Code: BTC 20236/D/S

Test Procedure: AP074 vs 1.1

Impact Energy: 30Nm

Conditions: Temperature: 18.2°C
Relative Humidity: 69.8%

TEST DATA			
	Positions		
Indent No.	X(mm)	Y(mm)	Damage
1	2950	1100	No perforation
2	3550	1100	No perforation
3	4150	1100	No perforation
4	3050	800	No perforation
5	3650	800	No perforation
6	4250	800	No perforation
7	2950	500	No perforation
8	3550	500	No perforation
9	3900	500	No perforation
10	4150	500	No perforation

Further details are available from The Building Test Centre.

For details of impact positions refer to figure D.1 and photograph D.1.

For details of the damage caused by the test refer to photograph D.2.

For details of the test apparatus used refer to figure B.2.

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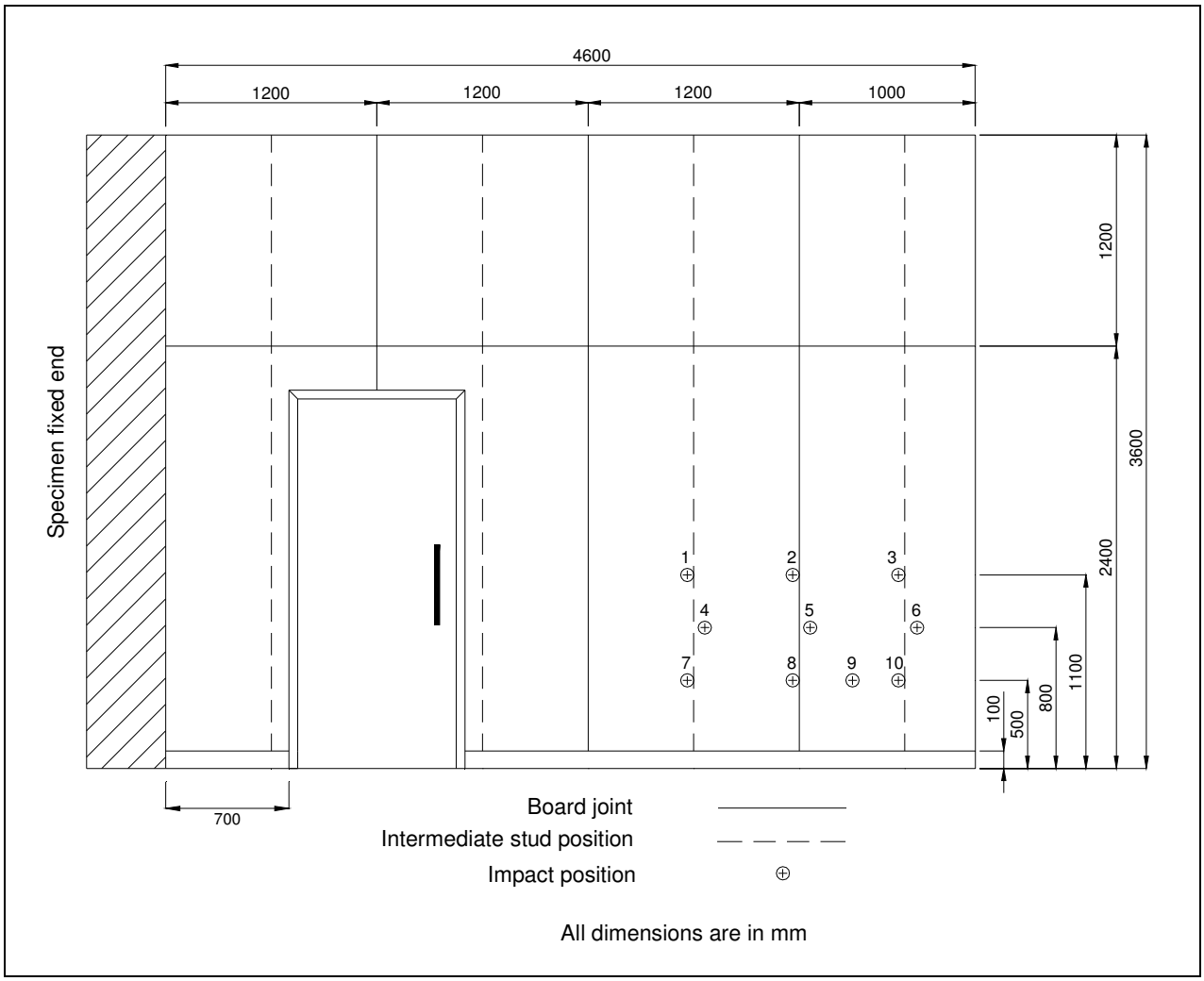

