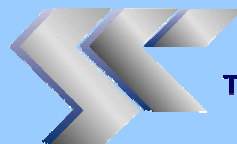


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Acoustic Detailing For Multi-Storey Residential Buildings

Residential Buildings



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Cover photo shows the six-storey extension of the Strand Palace Hotel, Covent Garden, London, which created a series of apartments in both new-build and renovation. On-site acoustic tests confirmed the excellent acoustic performance of *Slimdek* with a battened floor. The project parties were; Artesian plc (client), Goddard Manton (architect), Cameron Taylor Bedford (design engineer) and Miletrain (contractor).

Acoustic Detailing For Multi-Storey Residential Buildings

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FOREWORD

The 2003 edition of the Building Regulations Approved Document E sets minimum standards of acoustic performance for walls and floors between dwellings (separating walls and floors). The Regulations, which came into effect in July 2003, provide guidance on how the requirements can be met and how compliance must be demonstrated.

There are two methods of demonstrating compliance with the requirements; pre-completion on-site acoustic testing or by using Robust Details (RDs). The RDs have undergone a testing regime to prove that they more than satisfy the requirements of Part E. Information about the RDs is available from Robust Details Limited.

The first edition of RDs is limited in its coverage of steel framed construction details. Therefore, for steel framed residential buildings some pre-completion site testing will be required. This publication gives acoustic details for steel framed buildings with a range of floor and wall constructions. All the details provided are expected to satisfy the requirements of site testing. It has been produced to provide designers, developers and architects with confidence that their projects will pass the testing requirements, provided the details given are used.

Acoustic requirements for 'non-residential' buildings are not covered by Part E. Reference should be made to BS 8233, which includes maximum ambient noise targets for a range of buildings, including commercial premises. It also covers minimum noise level targets to ensure privacy in open plan offices etc.

This publication was prepared by Mr A G J Way and Dr G H Couchman of The Steel Construction Institute. Some of the details are taken from or based on information given in SCI Technical Information Sheets P320, P321 and P322, which were written by Dr M T Gorgolewski. The illustrations of Robust Details included in this publication are based on those given in the *Robust Details Handbook*.

Funding for the preparation of this publication was gratefully received from Corus Construction & Industrial.

Contents

	Page No.
FOREWORD	iii
SUMMARY	vi
1 INTRODUCTION	1
1.1 Acoustic performance requirements	1
1.2 Acoustic details in this publication	3
2 COMPOSITE DECK FLOORS	5
2.1 External wall and floor junction details	5
2.2 Internal wall and floor junction details	13
3 PRECAST CONCRETE FLOORS	19
3.1 External wall and floor junction details	19
3.2 Internal wall and floor junction details	23
4 FLOOR AND CEILING TREATMENTS	25
4.1 Floor treatment details	25
4.2 Ceiling treatment details	31
5 INTERGRATION AND SERVICE PENETRATIONS	34
5.1 Services through separating floors	34
5.2 Services in separating walls	35
5.3 Integration of columns in separating walls	37
6 REFERENCES	38
APPENDIX A CURRENT ROBUST DETAILS	39
A.1 RD status of separating floor and wall combinations	39
A.2 Robust Details for separating walls	40
A.3 Robust Details for separating floors	43

SUMMARY

This publication provides guidance on acoustic details for steel framed residential buildings. Special consideration of acoustic performance is required in order to satisfy Part E of the Building Regulations.

The acoustic details given in this publication are expected to satisfy the requirements of the Building Regulations as their performance has been assessed based on test results of similar details. Where appropriate, the details presented have been based on Robust Details (RDs) and amended as necessary to increase the scope provided by the RDs.

Details are given for the junction of external walls with separating floors and separating walls with separating floors. The floor constructions included are in-situ concrete slabs with shallow profiled metal deck supported on hot-rolled steel sections, in-situ concrete slabs with deep profiled metal deck supported on ASB (Asymmetric Beams) or RHS edge beams and precast concrete units supported on hot-rolled steel sections. The wall constructions included are light steel framing and masonry blockwork.

Floating floor treatments (with expected performance values), ceiling treatment options and details for services are also included.

1 INTRODUCTION

1.1 Acoustic performance requirements

1.1.1 Building Regulations

The Building Regulations^[1] impose, in Part E of Schedule 1, certain general requirements in relation to the acoustic performance of walls and floors between dwellings (separating walls and floors). The Regulations define the classes of dwelling that are covered; school buildings are also covered. There are specific requirements in relation to testing of sound insulation and these were modified in the latest amendment (2004) of the Regulations; the amended Regulations permit the use of Robust Details (see below) as an alternative to testing.

1.1.2 Approved Document E

Guidance on meeting the requirements of the Regulations is given in Approved Document E (2003 Edition)^[2], as amended in 2004. The Approved Document sets out minimum standards of acoustic performance and levels of sound insulation testing.

The full scope of Part E covers:

- Acoustic insulation of separating walls and floors between newly built dwellings, and dwellings formed by a material change of use.
- Acoustic insulation between hotel rooms, boarding house rooms, and other rooms used for residential purposes such as student halls of residence and key worker accommodation, formed by new-build or by a material change of use.
- Acoustic insulation between rooms within a dwelling formed by new-build or by a material change of use.
- Acoustic characteristics of common parts of apartment buildings.
- Acoustic characteristics of schools. Comprehensive guidance on requirements and ways of meeting them is covered by Building Bulletin 93^[3].

Sound insulation testing, often referred to as pre-completion site testing (PCT), has been required since the 2003 Edition of Part E (which came into force in July 2003) for at least 1 in 10 of every type of separating wall and floor at all residential construction sites, to show that the minimum performance standards have been met. The requirement for testing applies to residential buildings of all kinds, both purpose built and those formed by a material change of use. Tests must be carried out when the building is largely complete, with doors, skirting boards, electrical sockets and switches in place, but unfurnished and without a carpet (except with certain concrete and composite floors). It was originally intended to enforce the requirement for testing from January 2004, however this date was delayed to July 2004.

Because of the onerous nature of site testing, an alternative of using certain predefined 'Robust Details' (RDs) has been permitted by the Regulations and Part E has therefore been amended to explain this alternative.

1.1.3 Robust Details

The Robust Details recognised by the Regulations and Approved Document E are a set of technical construction details that are published by Robust Details Limited. The details have been demonstrated by testing to meet the acoustic insulation performance requirements that are set out in Approved Document E. Use of Robust Details avoids the need for pre-completion testing.

To use a Part E Robust Detail in the construction process, builders must first obtain permission from Robust Details Limited and pay the requisite fee for each home. Provided that the robust details are built correctly, this will be accepted by all building control bodies in England and Wales as evidence that the homes are exempt from pre-completion testing. On completion of each separating floor and wall, the builder is required to complete a compliance certificate and pass it to their building control body. Without this certificate, the building control body will not approve the home.

The following is an extract from Approved Document E, Annex E (as amended in 2004)^[2] and should be borne in mind when considering the use of RDs.

*It should be noted that the compliance of work with a robust detail, in circumstances where the correct procedures have been followed to attract exemption from PCT, is not a “deemed to satisfy” condition. The underlying requirement remains to achieve compliance with Part E1. The guidance in Approved Document E is that compliance will usually be established by the measured performance of the structure. Therefore it would be open to anyone, e.g. a homeowner, who considered that a party structure does not comply with Part E1, to seek to establish that by the carrying out of tests. It would **not** be a defence for the builder to show that he had correctly carried out a design detail approved by Robust Details Ltd, if the structure’s measured performance is shown not to meet the performance standards in Approved Document E.*

However, all the RDs have undergone a thorough development and testing procedure. The performance of each RD is based on the mean result of 30 tests with no more than 8 of the tests being on the same site and involving at least two builders. The RDs have been shown to have acoustic performance considerably in excess of the minimum standards of the Building Regulations, in order to allow for variations in workmanship and quality.

For the current list of RDs (taken from the *Robust Details Handbook*^[4]) see Appendix A. Procedures have been established to allow extension of this set as new details are proven.

The requirements for achieving RD status are clearly quite onerous in a number of ways over-and-above the technical performance requirements. The need to carry out a number of in-situ tests on a number of buildings (at the right time during construction) has had several consequences:

- The scope covered by the current RDs is quite limited.
- There are various idiosyncrasies which reflect the scope of what was available for testing.

It can be concluded that the published set is far from being an exhaustive statement of what will satisfy the required performance. Some other details are covered in Section 3 of this publication. It must be remembered however that these non-RD details, whilst more than likely to work, will still need pre-completion testing to demonstrate compliance.

Table 1.1 Summary of Part E requirements for separating walls and floors

Building type	Separating walls	Separating floors	
	$D_{nT,w} + C_{tr}$	$D_{nT,w} + C_{tr}$	$L'_{nT,w}$
Purpose built dwellings	≥ 45 dB	≥ 45 dB	≤ 62 dB
Dwellings formed by material change of use	≥ 43 dB	≥ 43 dB	≤ 64 dB
Purpose built rooms for residential purposes	≥ 43 dB	≥ 45 dB	≤ 62 dB
Rooms for residential purposes formed by material change of use	≥ 43 dB	≥ 43 dB	≤ 64 dB

Note: Refer to Approved Document E for complete information regarding the number of tests required.

1.2 Acoustic details in this publication

The following sections of this publication show recommended acoustic details for use in steel framed residential buildings. Some of the details are taken from or based on material given in SCI Technical Information Sheets P320^[5], P321^[6] and P322^[7]. This publication builds on the information and extends the scope of the details contained within those publications. In some cases the recommended acoustic details shown in Section 2 include minor improvements over the earlier details. Based on the acoustic test results of similar details, all the details given in this publication should satisfy the requirements in Approved Document E. Alternative proprietary details also exist for some forms of construction.

Quantified acoustic performance values that can be expected with a range of floor treatments are given in Section 4.1.

Some of the recommended acoustic details in Section 2.1 are Robust Details (as described above), provided that the limits in the *Robust Details Handbook* are observed. Where this is the case, the RD reference is given.

Details in Section 2.2 show separating walls combined with separating floors. Whilst similar walls used with other types of floors are covered by Robust Details, none of the combinations shown in Section 2.2 currently (see note below) are in the *Robust Details Handbook*. Post-completion testing of the wall would therefore be required in all cases.

Details in Section 3 show generic solutions for precast units on hot-rolled steel frames. In some cases, as noted on specific details, similar details exist which are Robust Details; reference to the appropriate RD is given.

Note

The RD references noted for the details given in this publication are correct at the time of printing. However, the portfolio of available RDs will be updated frequently. Check with the SCI, Corus or Robust Details Ltd for the latest information.

For further information on RDs and updates, contact:

The Steel Construction Institute
Silwood Park
Ascot
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SL5 7QN
Tel: 01344 623345
Fax: 01344 622944

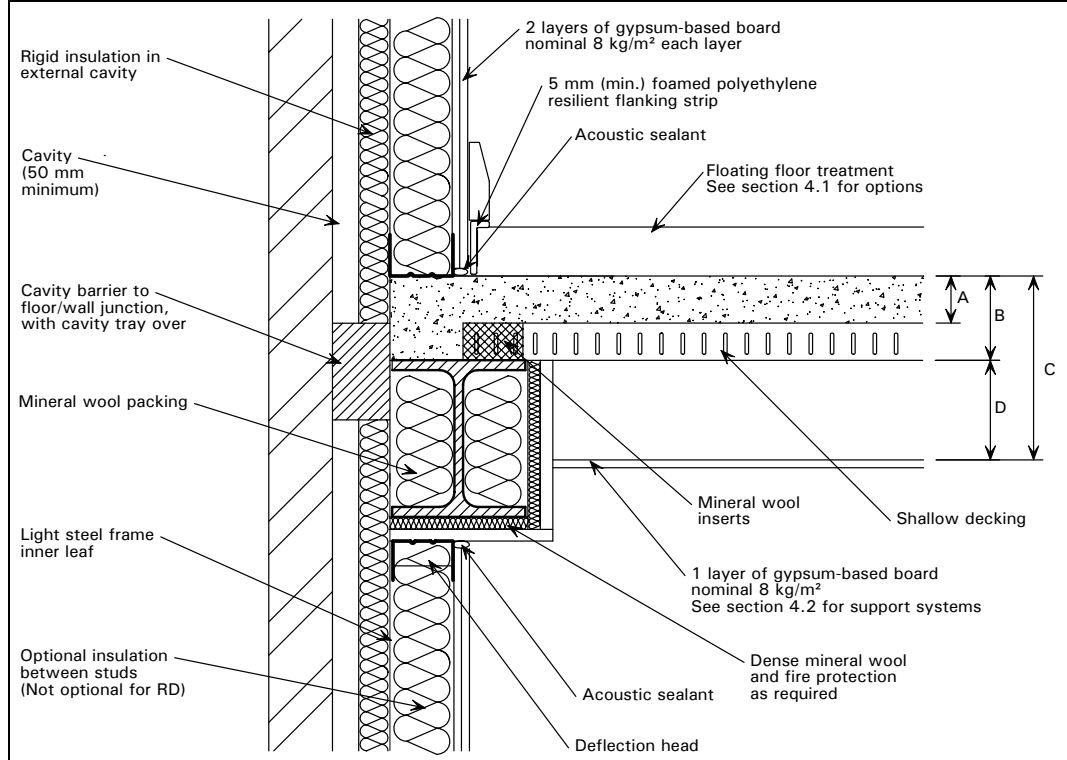
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2 COMPOSITE DECK FLOORS

2.1 External wall and floor junction details

2.1.1 External cavity wall with light steel internal leaf and shallow deck composite floor (with downstand beam)



General notes

This detail is a Robust Detail (E-FS-1) when it is used in conjunction with an RD floating floor treatment (See Section 4.1), $A \geq 80$ mm, $B \geq 130$ mm, $C \geq 300$ mm, the concrete density is at least 2200 kg/m^3 and the light steel frame inner leaf has insulation between the studs.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Decking may be trapezoidal or re-entrant in profile.

