PART E

Sound

APPROVED DOCUMENT

This publication includes the following Approved Document:
E1/2/3  Airborne and impact sound  1

This document has been approved by the Secretary of State as practical guidance to meeting the requirements of the above Paragraphs in Schedule 1 to the Regulations, but there is no obligation to adopt any particular solution in the documents if you prefer to meet the requirement in some other way.

If a contravention of a requirement is alleged then, if you have followed the guidance in the document, that will be evidence tending to show that you have complied with the Regulations. If you have not followed the guidance then that will be evidence tending to show that you have not complied. It will then be up to you to demonstrate by other means that you have satisfied the requirement.

Other requirements

The guidance relates only to the Requirement given at the start of each document. The building work will also have to comply with the requirements of any other relevant paragraphs in Schedules 1 and 2 to the Regulations. Other Approved Documents give guidance on the other requirements in Schedule 1.

Materials and Workmanship

Any building work to which a requirement of the regulations applies must, in accordance with Regulation 7, be carried out with proper materials and in a workmanlike manner. You may show that you have complied with this requirement in a number of ways, for example by following an appropriate British Standard or British Board of Agrément Certificate. You will find further guidance in the Approved Document on Materials and Workmanship.

British Standards and British Board of Agrément Certificates

When a document makes reference to a named British Standard, the relevant version of the Standard is the one listed at the end of the publication.

Building Regulations are made for specific purposes; health and safety, energy conservation and the welfare and convenience of disabled people. British Standards and Agrément Certificates are relevant guidance to the extent that they relate to these considerations. The Standards and Certificates themselves may address, also, other aspects of performance such as serviceability or aspects which although they relate to health and safety are ones which are not covered by the regulations.

The Secretary of State has agreed with the British Board of Agrément the aspects of performance which they need to assess in preparing their Certificates in order that the Board may demonstrate the compliance of a product or system, which has an Agrément Certificate, with the requirements of the regulations. An Agrément Certificate issued by the Board under these arrangements will give assurance that a product or system to which the Certificate relates, if properly used in accordance with terms of the Certificate, will meet the relevant requirements.
This Approved Document deals with the following Requirements from PART E of Schedule 1 to the Building Regulations 1985:

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<td><strong>Airborne sound (walls)</strong></td>
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| Walls. E1. (1) A wall which—  
  (a) separates a dwelling from another building or from another dwelling; or  
  (b) separates a habitable room within a dwelling from another part of the same building which is not used exclusively with the dwelling, shall have reasonable resistance to airborne sound.  
(2) In this paragraph “habitable room” means a room used for dwelling purposes but not a kitchen or scullery. | This requirement does not apply to a wall falling within the description in paragraph (b) which separates a habitable room within a dwelling from another part of the same building if that part is used only for the inspection, maintenance or repair of the building, its services or fixed plant or machinery. |
| **Airborne sound (floors)** | |
| Floors. E2. A floor which separates a dwelling from another dwelling, or from another part of the same building which is not used exclusively with the dwelling, shall have reasonable resistance to airborne sound. | This requirement does not apply to a floor which separates a dwelling from another part of the same building if that part is used only for the inspection, maintenance or repair of the building, its services or fixed plant or machinery. |
| **Impact sound (floors)** | |
| Floors. E3. A floor above a dwelling which separates it from another dwelling, or from another part of the same building which is not used exclusively with the dwelling, shall have reasonable resistance to impact sound. | This requirement does not apply to a floor which separates a dwelling from another part of the same building if that part is used only for the inspection, maintenance or repair of the building, its services or fixed plant or machinery. |
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0.1 This document describes two ways of meeting the requirements. The first and simplest is to follow one of the examples of more widely used constructions described in Section 1 (Walls) or Section 2 (Floors).

The second way is to repeat a construction which has been used in a similar building and shown by tests to give acceptable results. This is described in Section 3.

INTRODUCTION TO PROVISIONS

0.2 Two types of source produce the sounds which are heard in a neighbouring dwelling – airborne sources such as speech, musical instruments and loudspeakers and impact sources such as footsteps and the moving of furniture.

0.3 An airborne source sets up vibrations in the surrounding air which spread out and, in turn, set up vibrations in the enclosing walls and floors (called elements). An impact source sets up vibrations directly in the element it strikes. These vibrations spread out over the whole area of the element and into elements connected to it, such as internal walls, the inner leaves of external walls and floors. The vibrations in the elements force the air beside them to vibrate and it is these new airborne vibrations that are heard.

0.4 To achieve adequate sound insulation, the flow of sound energy through walls and floors should be restricted. The flow of energy may be by direct transmission or by flanking (indirect) transmission.