Figure D.1 Impact positions of Annex D – Determination of resistance to perforation by small hard body impact (Side B)

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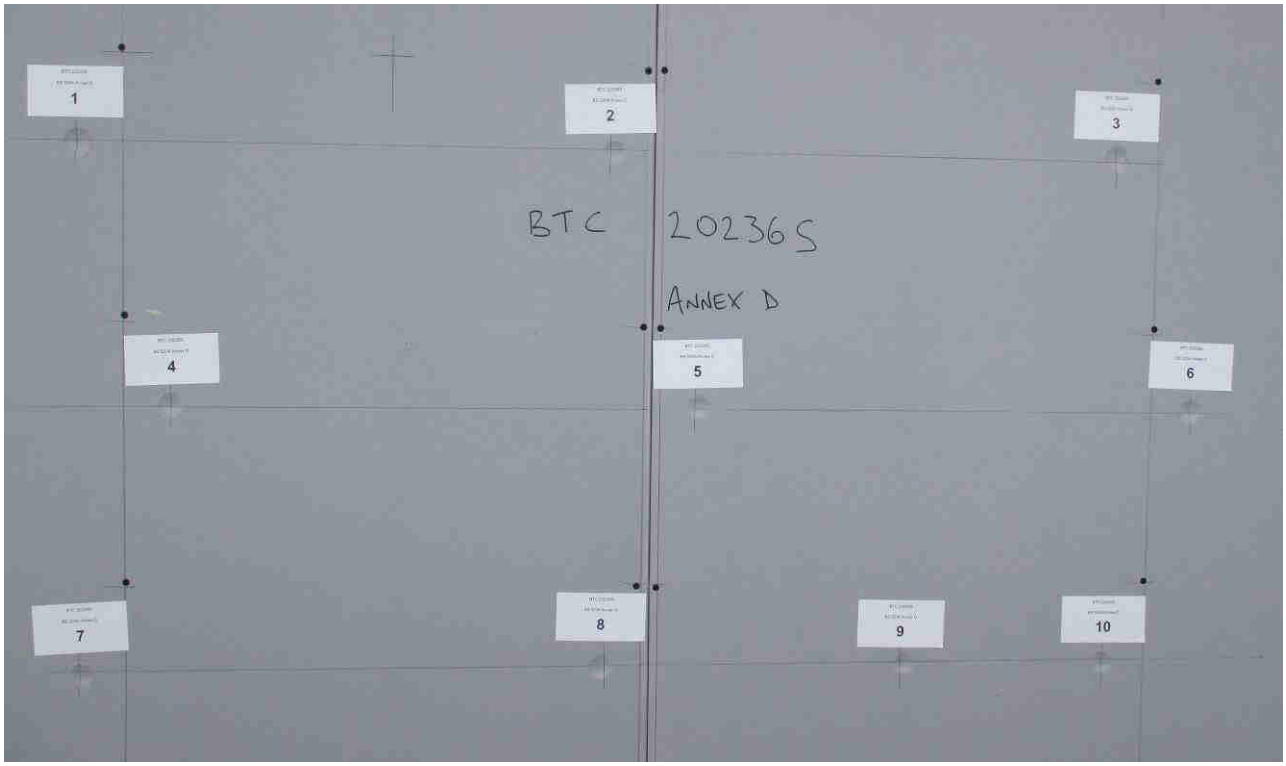