Decking may span in either direction.

Where decking profiles are at right angles to the walls, voids (above the beam) are filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

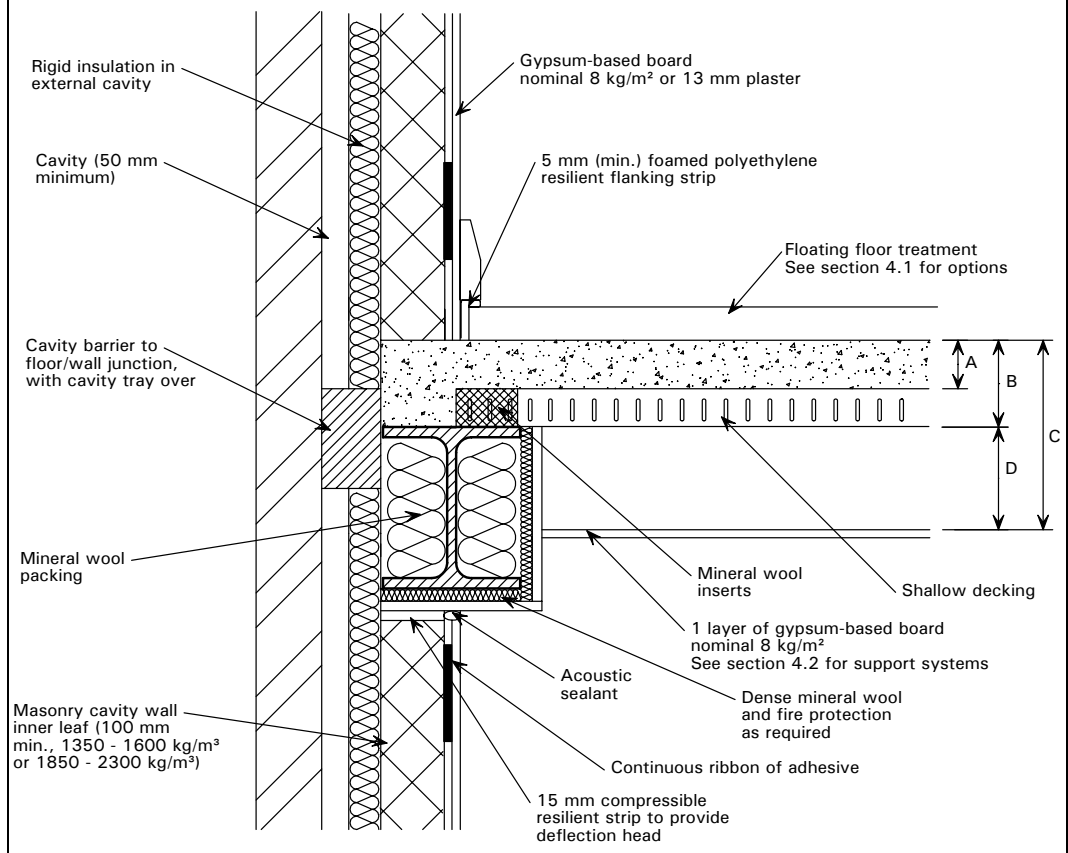
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Outer leaf may be masonry or precast panels.

Inner leaf must not be continuous between storeys.

2.1.2 External cavity wall with masonry internal leaf and shallow deck composite floor (with downstand beam)



General notes

This detail is a Robust Detail (E-FS-1) when it is used in conjunction with an RD floating floor treatment (See Section 4.1), $A \geq 80$ mm, $B \geq 130$ mm, $C \geq 300$ mm, the concrete density is at least 2200 kg/m^3 , the inner leaf concrete block is of density $1350 - 1600 \text{ kg/m}^3$ or $1850 - 2300 \text{ kg/m}^3$ and the inner leaf ≥ 100 mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Decking may be trapezoidal or re-entrant in profile.

Decking may span in either direction.

Where deck profiles are at right angles to the walls, voids (above the beam) are filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

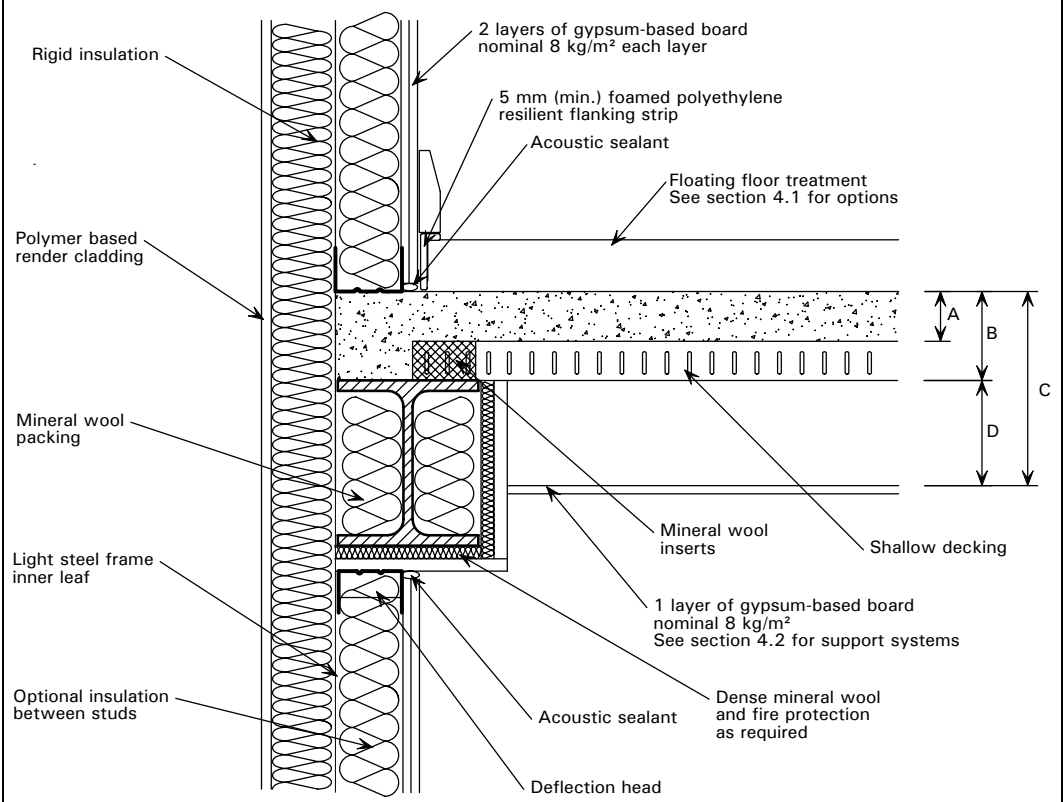
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Outer leaf may be masonry or precast panels.

Inner leaf must not be continuous between storeys.

2.1.3 External render wall (no cavity) with light steel and shallow deck composite floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm and $B \geq 130$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m^3 .

Decking may be trapezoidal or re-entrant in profile.

Decking may span in either direction.

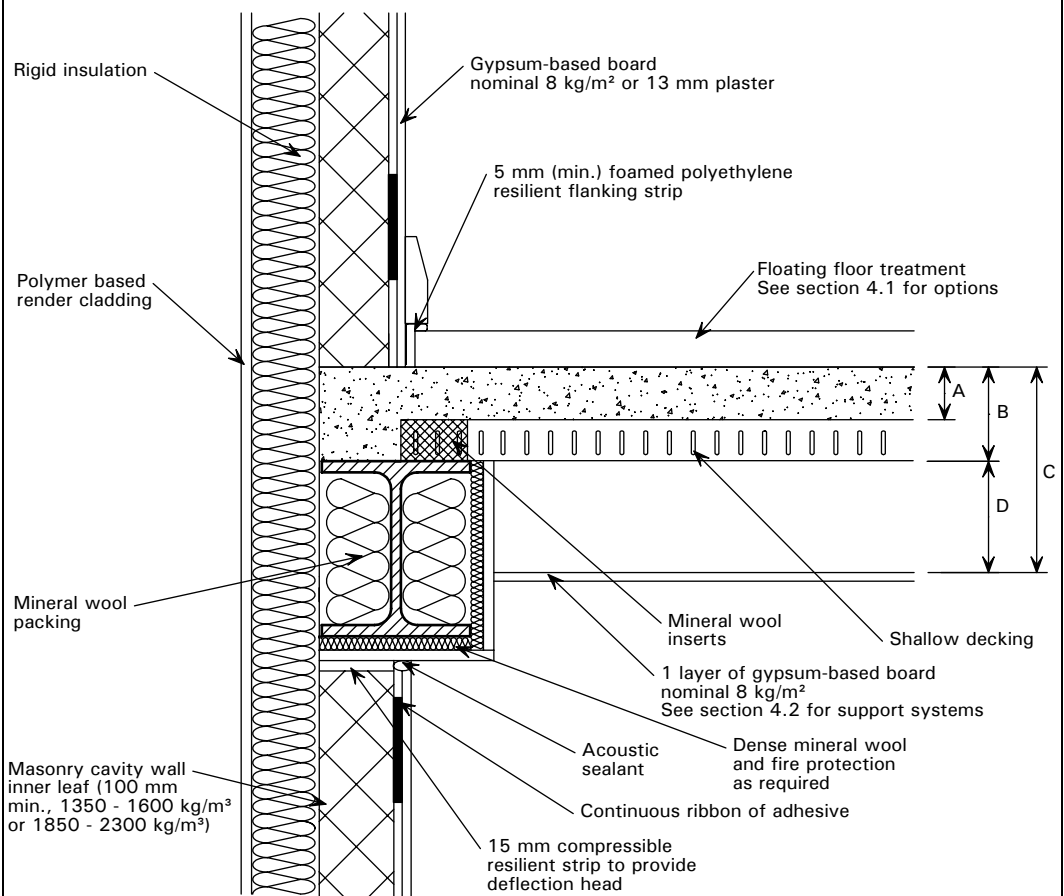
Where decking profiles are at right angles to the walls, voids (above the beam) are filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Inner leaf must not be continuous between storeys.

2.1.4 External render wall (no cavity) with masonry and shallow deck composite floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm and $B \geq 130$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may be trapezoidal or re-entrant in profile.

Decking may span in either direction.

Where deck profiles are at right angles to the walls, voids (above the beam) must be filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

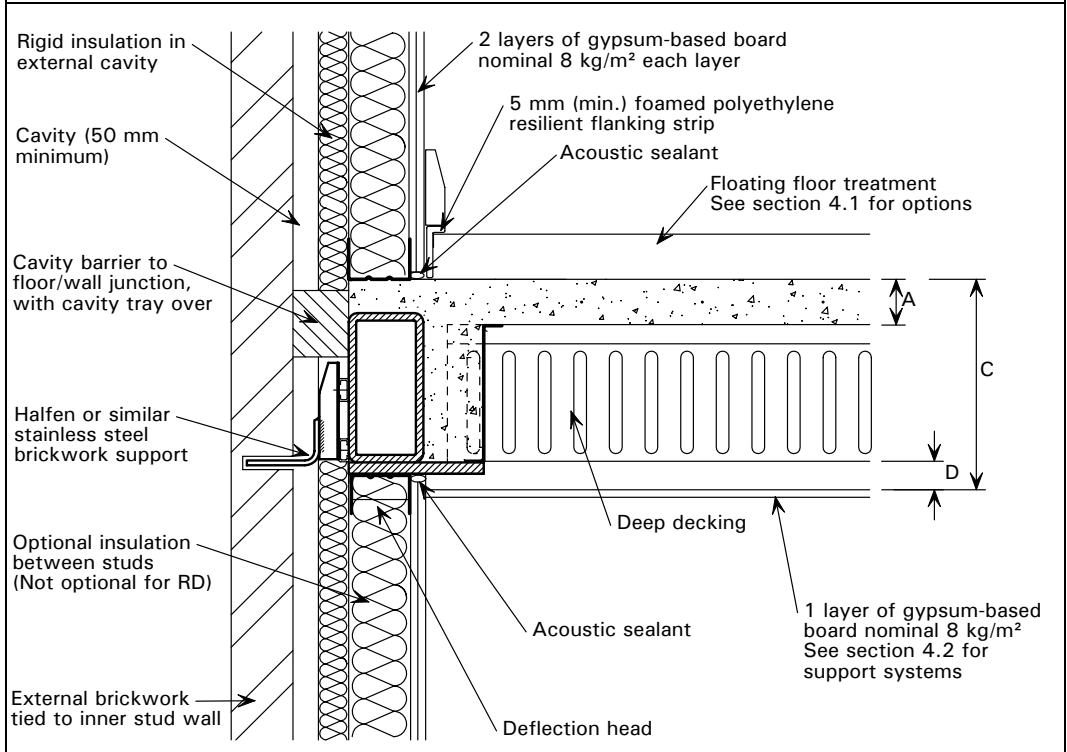
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Concrete block density should be 1350 - 1600 kg/m³ or 1850 - 2300 kg/m³.

Inner leaf must not be continuous between storeys.