Direct transmission

0.5 Direct transmission means the transmission of sound directly through a wall or floor from one of its sides to the other.

0.6 Walls should reduce the level of airborne sound. The solid masonry wall (Type 1) depends on its weight – being heavy it is not easily set into vibration. The walls with two or three leaves depend partly on their weight and partly on structural isolation between the leaves. Timber framed walls (Type 4) generally provide the most isolation and they can be much lighter than masonry walls.

0.7 With masonry walls the weight per square metre is the main factor but stiffness and damping (which turns sound energy into heat) are also important. Consequently walls of the same type but made from materials with different mechanical properties may need different weights to give the same insulation. Cavity masonry walls (Type 2) need at least as much weight as solid walls because their lower stiffness offsets the benefit of isolation.

0.8 Floors should reduce airborne sound and also, if they are above a dwelling, impact sound. The heavy solid floor (Type 1) depends on its weight to reduce airborne sound and on the soft covering to reduce impact sound at source. The floating floor contains a layer of highly porous spongy (resilient) material which largely isolates the walking surface from the base and this isolation contributes to both airborne and impact insulation. The resilient layer is only effective if it is not too stiff and so it is important to choose a suitable material and to make sure that it is not bypassed with rigid bridges such as fixings and pipes.

0.9 Air paths must be avoided – porous materials and gaps at joints in the structure must be sealed. Resonances must also be avoided – these may occur if some part of the structure (such as a dry lining) vibrates strongly at a particular sound frequency (pitch) and transmits more energy at this pitch.

Flanking transmission

0.10 Flanking transmission means the indirect transmission of sound from one side of a wall or floor to the other side.

0.11 Because solid elements vibrate when they are exposed to sound waves in the air they may cause sound waves in the air on both sides. Flanking transmission happens when there is a path along which sound can travel between elements on opposite sides of a wall or floor. This path may be through a continuous solid structure or through an air space (such as the cavity of an external wall). Usually paths through structure are more important with solid masonry elements and paths through an air space are more important with thin panels (such as studwork and ceilings) in which structural waves do not travel as freely.

0.12 The junction of a sound resisting element and a flanking element provides resistance to structural waves, but it may not be enough unless the flanking element is heavy or is divided by windows or similar openings into small sections which do not vibrate freely. Usually a minimum weight is also needed for thin panels connected by paths through air spaces (such as ceilings connected by air in roof spaces and over the ridge of the separating wall). The weight which is needed will be less if the path is blocked by non-porous material.

Special factors

0.13 In addition to the details of the construction, sound insulation is also affected by the presence of steps or staggered between neighbouring
dwellings, which can improve the performance, and by the layout of the rooms. Because these factors are important, care must be taken to take them into account when considering similar constructions (see Section 3).

0.14 Sound insulation may be reduced by careless detailing, careless workmanship and the use of unsuitable materials.

Section 1
Walls

1.1 Diagram 1 shows which walls of dwellings should be sound resisting.

Diagram 1  Sound resisting walls

Sound resisting wall (airborne sound only)

Dwelling

another dwelling
another building

Habitable room

another part of the same building which is not part of the dwelling
machinery room or tank room
place for any other purpose except if only used occasionally
for maintenance or repair

Habitable room

refuse chute
in same building
(see paragraph 1.4)

Non-habitable room

refuse chute
in same building
(see paragraph 1.4)
TYPES OF WALL

1.2 This Section describes some of the more widely used wall constructions. They are grouped into four main types, as shown in Diagram 2:

Type 1
**Solid masonry wall** — The resistance to airborne sound depends mainly on the weight of the wall.

Type 2
**Cavity masonry wall** — The resistance to airborne sound depends mainly on the weight of the leaves and the degree of isolation provided.

Type 3
**Solid masonry core with freestanding lightweight panels** — The resistance to airborne sound depends partly on the weight of the masonry core and partly on the panels and air spaces.

Type 4
**Timber frame with absorbent curtain** — The resistance to airborne sound depends mainly on the two isolated leaves and also on the absorption of sound in the air space.

1.3 For each type a selection of specifications for the wall itself is given and features identified, to which special attention should be paid if the sound resistance is not to be greatly reduced. The page opposite the specifications shows where the junctions between the wall and other parts of the construction are important and details some of the ways in which these junctions can be made.

REFUSE CHUTES

1.4 A wall separating a habitable room and a refuse chute should have a weight (including any plaster finishes) of at least 1320kg/m². A wall separating a non-habitable room which is in a dwelling from a refuse chute should have a weight (including any plaster finishes) of at least 220kg/m².