Photograph D.1. Specimen at the end of Annex D – Determination of resistance to perforation by small hard body impact

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Fax (0115) 945 1562
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Photograph D.2. Example of damage caused by the Annex D – Determination of resistance to perforation by small hard body impact

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Leics. LE12 6NP
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Fax (0115) 945 1562
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Annex E – Determination of resistance to structural damage by multiple impacts from a large soft body (between studs)

Test Date: 8th September 2017

Test Code: BTC 20236/E/1/S

Test Procedure: AP075 vs 4.1

Impact Energy: 120Nm

Conditions: Temperature: 18.3°C
Relative Humidity: 68.5%

TEST DATA	
Impact Number	Damage
1	No visible damage
2	No visible damage
3	No visible damage

Further details are available from The Building Test Centre.

For details of impact positions refer to figure E.1.

For details of the test apparatus used refer to figure C.2.

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Annex E – Determination of resistance to structural damage by multiple impacts from a large soft body (on stud)

Test Date: 8th September 2017

Test Code: BTC 20236/E/2/S

Test Procedure: AP075 vs 4.1

Impact Energy: 120Nm

Conditions: Temperature: 18.3°C
Relative Humidity: 68.5%

TEST DATA	
Impact Number	Damage
1	No visible damage
2	No visible damage
3	No visible damage

Further details are available from The Building Test Centre.

For details of impact positions refer to figure E.1.

For details of the test apparatus used refer to figure C.2.

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Loughborough
Leics. LE12 6NP
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Fax (0115) 945 1562
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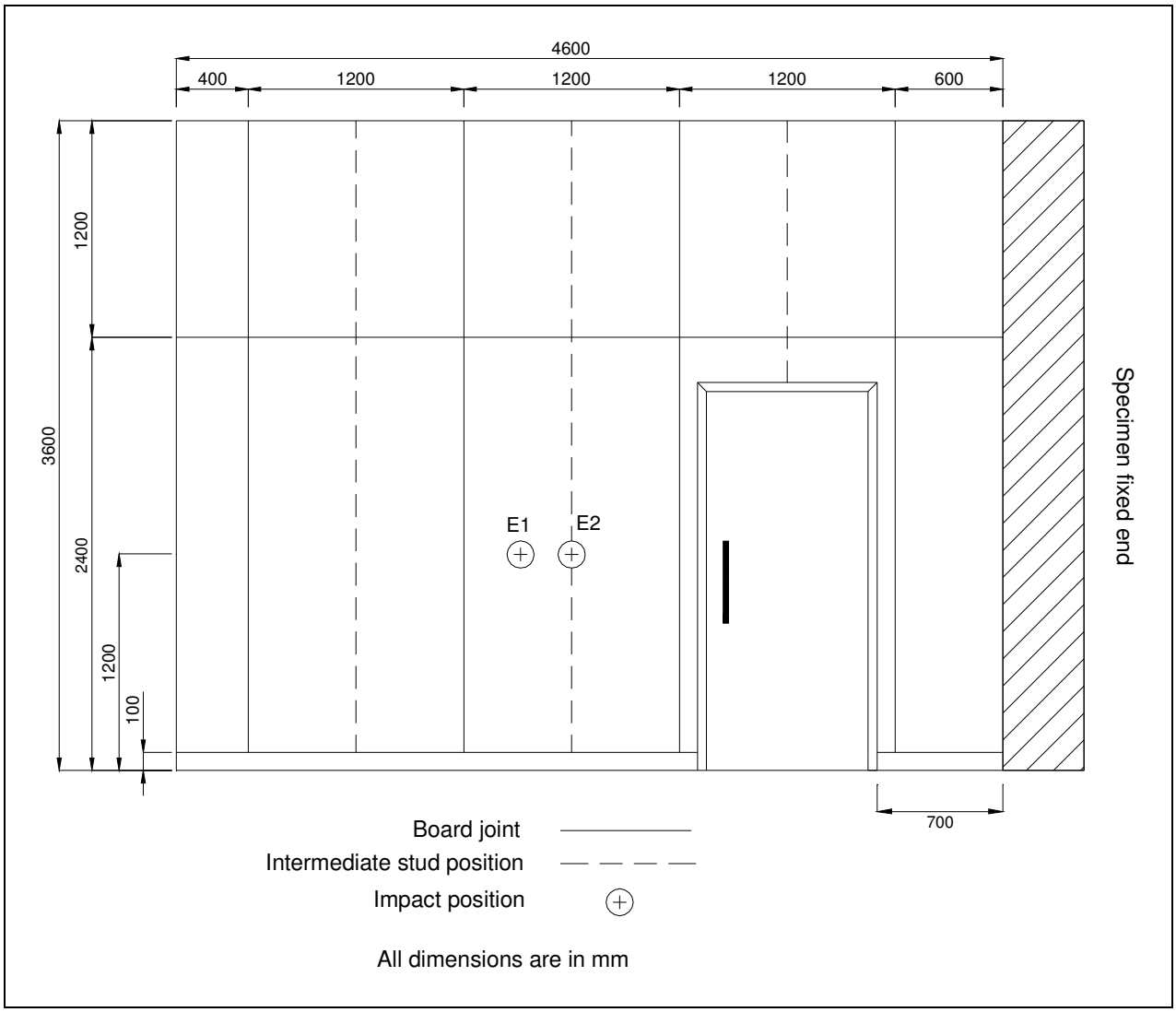