2.1.5 External cavity wall with light steel internal leaf and deep deck composite floor (with RHS or ASB edge beam)



General notes

This detail is a Robust Detail (E-FS-1) when it is used with an ASB edge beam, in conjunction with an RD floating floor treatment (See Section 4.1), $A \geq 80$ mm, $C \geq 300$ mm, the concrete density is at least 2200 kg/m³ and the light steel frame inner leaf has insulation between the studs.

The edge beam may be an RHS with welded plate or an ASB. However, acoustic performance may be impaired if an RHS is used.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Decking may span in either direction.

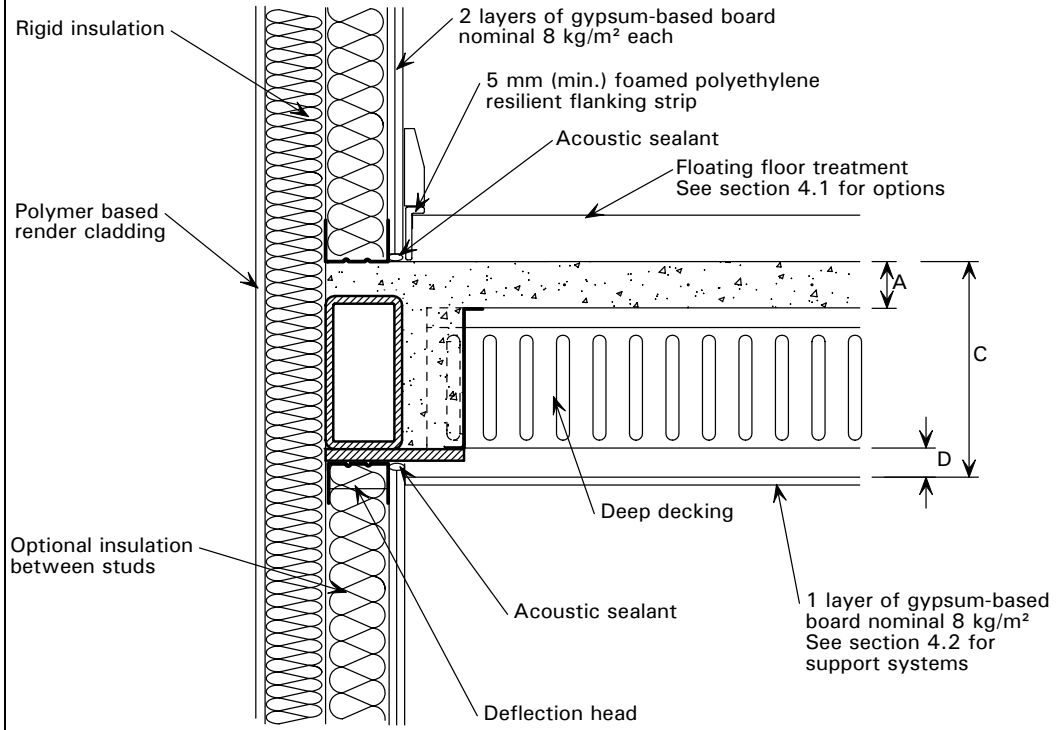
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Outer leaf may be masonry or precast panels.

Inner leaf must not be continuous between storeys.

2.1.6 External render wall (no cavity) with light steel and deep deck composite floor (with RHS or ASB edge beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm.

Edge beam may be an RHS with welded plate or an ASB. However, acoustic performance may be impaired if an RHS is used.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

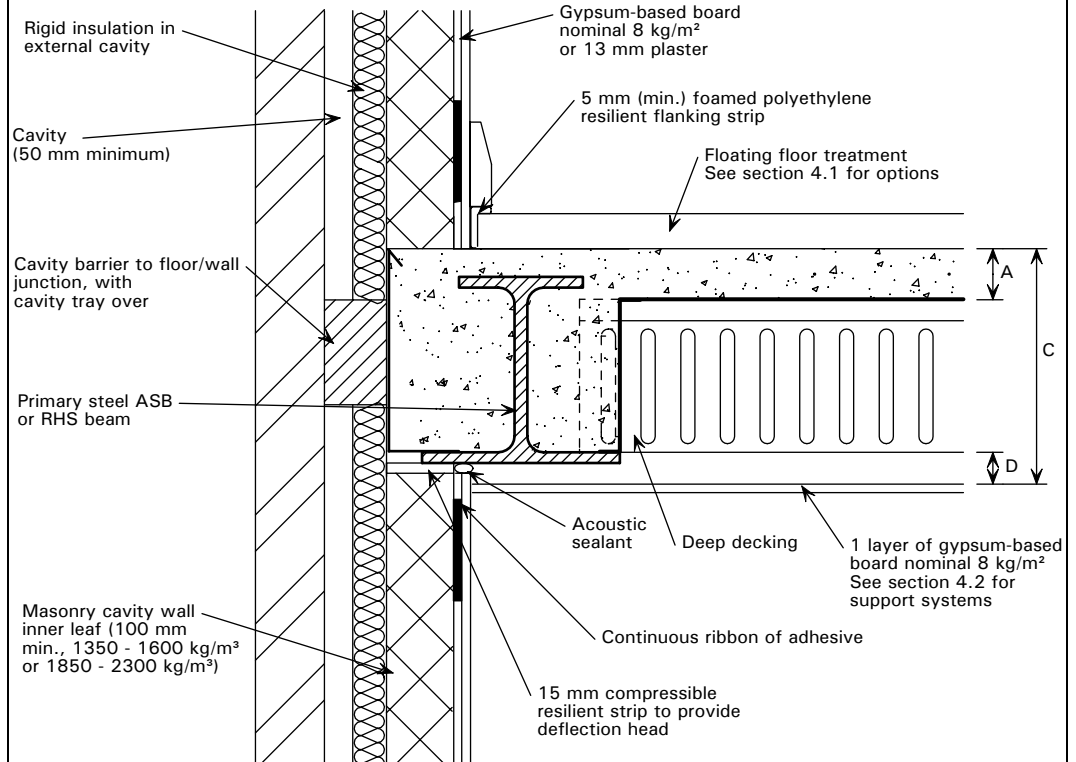
Decking may span in either direction.

Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Inner leaf must not be continuous between storeys.

2.1.7 External cavity wall with masonry inner leaf and deep deck composite floor (with ASB or RHS edge beam)



General notes

This detail is a Robust Detail (E-FS-1) when it is used with an ASB edge beam, in conjunction with an RD floating floor treatment (See Section 4.1), $A \geq 80$ mm, $C \geq 300$ mm, the concrete density is at least 2200 kg/m³, the inner leaf concrete block is of density 1350 - 1600 kg/m³ or 1850 - 2300 kg/m³ and the inner leaf ≥ 100 mm.

The edge beam may be an RHS with welded plate or an ASB. However, acoustic performance may be impaired if an RHS is used.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Decking may span in either direction.

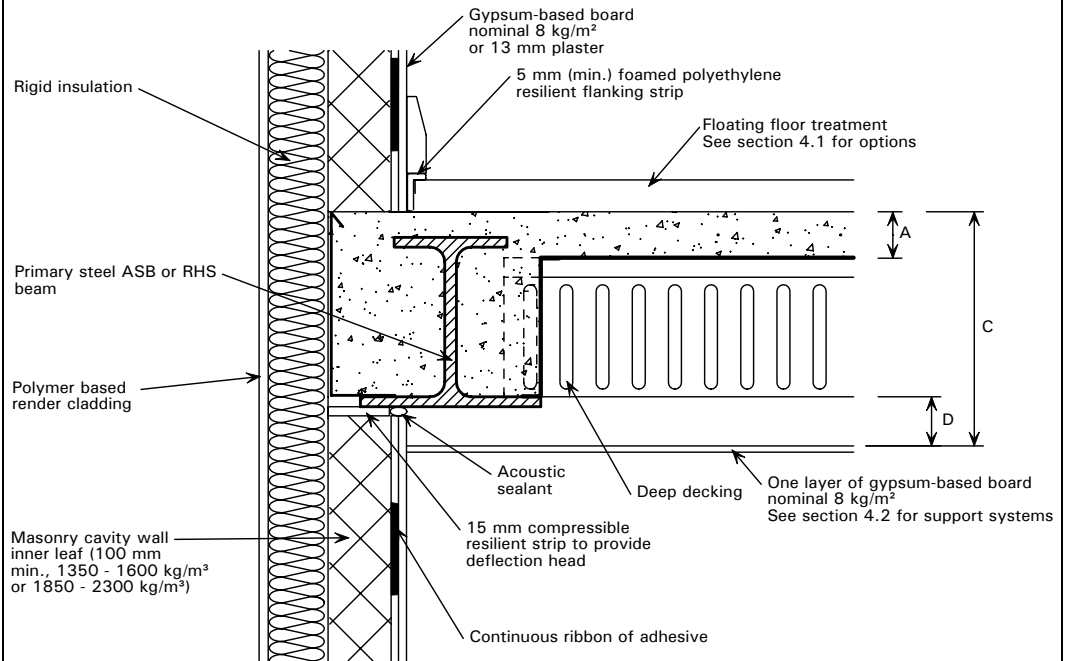
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Outer leaf may be masonry or precast panels.

Inner leaf must not be continuous between storeys.

2.1.8 External render wall (no cavity) with masonry and deep deck composite floor (with ASB or RHS edge beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm.

Edge beam may be an RHS with welded plate or an ASB. However, acoustic performance may be impaired if an RHS is used.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

Ceiling board should not be in direct contact with any steel beams or columns.

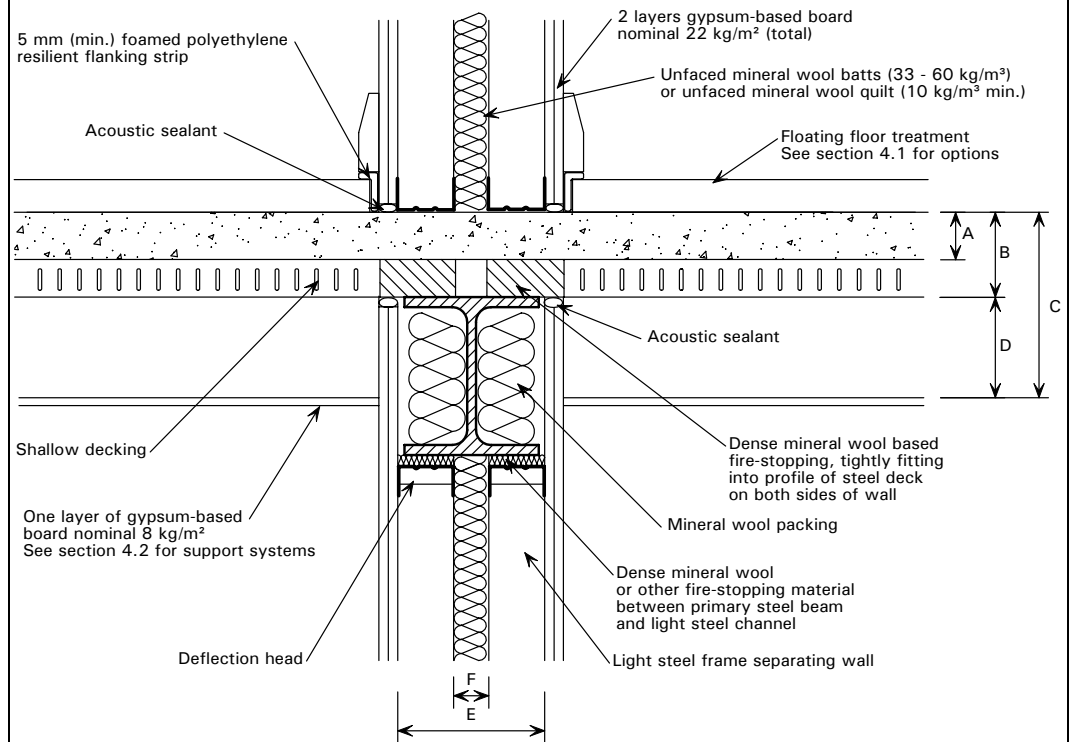
Wall materials

Concrete block density should be 1350 - 1600 kg/m³ or 1850 - 2300 kg/m³.

Inner leaf must not be continuous between storeys.

2.2 Internal wall and floor junction details

2.2.1 Internal light steel separating wall and shallow composite deck floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm, $B \geq 130$ mm, $E \geq 200$ mm and $F \geq 50$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

Decking may be trapezoidal or re-entrant in profile.