WEIGHT OF MASONRY WALLS

1.5 The weight of a wall is expressed in kilograms per square metre [kg/m²].

1.6 The density of the materials used (and on which the weight of the wall depends) is expressed in kilograms per cubic metre [kg/m³].

1.7 The density of a particular material may be taken from a current Agrement Certificate or from the manufacturer. In the latter case the building control authority may ask for confirmation.
Wall type 1  Solid masonry

The resistance to airborne sound depends mainly on the weight of the wall.

Points to watch
Fill the joints between the bricks or blocks with mortar, and seal the joints between the wall and the other parts of the construction (to achieve the weight and to avoid air paths).
Limit the pathways between walls and opposite sides of the sound resisting wall (to reduce flanking transmission).

Specifications
Specifications for four common types of walls which will give suitable insulation against direct sound transmission are given opposite.
Constructional details showing how to limit flanking transmission between elements on opposite sides of the wall are given on the opposite page.

### Wall specifications

#### A Brickwork plastered on both faces
- The weight of the wall (including the plaster) should be at least $375\text{kg/m}^2$
- The thickness of the plaster should be at least $12.5\text{mm}$ on each face
- Lay the bricks with the frogs upwards and in a bond which includes headers

#### B Brickwork with plasterboard on both faces
- The weight of the wall (including the plasterboard) should be at least $355\text{kg/m}^2$
- The weight of the masonry alone should be at least $355\text{kg/m}^2$
- The thickness of the plasterboard should be at least $12.5\text{mm}$ on each face
- Lay the bricks with the frogs upwards and in a bond which includes headers
- Do not plaster the brickwork (to avoid drumming)

#### C Concrete blockwork plastered on both faces
- The weight of the wall (including the plaster) should be at least $415\text{kg/m}^2$
- The thickness of the plaster should be at least $12.5\text{mm}$ on each face
- Use blocks which extend to the full thickness of the wall

#### D Dense concrete (in-situ or large panels)
- The weight of the wall (including plaster if used) should be at least $415\text{kg/m}^2$
- Fill joints between panels with mortar

**Note**
Examples of wall constructions meeting most needs are given in Appendix A.
Key junctions in the construction

Roof space
- Fill the joint between wall and roof—the means provided for firestopping will normally do.
- Above the ceiling level the weight of the wall may be reduced to not less than 150kg/m². If lightweight blocks are used to reduce the weight of the wall, then one side of the wall should be sealed with cement paint or plaster skim.

Ceiling
- The ceiling should be at least 12.5mm plasterboard or a material with at least the same weight.

Sound resisting wall
- Where a timber floor construction is used: fix the joists which are at a right angle to the wall with a joist hanger.
- Note: there are no restrictions on the timber floor construction nor on the ceiling material.

Intermediate floor
- Where a concrete floor construction of Type 1 or Type 2 (see Section 2) is used then either the wall or the floor may be carried through.

Ground floor
- There are no restrictions where the wall joins the ground floor or on the type of ground floor used.

External wall
- There should be at least 650mm between openings in the external wall unless it is a cavity wall and the cavity is closed.

If the external wall is of cavity construction, there are no restrictions on a masonry outside leaf (to either a masonry or a timber framed inner leaf).

Masonry external wall
- A masonry external wall (either a solid wall or the inner leaf of a cavity wall) should be either bonded to the sound resisting wall or butted to it and secured with wall ties (or similar) spaced not more than 300mm apart vertically.
- If the weight of the external wall is less than 120kg/m², the openings (on each floor) should be at least 1m high and not more than 700mm from the face of the sound resisting wall.

Timber frame external wall
- A timber frame external wall (either a timber frame wall or an inner leaf of timber construction) should be butted tight against the sound resisting wall and secured to it with suitable ties spaced not more than 300mm apart vertically.
- The joint between the lining to the external wall and the sound resisting wall should be sealed with mastic or tape.

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Airborne and impact sound
Wall type 2  Cavity masonry

Wall specifications

A  Two leaves of brickwork plastered on the room faces
   - the width of the cavity should be at least 50mm
   - the weight of the wall (including the plaster) should be at least 415kg/m²
   - the thickness of the plaster should be at least 12.5mm on each face
   lay the bricks with the frogs upwards

B  Two leaves of concrete blockwork plastered on the room faces
   - the width of the cavity should be at least 50mm
   - the weight of the wall (including the plaster) should be at least 415kg/m²
   - the thickness of the plaster should be at least 12.5mm on each face

C  Two leaves of lightweight concrete blockwork plastered or dry-lined on room faces
   - the width of the cavity should be at least 75mm
   - the weight of the wall (including the plaster or dry lining) should be at least 250kg/m²
   - the thickness of the plaster should be at least 12.5mm on each face
   seal the face of the blockwork with cement point through the full width and depth of an intermediate floor

Points to watch

Fill the joints between the bricks or blocks with mortar, and seal the joints between the wall and the other parts of the construction (to achieve the weight and to avoid air paths).
Maintain the separation of the leaves and space them at least 50mm apart. Connect the leaves with butterfly pattern wall ties spaced at least 900mm apart horizontally and at least 450mm apart vertically.