Figure E.1. Impact positions of Annex E – Determination of resistance to structural damage by multiple impacts from a large soft body (Side A)

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Annex F – Determination of the effects of door slamming

Test Date: 8th September 2017

Test Code: BTC 20236/F/S

Test Procedure: AP076 vs 1.1

Weight of door: 60kg

Conditions: Temperature: 18.4°C
Relative Humidity: 69.3%

Number of slams: 3 pre-slams, 100 main test

TEST DATA		
Slams Type	Residual Displacement (mm)	Observations
Pre-slams	0.6 (Taken after 5 minutes)	No visible damage
Main Test	0.9 (Taken after 5 minutes)	No visible damage

Further details are available from The Building Test Centre.

For a schematic diagram illustrating the arrangement used for the door slamming test refer to figure F.1.

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Leics. LE12 6NP
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Fax (0115) 945 1562
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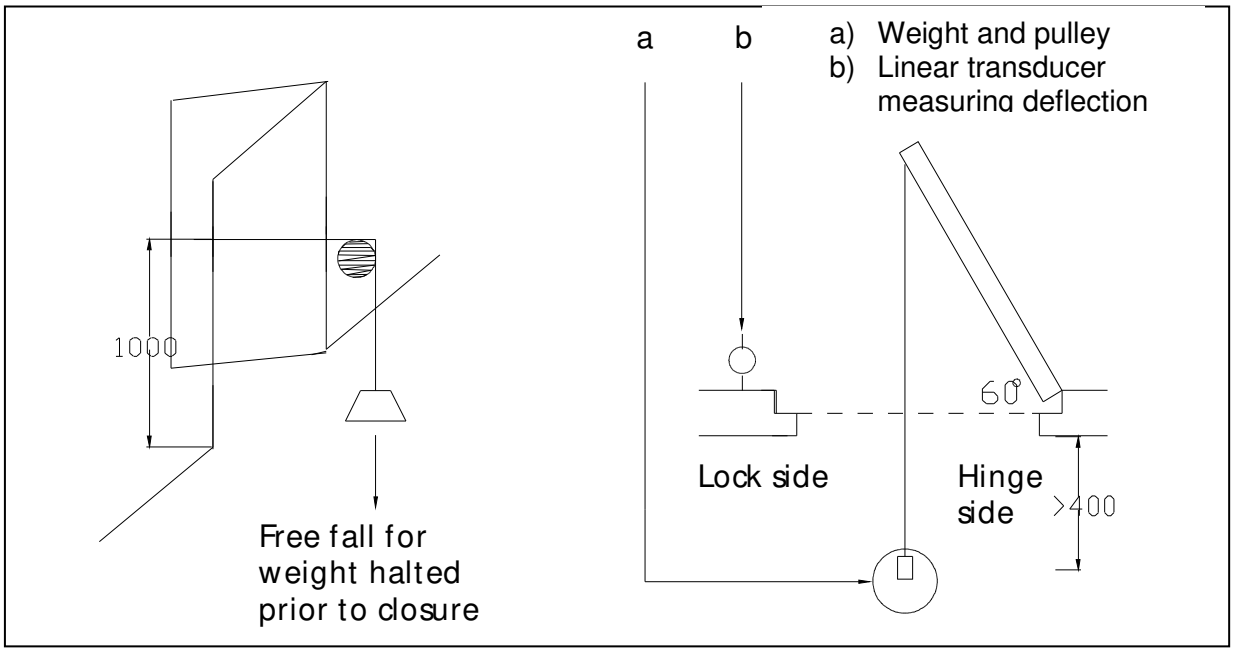

Figure F.1 Arrangement for Annex F - Determination of the effects of door slamming

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Leics. LE12 6NP
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Fax (0115) 945 1562
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Annex G – Determination of resistance to crowd pressure

Test Date: 8th September 2017

Test Code: BTC 20236/G/S

Test Procedure: AP077 vs 1.0

Conditions: Temperature: 19.6°C
Relative Humidity: 58.1%

Max. Load Attained: 3750N

TEST DATA		
Load (N)	Deflection (mm)	Damage
0	0	-
500	1	No visible damage
1000	4	No visible damage
1500	6	No visible damage
1875	8	No visible damage
2000	8	No visible damage
2500	11	No visible damage
3000	14	No visible damage
3500	18	No visible damage
3750	20	No visible damage
Residual Deformation	4.6 (Taken after 5 minutes)	-

Further details are available from The Building Test Centre.

For details of the load position refer to figure G.1.

For details of the test apparatus used refer to figure G.2.