Where decking profiles are at right angles to the walls, voids (above the beam) are filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

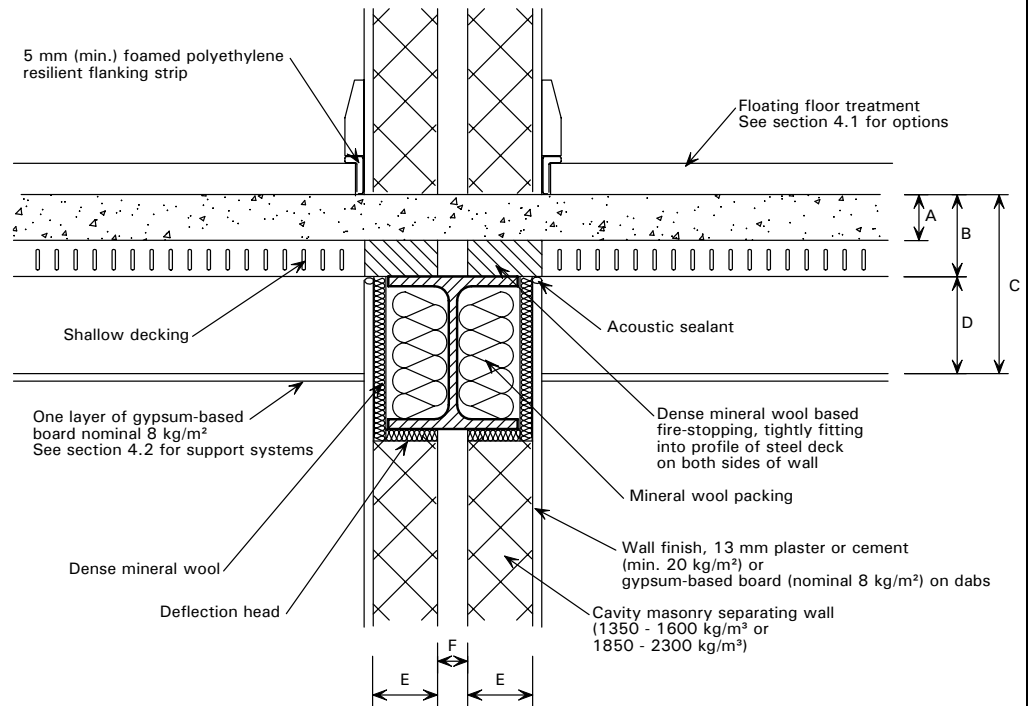
Ceiling board should not be in direct contact with any steel beams or columns.

Floor treatment should not be continuous under separating wall.

Wall materials

Wall board should not be in direct contact with any steel beams or columns.

2.2.2 Internal cavity masonry separating wall and shallow composite deck floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm, $B \geq 130$ mm, $E \geq 100$ mm and $F \geq 75$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

Decking may be trapezoidal or re-entrant in profile.

Where decking profiles are at a right angle to the walls, voids must be filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

Ceiling board should not be in direct contact with any steel beams or columns.

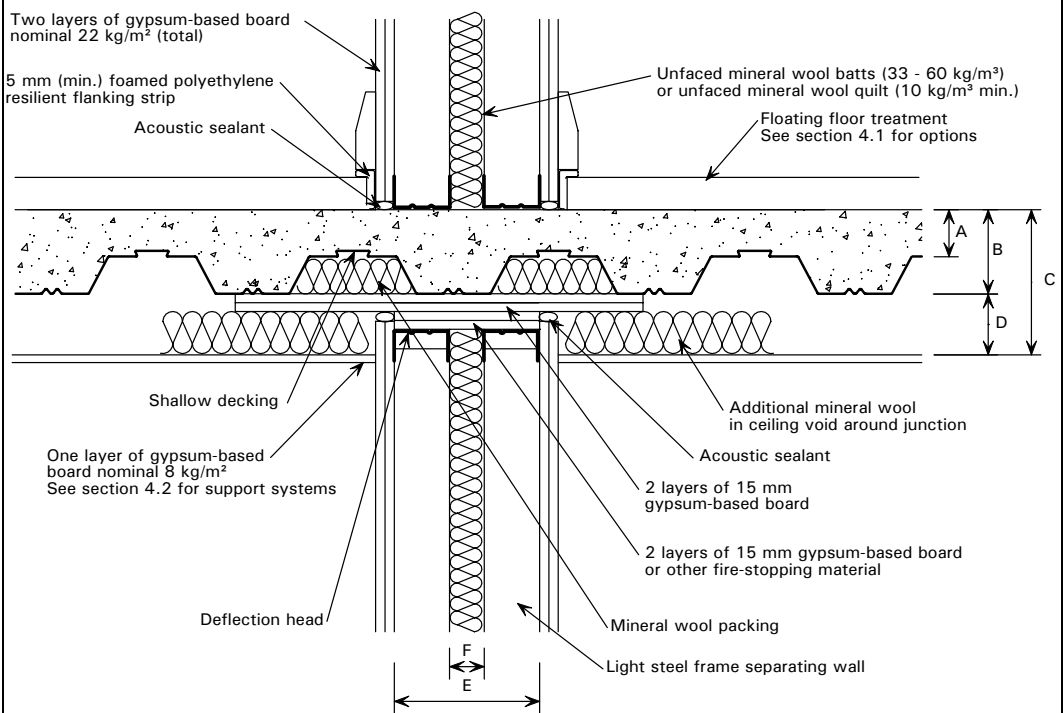
Floor treatment should not be continuous under separating wall.

Wall materials

Concrete block density should be 1350 – 1600 kg/m³ or 1850 – 2300 kg/m³.

Wall board should not be in direct contact with any steel beams or columns.

2.2.3 Internal light steel separating wall and shallow composite deck floor (no downstand beam)



General notes

Performance levels similar to those for an RD could be expected with $A \geq 80$ mm, $B \geq 130$ mm, $E \geq 200$ mm and $F \geq 50$ mm.

Proprietary alternative solutions that exist may be adopted.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

Decking may be trapezoidal or re-entrant in profile.

Where decking profiles are at right angles to the walls, voids (above the wall) are filled with profiled mineral wool inserts and caulked with acoustic or flexible sealant.

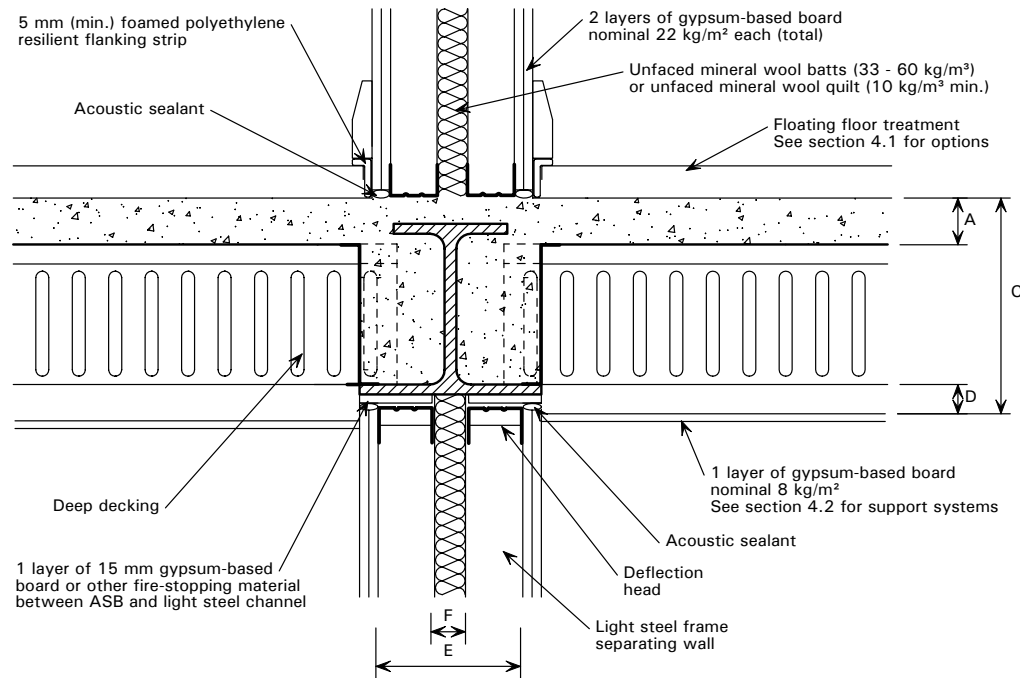
Ceiling board should not be in direct contact with any steel beams or columns.

Floor treatment should not be continuous under separating wall.

Wall materials

Wall board should not be in direct contact with any steel beams or columns.

2.2.4 Internal light steel separating wall and deep deck composite floor (with ASB beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm, $E \geq 200$ mm and $F \geq 50$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

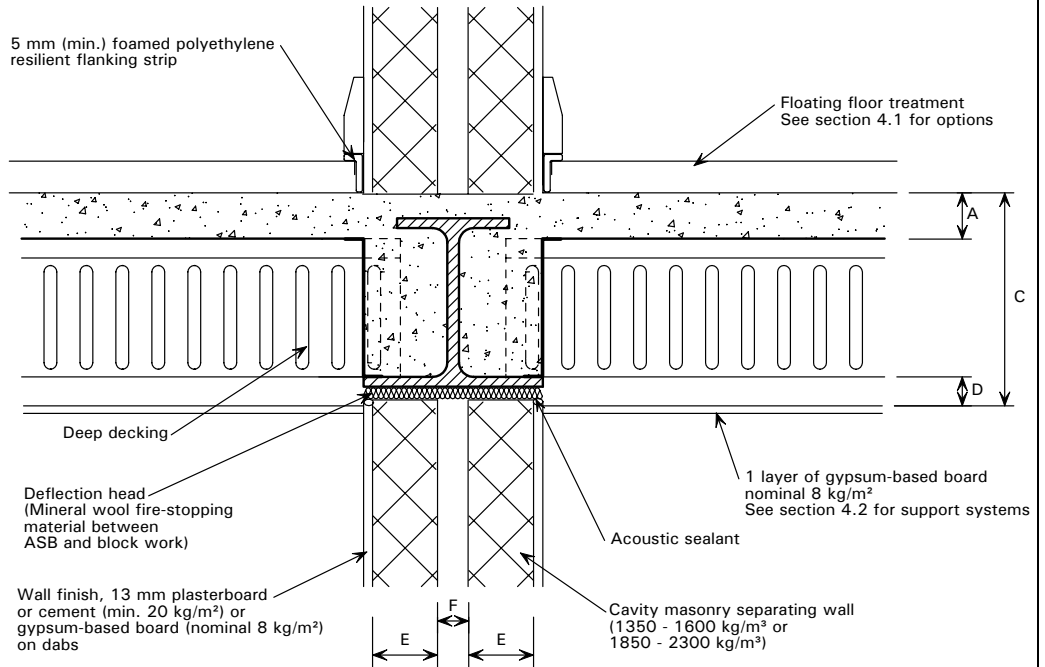
Floor treatment should not be continuous under separating wall.

Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Wall board should not be in direct contact with any steel beams or columns.

2.2.5 Internal cavity masonry separating wall and deep deck composite floor (with ASB beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm, $E \geq 100$ mm and $F \geq 75$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

Ceiling board should not be in direct contact with any steel beams or columns.

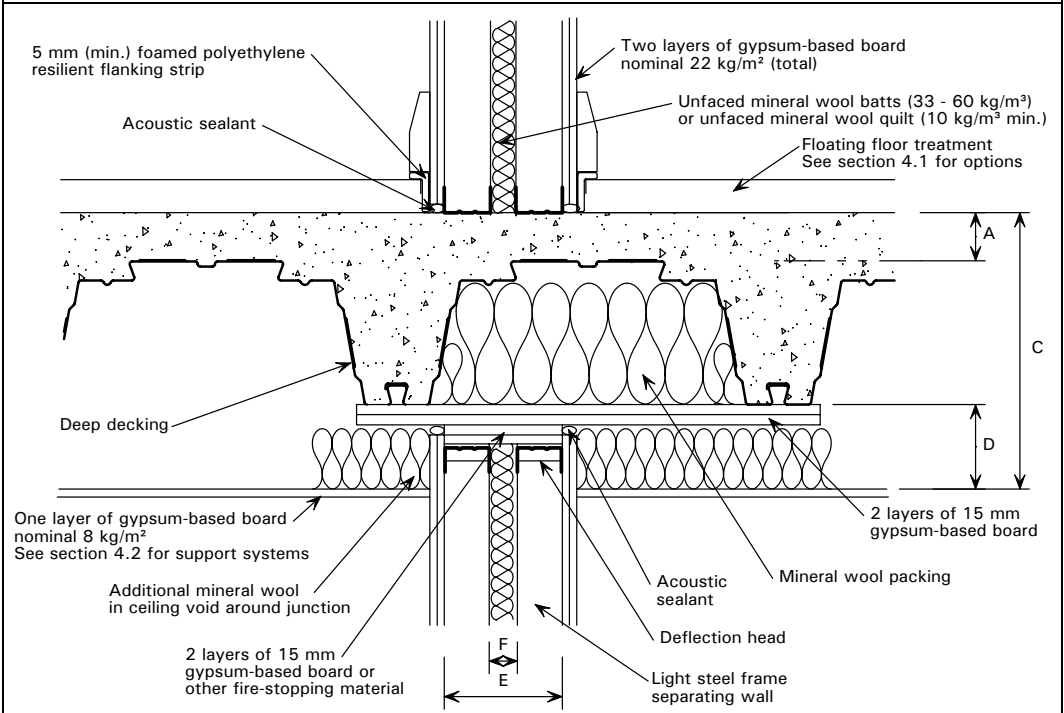
Floor treatment should not be continuous under separating wall.

Wall materials

Concrete block density should be 1350 – 1600 kg/m³ or 1850 – 2300 kg/m³.

Wall board should not be in direct contact with any steel beams or columns.

2.2.6 Internal light steel separating wall and deep deck composite floor (with no beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 80$ mm, $E \geq 200$ mm and $F \geq 50$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Concrete density should be at least 2200 kg/m³.

Decking may span in either direction.

Ceiling board should not be in direct contact with any steel beams or columns.

Floor treatment should not be continuous under separating wall.