Specifications

Specifications for three common types of wall are shown at A, B and C opposite.
Constructional details showing how to limit flanking transmission are given on the opposite page.

Stepped and/or staggered dwellings

The stepping and/or staggering of a wall can improve the resistance to sound. Specification D may be used with stepped and staggered dwellings.
Note: that if a cavity in an external wall is completely filled with an insulating material other than loose fibre, care should be taken that the insulating material does not enter the cavity in the separating wall.

Additional specification to be used in step and stagger situations only

D  Two leaves of brickwork plastered on the room faces
   - the width of the cavity should be at least 50mm
   - the weight of the wall (including the plaster) should be at least 355kg/m²
   - the thickness of the plaster should be at least 12.5mm on each face
   lay the bricks with the frogs upwards

Note:
Examples of wall constructions meeting most needs are given in Appendix A.

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### Key junctions in the construction

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
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<td><strong>Roof space</strong></td>
<td>fill the joint between wall and roof – the means provided for firestopping will normally do above the ceiling level the weight of the wall may be reduced to not less than 150kg/m². If lightweight blocks are used to reduce the weight of the wall then one side of the wall should be sealed with cement paint or plaster skin.</td>
</tr>
<tr>
<td><strong>Ceiling</strong></td>
<td>the ceiling should be at least 12.5mm plasterboard or a material with at least the same weight.</td>
</tr>
<tr>
<td><strong>Sound resisting wall</strong></td>
<td>where a timber floor construction is used, fix the joists which are at a right angle to the wall with a joist hanger.</td>
</tr>
<tr>
<td><strong>Intermediate floor</strong></td>
<td>there are no restrictions on the timber floor construction nor on the ceiling material.</td>
</tr>
<tr>
<td><strong>Ground floor</strong></td>
<td>where a concrete floor construction of Type 1 or Type 2 (see Section 2) is used the floor should be carried through to the cavity face of the wall leaf.</td>
</tr>
<tr>
<td><strong>External wall</strong></td>
<td>there are no restrictions where the wall joins the ground floor or on the type of ground floor used.</td>
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</table>

**Masonry external wall**

A masonry external wall (either a solid wall or the inner leaf of a cavity wall) should be either bonded to the Sound Resisting wall or butted to it and secured with wall ties (or similar) spaced not more than 300mm apart vertically.

Unless the wall is specification Type B, the weight of the inner leaf of the external wall should be at least 120kg/m².

**Timber frame external wall**

A timber frame external wall (whether a timber frame wall or an inner leaf of timber construction) should be butted tightly against the sound resisting wall and secured to it with suitable ties spaced not more than 300mm apart vertically.

The joint between the lining to the external wall and the sound resisting wall should be sealed with mastic or tape.

If the external wall is a cavity wall, block the air path in the cavity (to minimise the transmission of sound).
Wall type 3 Masonry (with lightweight panels)

The resistance to airborne sound depends partly on the weight of the masonry core and partly on the use of panels and air spaces.

This type should only be used with a concrete ground floor (to prevent air paths).

**Points to watch**

Fill the joints between the bricks or blocks with mortar (to achieve the weight and avoid air paths).

Support the lightweight panels only from floor and ceiling—do not tie or fix them to the masonry core (to maintain isolation).

**Specifications**

Specifications for four common types of masonry core construction and two types of lightweight panel are given opposite.

Construction details showing how to limit flanking transmission are given on the opposite page.

Examples of wall masonry core constructions meeting most needs are given in Appendix A.