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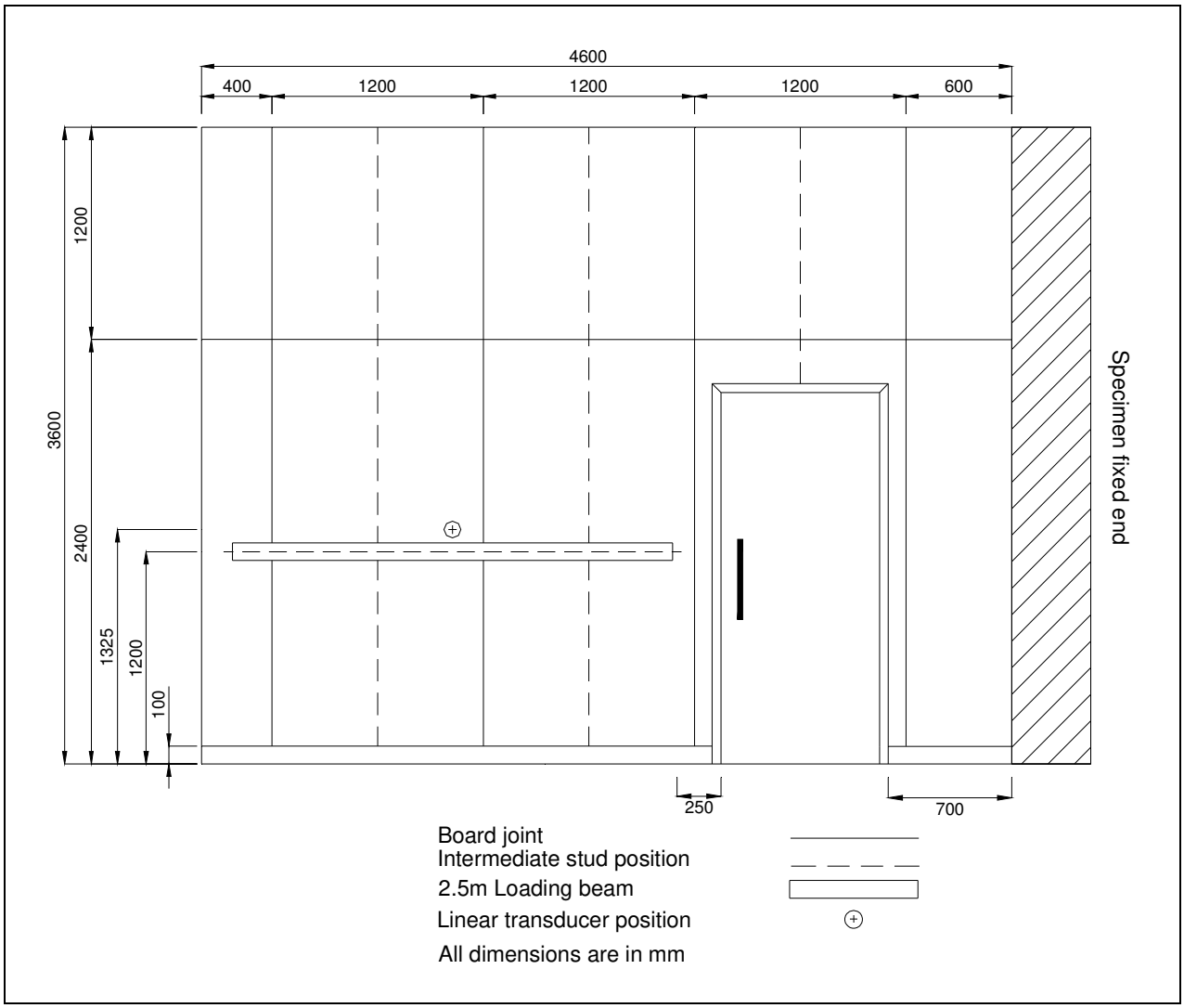

Figure G.1. Load position of Annex G – Determination of resistance to crowd pressure (Side A)