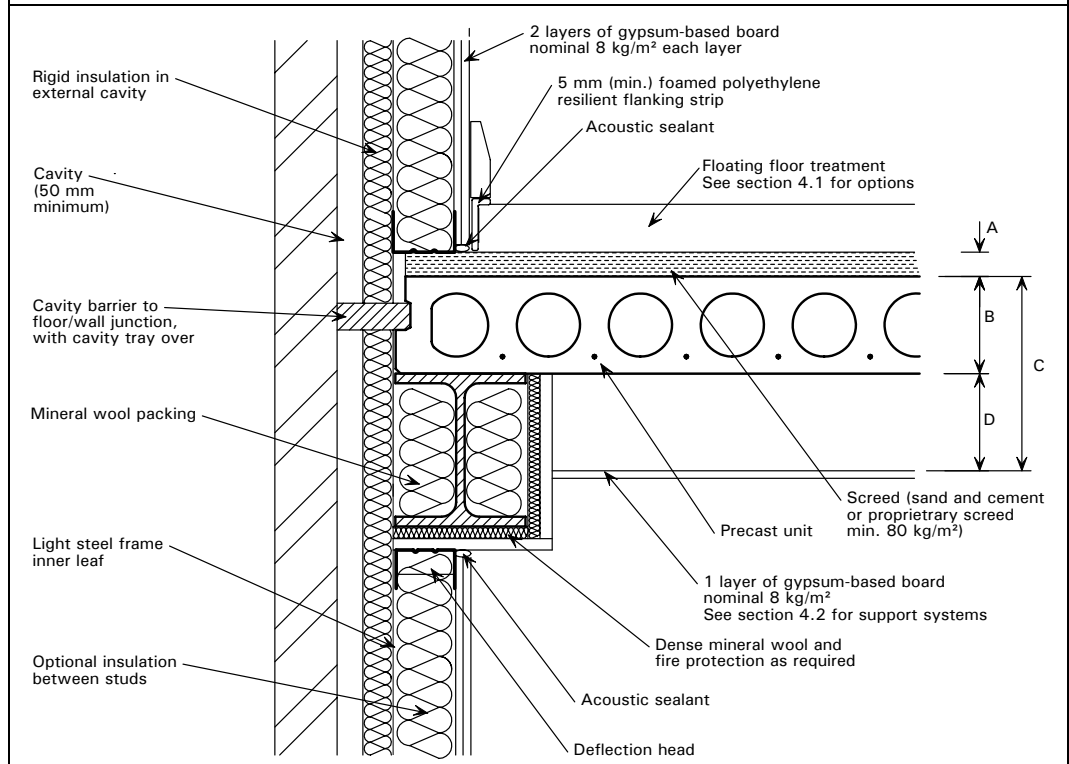
Wall materials

Wall board should not be in direct contact with any steel beams or columns.

3 PRECAST CONCRETE FLOORS

3.1 External wall and floor junction details

3.1.1 External cavity wall with light steel internal leaf and precast floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 40$ mm and $B \geq 150$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Precast unit mass should be at least 300 kg/m².

Screed mass should be at least 80 kg/m².

Outer leaf may be masonry or precast panels.

Precast units must butt tightly together and all voids between units must be grouted.

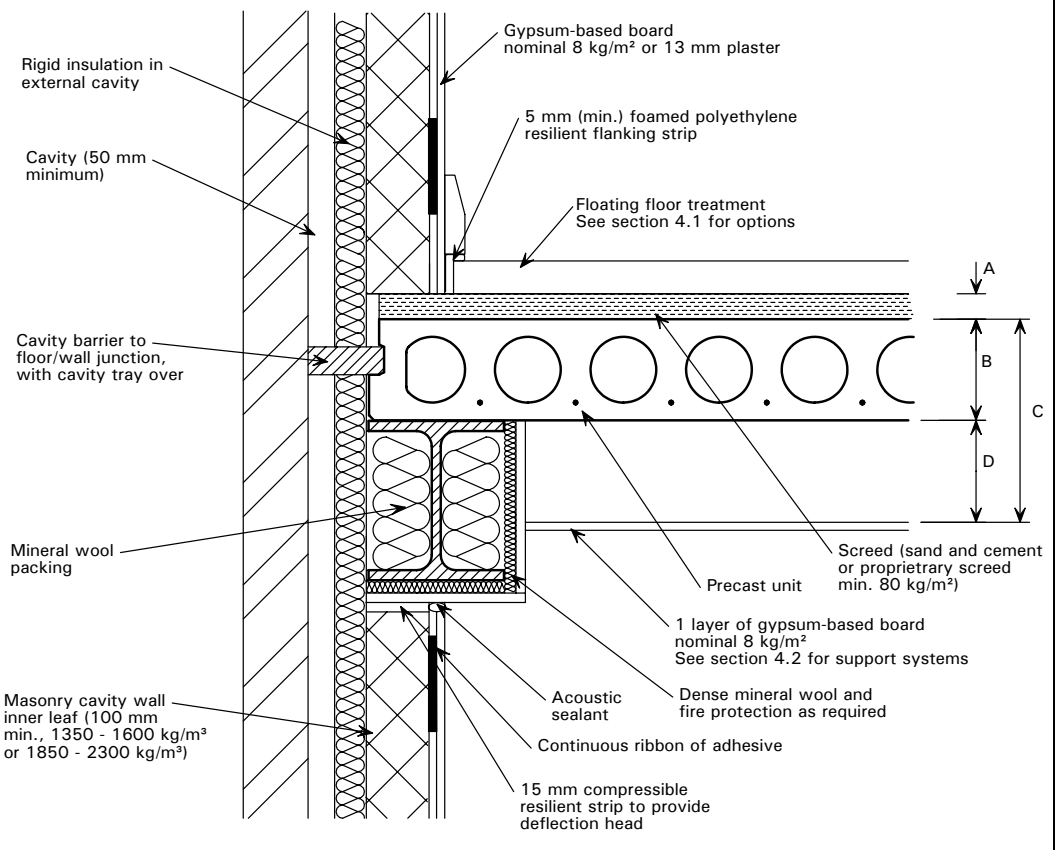
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Voids between the wall and floor must be filled with acoustic or flexible sealant.

Inner leaf must not be continuous between storeys.

3.1.2 External cavity wall with masonry internal leaf and precast floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 40$ mm and $B \geq 150$ mm.

This detail is similar to Robust Detail E-FC-1.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Precast unit mass should be at least 300 kg/m².

Screed mass should be at least 80 kg/m².

Precast units must butt tightly together and all voids between units must be grouted.

Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

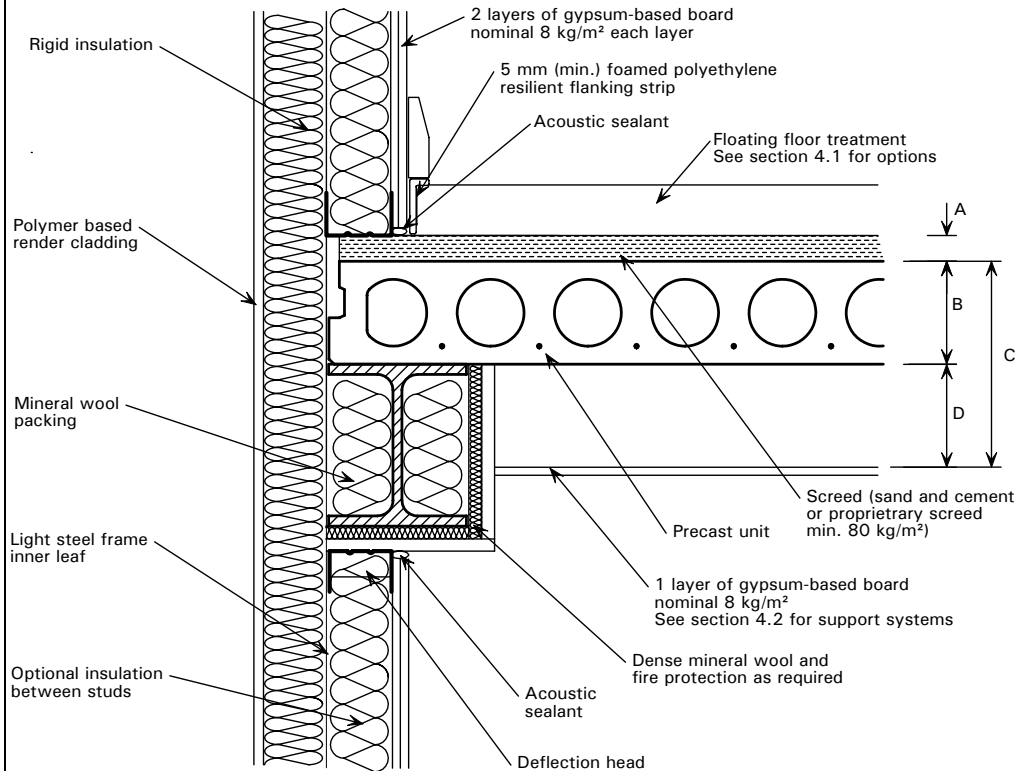
Concrete block density should be 1350 – 1600 kg/m³ or 1850 – 2300 kg/m³.

Voids between the wall and floor must be filled with acoustic or flexible sealant.

Inner leaf must not be continuous between storeys.

Outer leaf may be masonry or precast panels.

3.1.3 External render wall (no cavity) with light steel and precast floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 40$ mm and $B \geq 150$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Precast unit mass should be at least 300 kg/m².

Screed mass should be at least 80 kg/m².

Precast units must butt tightly together and all voids between units must be grouted.

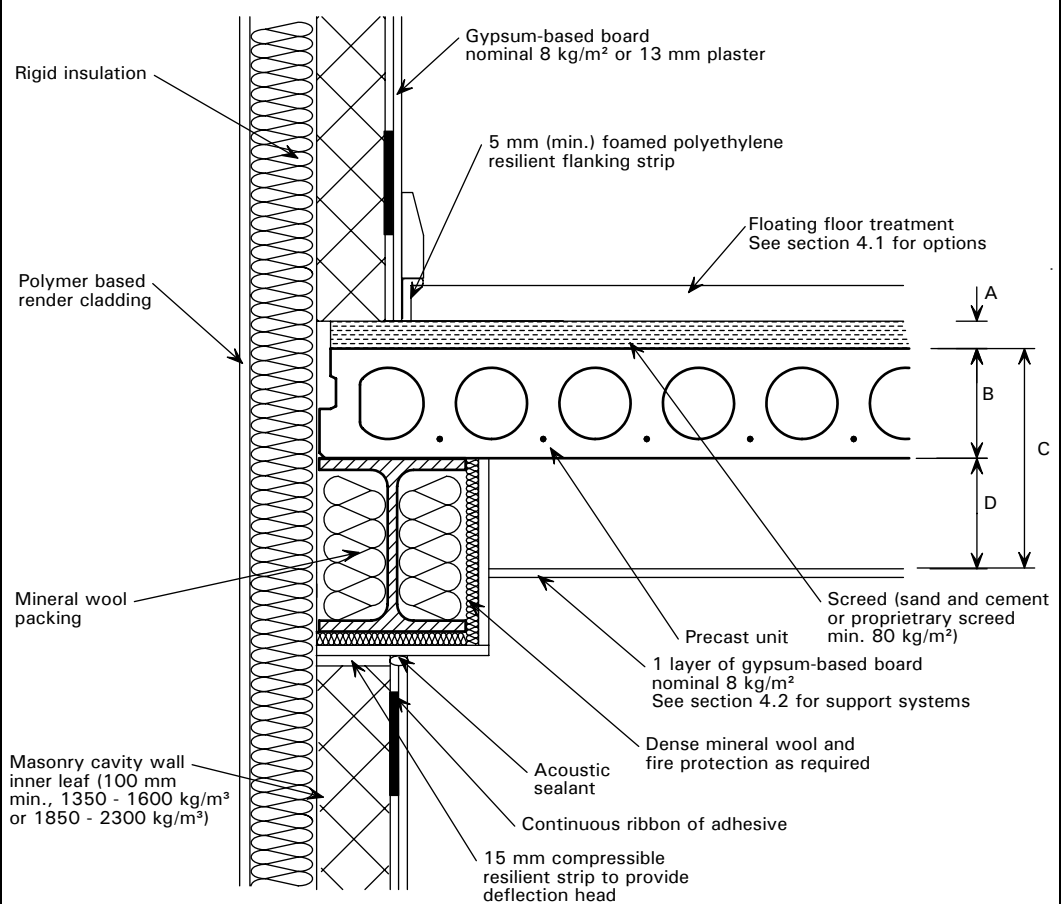
Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

Voids between the wall and floor must be filled with acoustic or flexible sealant.

Inner leaf must not be continuous between storeys.

3.1.4 External render wall (no cavity) with masonry and precast floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 40$ mm and $B \geq 150$ mm.

This detail is similar to Robust Detail E-FC-1.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Precast unit mass should be at least 300 kg/m².

Screed mass should be at least 80 kg/m².

Precast units must butt tightly together and all voids between units must be grouted.

Ceiling board should not be in direct contact with any steel beams or columns.