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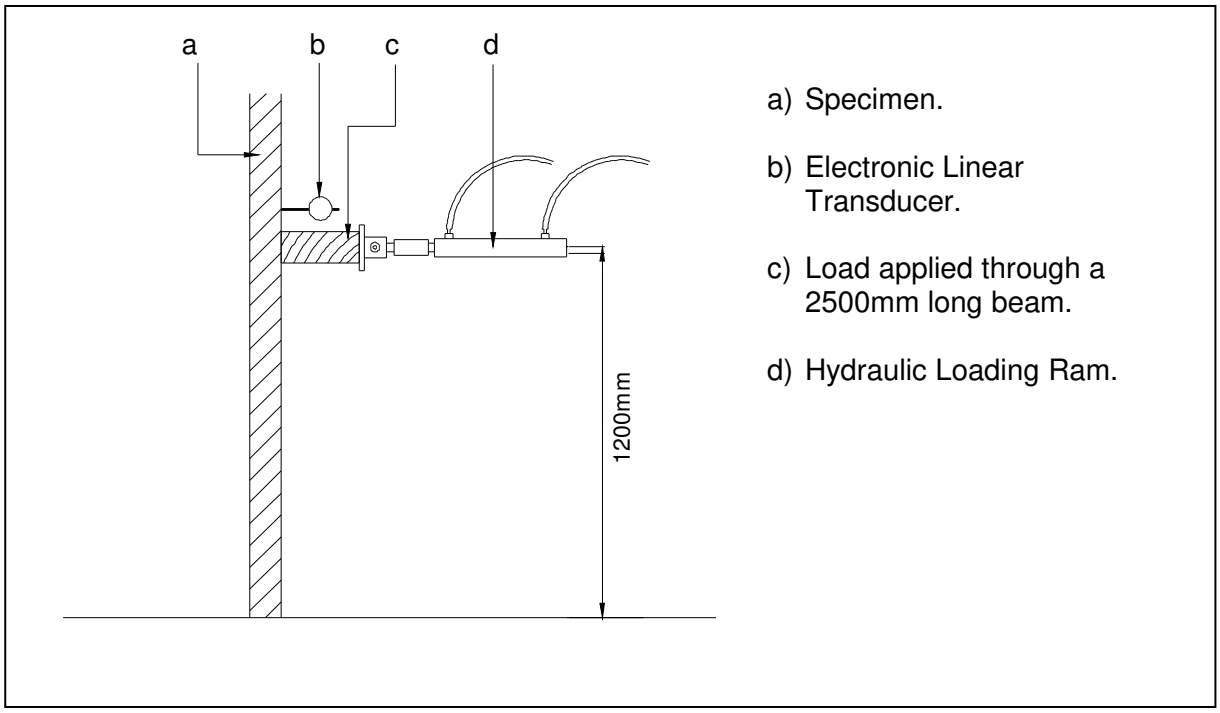

Figure G.2. Apparatus for Annex G – Determination of resistance to crowd pressure

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Leics. LE12 6NP
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Fax (0115) 945 1562
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APPENDIX B – CRITERIA FOR ACCEPTANCE

Annex A - Determination of partition stiffness

The maximum deflection and residual deformation shall not exceed the limits for the grade being tested given in the table below.

Note. Only superficial cracks which represent aesthetic damage are acceptable.

Stiffness: applied loads and deflection.			
Grade	**Applied Load** N	**Maximum deflection** mm	**Maximum residual deformation** mm
LIGHT DUTY	500	25	5
MEDIUM DUTY	500	20	3
HEAVY DUTY	500	15	2
SEVERE DUTY	500	10	1

Annex B - Determination of surface damage by small hard body impact

Judgment made on whether the damage is acceptable by the user of the partition based on the description of damage along with photographic evidence held by the laboratory.

Note. No specific criteria for acceptance is given because the impact damage will vary with different materials and forms of construction; some surface damage may be acceptable because it can be easily repaired.

Annex C - Resistance to damage by impact from a large soft body

Partition should be capable of withstanding the impact energies without sustaining either permanent deformation in excess of 2 mm or any damage. Any local damage that can easily be repaired to regain the partitions original properties shall be permitted.

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East Leake
Loughborough
Leics. LE12 6NP
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Fax (0115) 945 1562
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Website www.btconline.co.uk

Annex D - Determination of resistance to perforation by small hard body impact

No perforation of the partition allowable. We take perforation to mean exposure of the partition cavity. No requirement for this test for a light duty partition.

Annex E – Determination of resistance to structural damage by multiple impacts from a large Soft body

Capable of withstanding the impact energies without collapsing or dislocating the partition or its fixings.

Annex F - Determination of the effects of door slamming

The partition shall not be damage nor shall door frame fittings and architrave become detached or loose after the door leaf has been slammed.

The closing jamb of the doorframe shall not be permanently displaced by more than 3 mm as a result of the pre slam test and by more than 1 mm as a result of the main test, from its position at the start of the test.

Annex G – Determination of resistance to crowd pressure.

No collapse or damage that would render the partition dangerous, due to any of its parts becoming dislodged or shattered, in a manner that could cause injury.

Note. For partitions that do not collapse and where the damage is not dangerous, any deflection and any damage reported in the test report is for information only.