Wall materials

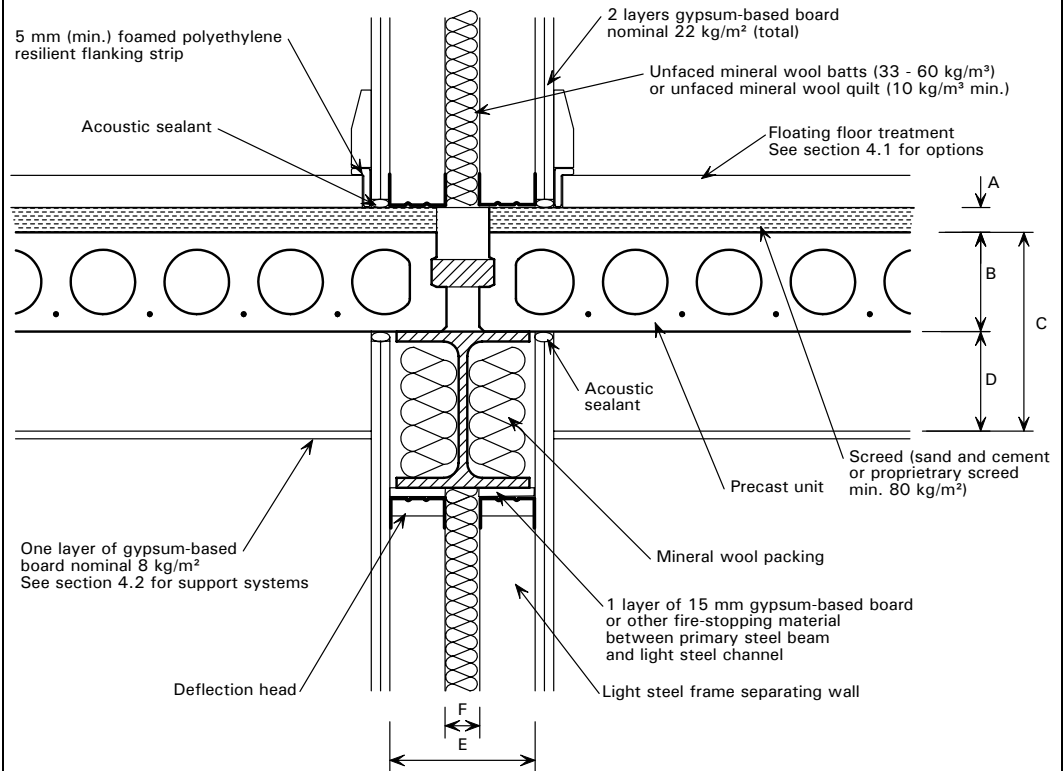
Concrete block density should be 1350 – 1600 kg/m³ or 1850 – 2300 kg/m³.

Voids between the wall and floor must be filled with acoustic or flexible sealant.

Inner leaf must not be continuous between storeys.

3.2 Internal wall and floor junction details

3.2.1 Internal light steel separating wall and precast floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 40$ mm, $B \geq 150$, $E \geq 200$ mm and $F \geq 50$ mm.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Precast unit mass should be at least 300 kg/m².

Screed mass should be at least 80 kg/m².

Precast units must butt tightly together and all voids between units must be grouted.

Ceiling board should not be in direct contact with any steel beams or columns.

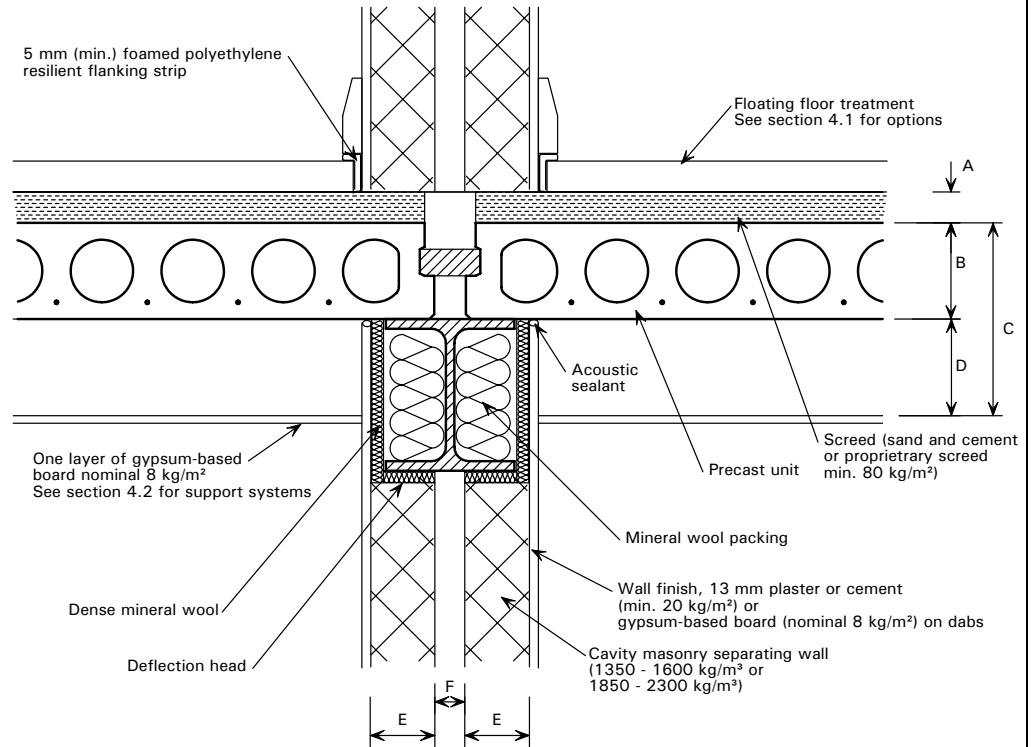
Floor treatment should not be continuous under separating wall.

Wall materials

Voids between the wall and floor must be filled with acoustic or flexible sealant.

Wall board should not be in direct contact with any steel beams or columns.

3.2.2 Internal cavity masonry separating wall and precast floor (with downstand beam)



General notes

Performance levels similar to those of an RD could be expected with $A \geq 40$ mm, $B \geq 150$, $E \geq 100$ mm and $F \geq 75$ mm.

This detail is similar to Robust Detail E-FC-1.

Dimension D depends on the ceiling treatment used, see Section 4.2.

See Section 4 for floor and ceiling treatment options.

Floor materials

Precast unit mass should be at least 300 kg/m².

Screed mass should be at least 80 kg/m².

Precast units must butt tightly together and all voids between units must be grouted.

Ceiling board should not be in direct contact with any steel beams or columns.

Floor treatment should not be continuous under separating wall.

Wall materials

Concrete block density should be 1350 – 1600 kg/m³ or 1850 – 2300 kg/m³.

Voids between the wall and floor must be filled with acoustic or flexible sealant.

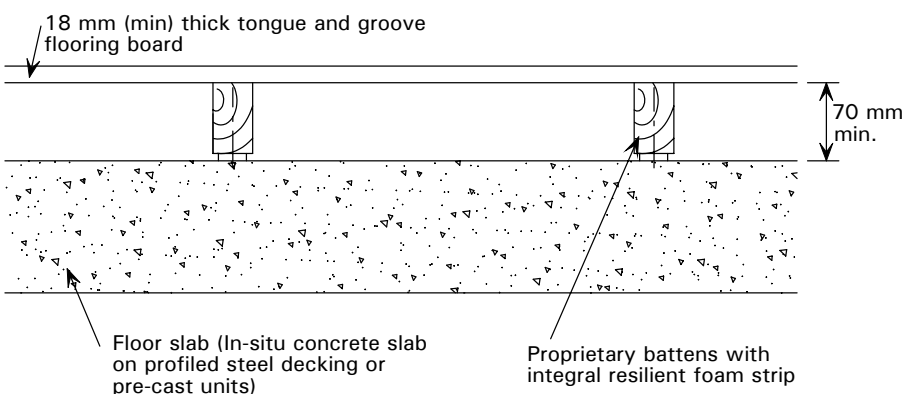
Wall board should not be in direct contact with any steel beams or columns.

4 FLOOR AND CEILING TREATMENTS

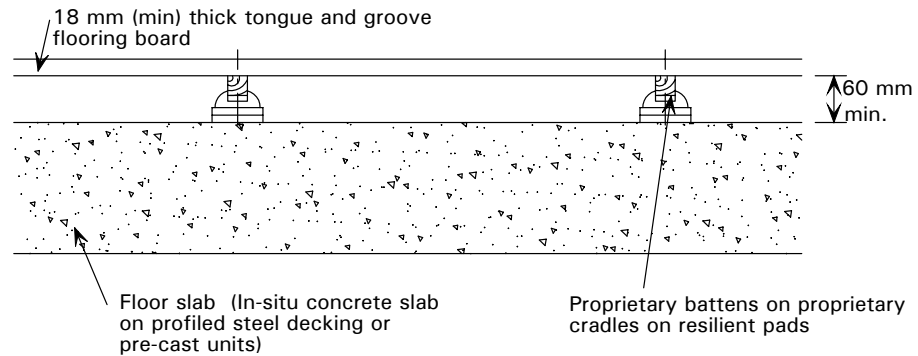
4.1 Floor treatment details

All floating floor treatments (FFT) given below can be used with floor slabs constructed from in-situ concrete with deep or shallow profile metal decking or with floor slabs constructed from precast units and screed topping. However, manufacturer's instructions should be consulted for all FFTs.

Typical performance values are quoted for each type of floor treatment when used in conjunction with an appropriate composite slab. The quoted performance values assume the presence of a gypsum-based board ceiling in addition to the floating floor treatment. See Section 4.2 for ceiling treatment options.

4.1.1 Deep batten floor
 <p>18 mm (min) thick tongue and groove flooring board</p> <p>70 mm min.</p> <p>Floor slab (In-situ concrete slab on profiled steel decking or pre-cast units)</p> <p>Proprietary battens with integral resilient foam strip</p>
<p>Notes</p> <p>This floating floor treatment is a Robust Detail floor treatment (FFT 1) when used with 18 mm (minimum) tongue and groove flooring board and resilient composite battens at least 70 mm deep.</p> <p>Total clearance ≥ 70 mm when loaded to 25 kg/m^2.</p> <p>The timber batten is bonded to resilient foam strips at the top or at the bottom.</p> <p>For additional performance, a 19 mm gypsum-based board may be included under the flooring board (optional).</p> <p>Services installed in floor should not bridge the resilient layer.</p> <p>Separate flanking strips should be used to isolate the walls from the floating floor system.</p> <p>Floor treatment must be installed in accordance with the manufacturer's instructions.</p>
<p>Expected Performance</p> <p>Airborne: $54 \text{ dB} \leq D_{nT_w} + C_{tr} \leq 60 \text{ dB}$</p> <p>Impact: $35 \text{ dB} \leq L'_{nT_w} \leq 45 \text{ dB}$</p>

4.1.2 Cradle and batten floor



Notes

This floating floor treatment is a Robust Detail floor treatment (FFT 2) when used with 18 mm (minimum) tongue and groove flooring board and a resilient cradle and batten system at least 60 mm deep.

Total clearance ≥ 60 mm when loaded to 25 kg/m^2 .

The battens are supported by cradles and resilient pads.

For additional performance, a 19 mm gypsum-based board may be included under the flooring board (optional).

Services installed in floor should not bridge the resilient layer.

Separate flanking strips should be used to isolate the walls from the floating floor system.

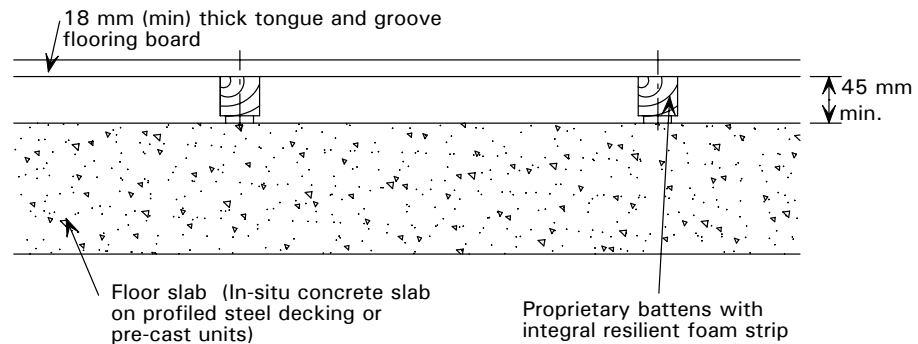
Floor treatment must be installed in accordance with the manufacturer's instructions.

Expected Performance

Airborne: $54 \text{ dB} \leq D_{nT_w} + C_{tr} \leq 60 \text{ dB}$

Impact: $35 \text{ dB} \leq L'_{nT_w} \leq 45 \text{ dB}$

4.1.3 Standard batten floor



Notes

This floating floor treatment is a Robust Detail floor treatment (FFT 3) when used with 18 mm (minimum) tongue and groove flooring board and resilient composite standard battens at least 45 mm deep.

Total clearance ≥ 45 mm when loaded to 25 kg/m^2 .

The timber batten is bonded to resilient foam strips at the top or at the bottom.

For additional performance, a 19 mm gypsum-based board may be included under the flooring board (optional).

Services installed in floor should not bridge the resilient layer.

Separate flanking strips should be used to isolate the walls from the floating floor system.

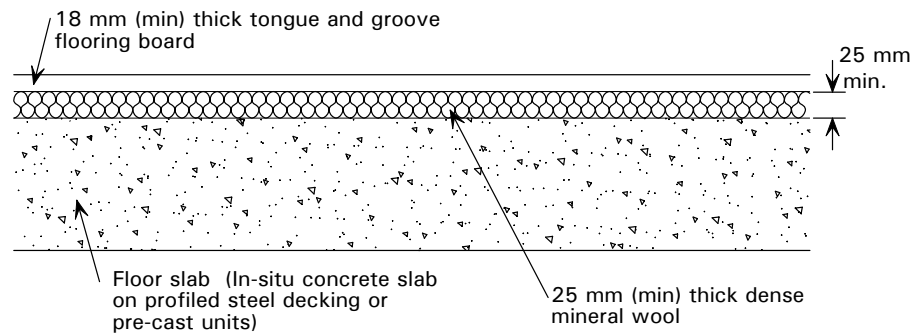
Floor treatment must be installed in accordance with the manufacturer's instructions.

Expected Performance

Airborne: $54 \text{ dB} \leq D_{nT_w} + C_{tr} \leq 60 \text{ dB}$

Impact: $35 \text{ dB} \leq L'_{nT_w} \leq 45 \text{ dB}$

4.1.4 Platform floor



Notes

This floating floor treatment is a Robust Detail floor treatment (FFT 4) when used with 18 mm (minimum) tongue and groove flooring board and mineral wool resilient layer at least 25 mm (minimum 150 kg/m³) or 30 mm (minimum 140 kg/m³).

Overall mass per unit area of floor system should be at least 16 kg/m².

For additional performance, a 19 mm gypsum-based board may be included under the flooring board (optional).

No services should be installed in the floor system.

Separate flanking strips should be used to isolate the walls from the floating floor system.

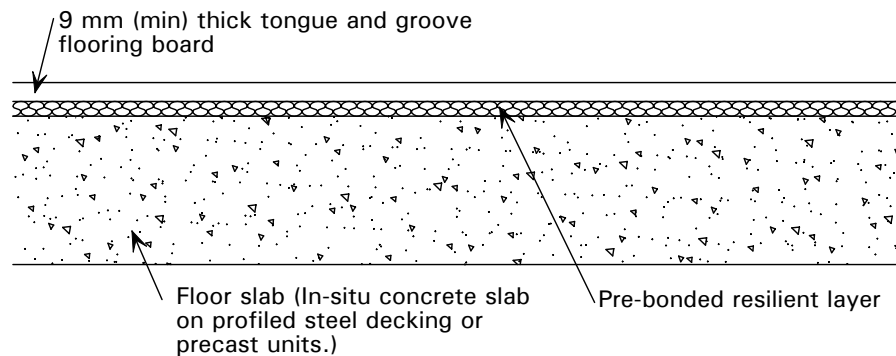
Floor treatment must be installed in accordance with the manufacturer's instructions.

Expected Performance

Airborne: $52 \text{ dB} \leq D_{nT_w} + C_{tr} \leq 57 \text{ dB}$

Impact: $40 \text{ dB} \leq L'_{nT_w} \leq 45 \text{ dB}$

4.1.5 Shallow platform floor



Notes

This floating floor treatment is a Robust Detail floor treatment (FFT 5) when used with 9 mm (minimum) tongue and groove flooring board and resilient layer pre-bonded to the flooring board.

No services should be installed in the floor system.

The resilient layer should not simply be turned up at the edges of the floor to isolate the walls from the floor treatment, separate flanking strips should be used.

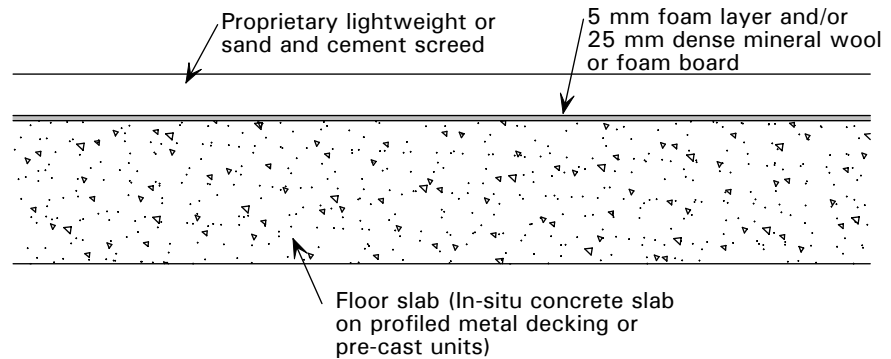
Floor treatment must be installed in accordance with the manufacturer's instructions.

Expected Performance

Airborne: $50 \text{ dB} \leq D_{nT_w} + C_{tr} \leq 57 \text{ dB}$

Impact: $40 \text{ dB} \leq L'_{nT_w} \leq 50 \text{ dB}$

4.1.6 Screed floor



Notes

Screed is sand and cement mix or a proprietary lightweight screed.

The resilient layer should be dense mineral wool, plastic insulant, or a foam layer carefully installed to ensure continuity.

The resilient layer should not simply be turned up at the edges of the floor to isolate the walls from the screed, separate flanking strips should be used.

Care must be taken to avoid air gaps at edges of the screed.

No services should be installed in the floor system.

Floor treatment must be installed in accordance with the manufacturer's instructions.

Expected Performance

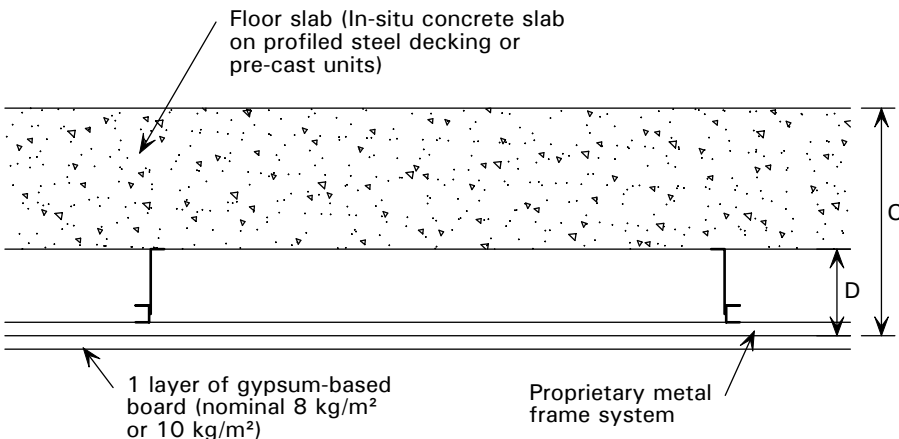
Airborne: $50 \text{ dB} \leq D_{nT_w} + C_{tr} \leq 57 \text{ dB}$

Impact: $40 \text{ dB} \leq L'_{nT_w} \leq 50 \text{ dB}$

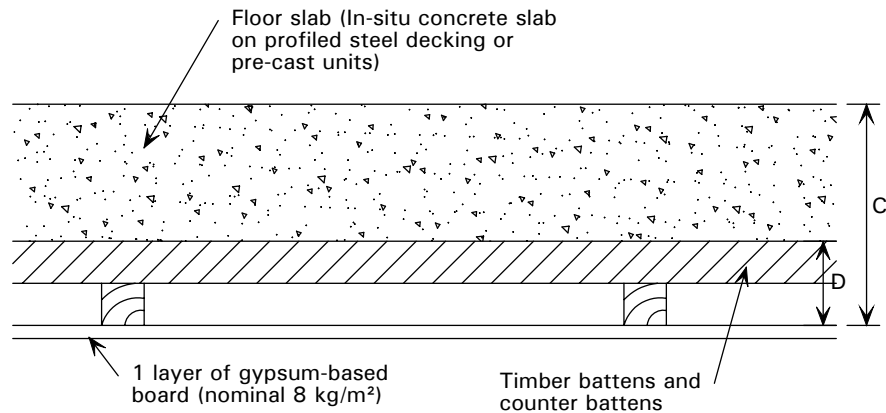
4.2 Ceiling treatment details

All separating floors should have a ceiling treatment of at least one layer of nominal 8 kg/m² of gypsum-based board. Ceiling treatments to precast unit separating floors may require 10 kg/m² of gypsum-based board depending on the size of the void between ceiling and precast unit (see details below for further guidance).

The sound insulation performance of a ceiling treatment can be increased by placing a mineral wool quilt in the ceiling void (performance improved typically by 3 - 4 dB for airborne and 4 - 5 dB for impact sound) or by using two layers of gypsum-based board (performance improved typically by 2 - 4 dB for airborne and 3 - 5 dB for impact sound).

4.2.1 Board and metal frame	
 <p>The diagram illustrates a cross-section of a ceiling treatment. At the top is a floor slab, which can be either an in-situ concrete slab on profiled steel decking or a pre-cast unit. Below the floor slab is a ceiling void of height C. This void contains a layer of gypsum-based board, which is supported by a proprietary metal frame system. The height of the metal frame system is denoted as D. The gypsum-based board has a nominal weight of 8 kg/m² or 10 kg/m².</p>	
Notes	
Proprietary metal frame systems can be used to hang the ceiling below downstand beams to form a flat soffit.	
For in-situ concrete slabs supported by profiled steel decking:	
<ul style="list-style-type: none">• Ceiling board must be at least 8 kg/m² of gypsum-based board• C must be ≥ 300 mm for use with RD (E-FS-1).	
For all floor constructions:	
<ul style="list-style-type: none">• D must be ≥ 100 mm with ceiling board of 8 kg/m²• D must be ≥ 75 mm with ceiling board of 10 kg/m².	
All ceiling joints must be sealed with tape or caulked with sealant.	
Ceiling treatment must be installed in accordance with the manufacturer's instructions.	

4.2.2 Board and timber battens



Notes

Timber battens fixed to the underside of the slab support the ceiling board close to the slab.

For in-situ concrete slabs supported by profiled steel decking:

- Ceiling board must be at least 8 kg/m² of gypsum-based board
- C must be ≥ 300 mm for use with RD (E-FS-1)
- D must be ≥ 100 mm with ceiling board of 8 kg/m².

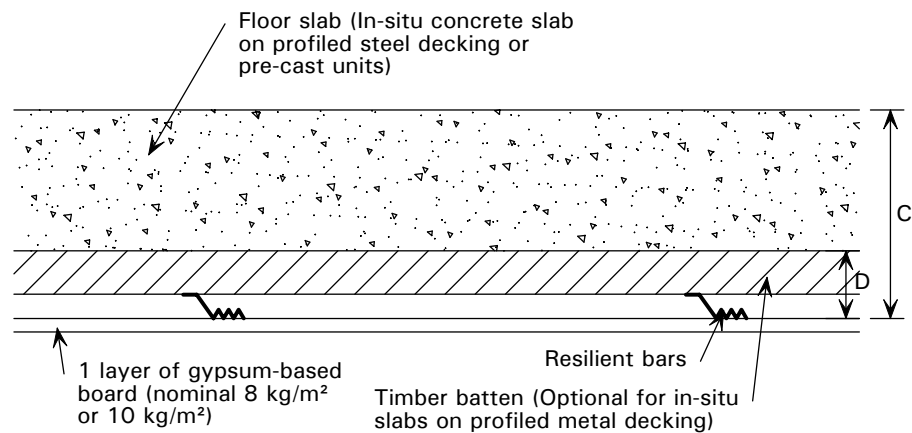
For precast unit with screed floors:

- Ceiling board must be at least 8 kg/m² of gypsum-based board
- D must be ≥ 100 mm for use with RD (E-FC-1)

All ceiling joints must be sealed with tape or caulked with sealant.

Ceiling treatment must be installed in accordance with the manufacturer's instructions.

4.2.3 Board and resilient bars



Notes

Proprietary resilient bars decouple the ceiling from the floor slab and enhance acoustic insulation of the floor.

For in-situ concrete slabs supported by profiled steel decking:

- Ceiling board must be at least 8 kg/m² of gypsum-based board
- C must be ≥ 300 mm for use with RD (E-FS-1)
- Resilient bars may be fixed directly to the underside of the deck.

For precast unit and screed floors:

- Ceiling board must be at least 10 kg/m² of gypsum-based board
- D must be ≥ 65 mm for use with RD (E-FC-1)
- This form of ceiling treatment is only suitable if precast units are ≥ 200 mm deep and ≥ 300 kg/m².

All ceiling joints must be sealed with tape or caulked with sealant.

Ceiling treatment must be installed in accordance with the manufacturer's instructions.

4.2.4 Down lighters and recessed lighting

Down lighters or recessed lighting may be installed in the ceiling with no significant loss of acoustic performance provided that:

- There is a minimum ceiling void of 75 mm.
- Lighting is installed in accordance with the manufacturer's instructions.
- There is no more than one light per 2 m² of ceiling area in each room.
- The centres between lights are not less than 0.75 m.
- The openings do not exceed 100 mm diameter or 100 × 100 mm.

Particular attention should be paid to Building Regulations Part B – Fire Safety^[8].

5 INTERGRATION AND SERVICE PENETRATIONS

5.1 Services through separating floors

Services that penetrate separating floors must be detailed appropriately to ensure that the acoustic performance of the separating floor is not impaired. The usual solution is to box in the service with two layers of gypsum-based board. It is not necessary for the service penetration to be adjacent to a wall.

A typical service penetration detail is given.

5.1.1 Pipes through separating floor

Two layers of gypsum-based board nominal 8 kg/m² each

25 mm (min.) of mineral wool quilt (10 kg/m³ min.)

5 mm (min.) foamed polyethylene resilient flanking strip

Service pipe

Floating floor treatment

Floor slab (In-situ concrete slab on profiled metal decking or pre-cast units)

Voids sealed around pipe

One layer of gypsum-based board nominal 8 kg/m²

Fire stop cavity barrier

Timber or light steel frame

Notes

This detail is recommended in the *Robust Details Handbook*^[4].

The floor slab may be in-situ concrete supported by profiled metal decking or precast concrete units with a screed.

See Section 4 for floor and ceiling treatment options.

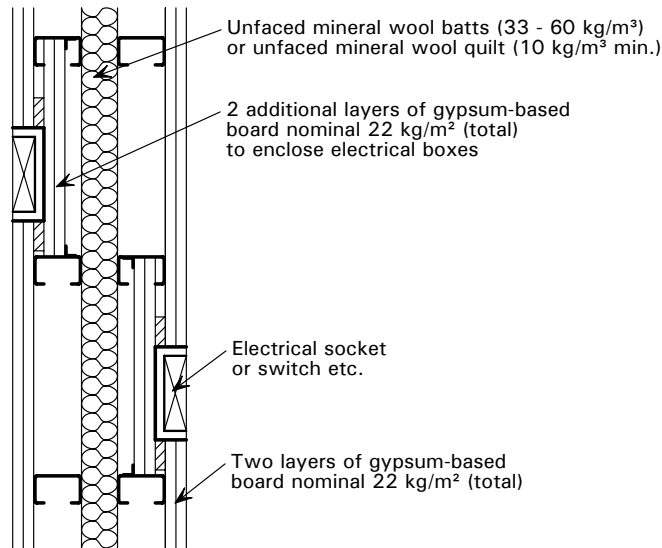
The frame used for boxing in may be timber or light steel.

5.2 Services in separating walls

Services within separating walls must be detailed appropriately to ensure that the acoustic performance of the separating wall is not impaired. The usual solutions are to stagger services on either side of the wall and provide additional layers of gypsum-based board where the wall board is penetrated.

Typical details for services in light steel framed separating wall are given.

5.2.1 Electrical sockets and switches (staggered method)



Notes

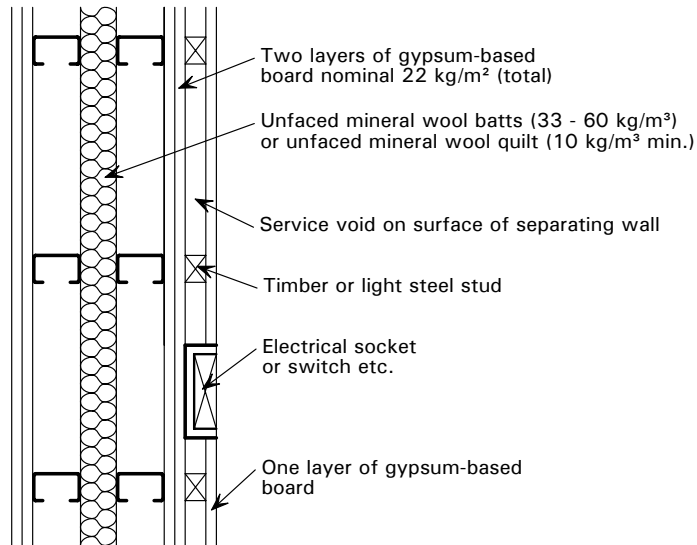
This detail is recommended in the *Robust Details Handbook*^[4].

Sockets, switches etc must be staggered on each side of the wall.

This method is not preferred when there are several switches or sockets to be located in close proximity.

Wall details must be in accordance with requirements given in Section 2.2.

5.2.2 Electrical sockets and switches (service void method)



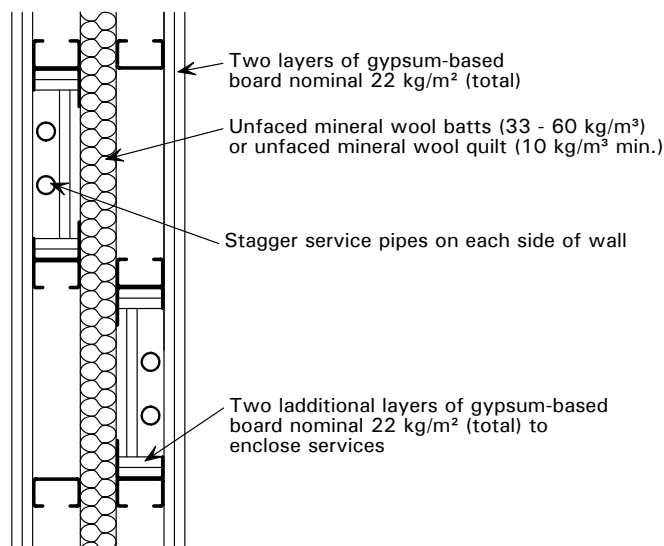
Notes

This detail is recommended in the *Robust Details Handbook*^[4].

The service void method (shown) is the preferred method when there are several switches or sockets to be located in close proximity e.g. in a kitchen.

Wall details must be in accordance with requirements given in Section 2.2.

5.2.3 Piped services



Notes

This detail is recommended in the *Robust Details Handbook*^[4]

Services must be staggered on each side of the wall.

Wall details must be in accordance with requirements given in Section 2.2.

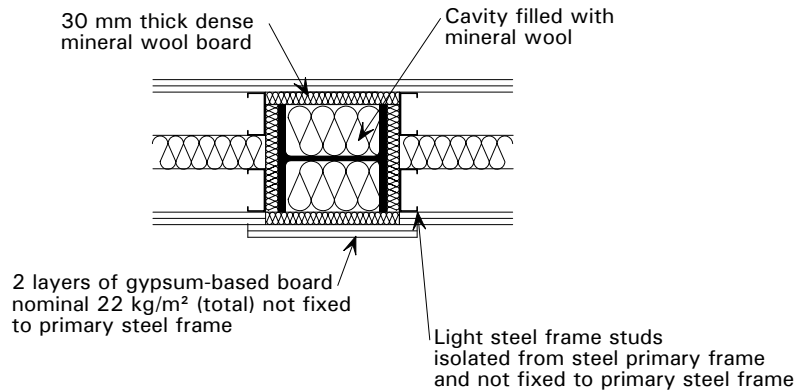
This detail is not applicable for soil and vent pipes or gas pipes.

5.3 Integration of columns in separating walls

Steel columns within separating walls must be detailed appropriately to ensure that the acoustic performance of the separating wall is not impaired.

Typical details for columns located in a light steel framed separating wall are given.

5.3.1 Columns in separating walls



Notes

Wall board is decoupled from the column with 30 mm of dense mineral wool board.

Proprietary alternative solutions that exist may be adopted.

Wall details must be in accordance with requirements given in Section 2.2.

6 REFERENCES

- 1 The Building Regulations 2000 (SI 2000/2531)
As amended by:
The Building (Amendment) Regulations 2001 (SI 2001/3335),
The Building (Amendment) Regulations 2002 (SI 2002/440)
The Building (Amendment)(No. 2) Regulations 2002 (SI 2002/2871)
The Building (Amendment) Regulations 2003 (SI 2003/2692)
The Building (Amendment) Regulations 2004 (SI 2004/1465))
The Stationery Office
*(For latest revisions, check Building Regulations on ODPM website:
www.odpm.gov.uk and www.tso.co.uk)*
- 2 Building Regulations 2000 – Approved Document E (2003 Edition)
Resistance to the passage of sound
Approved Document E – Amendments 2004
The Stationery Office
- 3 Building Bulletin 93
Acoustic design of schools
The Stationery Office, 2003
- 4 Robust Details Handbook
Robust Details Ltd, 2004
- 5 GORGOLEWSKI, M.T. and COUCHMAN, G.H.
Acoustic performance of light steel framed systems - Meeting the new requirements of Part E of the Building Regulations (2003) (P320)
The Steel Construction Institute, 2003
- 6 GORGOLEWSKI, M.T. and LAWSON, R.M.
Acoustic performance of *Slimdek* – Meeting the new requirements of Part E of the Building Regulations (2003) (P321)
The Steel Construction Institute, 2003
- 7 GORGOLEWSKI, M.T. and LAWSON, R.M.
Acoustic performance of composite floors - meeting the new requirements of Part E of the Building Regulations (2003) (P322)
The Steel Construction Institute, 2003
- 8 Building Regulations 2000 – Approved Document B
Fire Safety
The Stationery Office, 2000

APPENDIX A CURRENT ROBUST DETAILS

The following information is taken from the first edition (June 2004) of the *Robust Details Handbook* [4].

A.1 RD status of separating floor and wall combinations

		Concrete floors		Timber floors	Steel concrete composite floors
		E-FC-1	E-FC-2	E-FT-1	E-FS-1
Masonry walls	E-WM-1	●	W	X	W
	E-WM-2	●	W	X	W
	E-WM-3	●	W	X	W
	E-WM-4	●	W	X	W
	E-WM-5	●	W	X	W
	E-WM-6	F	W + F	X	W + F
Timber walls	E-WT-1	U	W	●	W
	E-WT-2	U	W	●	W
Steel walls	E-WS-1	U	W	X	W
	E-WS-2	U	●	X	W

Key:

- Permissible RD wall and floor combination – no pre-completion testing required
- W Only the separating wall requires pre-completion testing
- F Only the separating floor requires pre-completion testing
- W + F Both the separating wall and floor require pre-completion testing
- U This is an uncommon form of construction, see ref. [4] for further guidance
- X Unacceptable combinations, see ref. [4] for further guidance

A.2 Robust Details for separating walls

A.2.1 Masonry separating walls

E-WM-1: Dense aggregate blocks (wet plaster)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction: timber floor supported on joist hangers
	4	Internal floor junction: timber floor joist built in, beam and block or precast concrete
	5	Separating floor junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Roof junction: pitched roof without room in roof
	8	Roof junction: pitched roof with room in roof

E-WM-2: Lightweight aggregate blocks (wet plaster)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction: timber floor supported on joist hangers
	4	Internal floor junction: timber floor joist built in, beam and block or precast concrete
	5	Separating floor junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Roof junction: pitched roof without room in roof
	8	Roof junction: pitched roof with room in roof

E-WM-3: Dense aggregate blocks (render and gypsum-based board on dabs)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction: timber floor supported on joist hangers
	4	Internal floor junction: timber floor joist built in, beam and block or precast concrete
	5	Separating floor junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Roof junction: pitched roof without room in roof
	8	Roof junction: pitched roof with room in roof
	9	Flue blocks built into separating wall

E-WM-4: Lightweight aggregate blocks (render and gypsum-based board on dabs)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction: timber floor supported on joist hangers
	4	Internal floor junction: timber floor joist built in, beam and block or precast concrete
	5	Separating floor junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Roof junction: pitched roof without room in roof
	8	Roof junction: pitched roof with room in roof
	9	Flue blocks built into separating wall

E-WM-5: Besblock "Star Performer" dense aggregate cellular blocks (render and gypsum-based board on dabs)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction: timber floor supported on joist hangers
	4	Internal floor junction: timber floor joist built in, beam and block or precast concrete
	5	Separating floor junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Roof junction: pitched roof without room in roof
	8	Roof junction: pitched roof with room in roof
	9	Flue blocks built into separating wall

E-WM-6: Aircrete blocks (render and gypsum-based board on dabs)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction: timber floor supported on joist hangers
	4	Internal floor junction: timber floor joist built in, beam and block or precast concrete
	5	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	6	Roof junction: pitched roof without room in roof
	7	Roof junction: pitched roof with room in roof

A.2.2 Timber separating walls

E-WT-1: Twin timber frames (without sheathing board)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction
	4	Separating floor junction
	5	Internal wall junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Raft foundation
	8	Roof junction: pitched roof without room in roof
	9	Services and sockets in the separating wall

E-WT-2: Twin timber frames (with sheathing board)	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction
	4	Separating floor junction
	5	Internal wall junction
	6	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	7	Raft foundation
	8	Roof junction: pitched roof without room in roof
	9	Services and sockets in the separating wall

A.2.3 Steel separating walls

E-WS-1: Twin metal frames	1	External (flanking) wall junction
	2	Staggered external (flanking) wall junction
	3	Internal floor junction
	4	Internal wall junction
	5	Ground floor junction: timber floor, beam and block, precast concrete plank, cast in-situ concrete slab or ground bearing slab
	6	Raft foundation
	7	Roof junction: pitched roof without room in roof
	8	Services and sockets in the separating wall

E-WS-2: British Gypsum GypWall QUIET IWL	1	External (flanking) wall junction – steel or timber frame inner leaf (at concrete column position)
	2	External (flanking) wall junction – masonry inner leaf (at concrete column position)
	3	External (flanking) wall junction – steel or timber frame inner leaf (not at concrete column position)
	4	Separating wall to separating wall junction
	5	Separating floor junction – in-situ concrete floor E-FC-2
	6	Internal wall junction
	7	Sockets in the separating wall

A.3 Robust Details for separating floors

A.3.1 Concrete separating floors

E-FC-1: Precast concrete plank	1	External (flanking) wall junction
	2	Separating wall junction
	3	Ceiling treatments for E-FC-2
	4	Floating floor treatments for E-FC-2
	5	Services – Service pipes through separating floor

E-FC-2: In-situ concrete slab	1	External (flanking) wall junction – steel or timber frame inner leaf
	2	External (flanking) wall junction – masonry inner leaf
	3	Separating wall junction
	4	Ceiling treatments for E-FC-1
	5	Floating floor treatments for E-FC-1
	6	Services – Service pipes through separating floor

A.3.2 Timber separating floors

E-FT-1: Timber I-joists	1	External (flanking) wall junction
	2	Separating wall junction
	3	Internal wall junction (non load bearing)
	4	Internal wall junction (load bearing)
	5	Ceiling treatments for E-FT-1
	6	Floating floor treatments for E-FT-1
	7	Services – Service pipes through separating floor

A.3.3 Steel separating floors

E-FS-1: In-situ concrete slab supported by profile metal deck	1	External (flanking) wall junction – steel or timber frame inner leaf
	2	External (flanking) wall junction – masonry inner leaf
	3	Ceiling treatments for E-FS-1
	4	Floating floor treatments for E-FS-1
	5	Services – Service pipes through separating floor

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