**Masonry core specifications**

| A Brickwork | the weight of the masonry should be at least 300kg/m² | lay the bricks with the frogs upwards |
| B Concrete blockwork (block density at least 1500kg/m³) | the weight of the masonry should be at least 300kg/m² |
| C Concrete blockwork (block density less than 1500kg/m³) | the weight of the masonry should be at least 200kg/m² |
| D Autoclaved aerated concrete blockwork | the weight of the masonry should be at least 160kg/m² |

**Panel specifications**

| E Two sheets of plasterboard joined by a cellular core | the weight of the panel (including plaster finish if used) should be at least 18kg/m² | tape the joints between the panels (to avoid air paths) |
| F Two sheets of plasterboard (with or without a supporting framework) | the thickness of each sheet should be at least 12.5mm or if bonded together without a supporting framework, the overall thickness should be at least 30mm | stagger the joints between the sheets (to avoid air paths) |

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Key junctions in the construction

Roof space
- Fill the joint between wall and roof—the means provided for firestopping will normally do.
- Above the ceiling level the weight of the wall may be reduced to not less than 150kg/m². If lightweight blocks are used to reduce the weight of the wall then one side of the wall should be sealed with cement paint or plaster skim.

Ceiling
- The ceiling should be at least 12.5mm plasterboard or a material with at least the same weight.
- Seal the gap between ceiling and masonry core with a timber batten, and the gap between ceiling and lightweight panels with mastic, tape, or a cove.

Intermediate floor
- Fix timber joists which are at a right angle to the masonry core with a joist hanger, and seal the space between the joists with a timber batten.
- Seal the gap between the ceiling and the lightweight panel with mastic, tape or a cove.

Sound resisting wall
- This type of wall construction should only be used with a concrete floor.
- There should be at least 650mm between openings in the external wall unless it is a cavity wall and the cavity is closed.

External wall
- Lightweight panels at the external wall should be one of the specified types and not fixed to the external wall.
- Seal the joint between the panels with mastic or tape.

Loadbearing partition
- Fix the partition to the masonry core through a continuous padding of mineral fibre quilt. Seal the joint between the partition and the panels with mastic or tape.

Non-loadbearing partition
- Tight butt the partition to the lightweight panel, and seal the joint with mastic or tape.

Note: Neither type of partition should be of masonry construction.
Wall type 4  Timber frame

The resistance to airborne sound depends mainly on the use of two isolated frames and also on the absorption of sound in the air space.

Points to watch
If the two frames need to be connected together use 14–16 gauge metal straps fixed below ceiling level and spaced at least 1.2m apart horizontally.
Services penetrating the cladding create possible air paths and, generally, should be avoided. Power points may be set in the cladding provided that there is a similar thickness of cladding behind the socket box. Power points should not be placed back to back across the wall.

Specifications
Specifications for two types of cladding and the absorbent curtain are given opposite.
Construction details showing how to limit flanking transmission are given on the opposite page.
Where fire stops are needed they should either be flexible or if rigid fixed only to one frame.

Basic construction – 1
- Cladding as specified below
- The absorbent curtain should be as specified below, and positioned as described

Basic construction – 2
- Brickwork or blockwork wall

Cladding specification
- At least two sheets of plasterboard with or without plywood sheathing
- The combined thickness of the sheets should be at least 30mm
- Stagger the joints between the sheets (to avoid air paths)

Absorbent curtain specification
- Unfaced mineral fibre quilt (which may be wire-reinforced)
- The quilt should have a density of at least 12kg/m²
- The thickness should be at least 25mm if the curtain is suspended in the cavity between the two frames, or at least 50mm if it is fixed to one of the frames
## Key junctions in the construction

### Roof space
- Between the ceiling level and the underside of the roof finish, either:
  1. Carry both frames through, when the cladding on each frame may be reduced to not less than 25mm, or
  2. Close the cavity at ceiling level without connecting the two frames rigidly together, and use one frame with at least 25mm cladding on both sides.
- In each case seal the space between frame and roof finish — the means provided for firestopping will normally do.

### Ceiling
- The ceiling should be at least 12.5mm plasterboard, or a material with at least the same weight.

### Sound resisting wall

### Intermediate floor

### Ground floor

### External wall
- There are no restrictions on the external cladding to a timber frame wall leaf.
- If a masonry veneer wall is used, there is no restriction on the material to be used but fill the space between the end of the wall frames and the masonry veneer so as to seal air gaps.
- Line the timber frame with at least 12.5mm plasterboard, or a material with at least the same weight.
- If the external wall is a cavity wall, block the air path in the cavity (to minimise the transmission of sound).

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Airborne and impact sound
Section 2
Floors

2.1 Diagram 3 shows which floors of dwellings should be sound resisting and whether they should resist airborne sound only or airborne and impact sound.

<table>
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<th>Diagram 3</th>
<th>Sound resisting floors</th>
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<tbody>
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<td>●●●●●</td>
<td>Sound resisting floor</td>
</tr>
<tr>
<td>floor to resist airborne sound only</td>
<td>Dwelling above</td>
</tr>
<tr>
<td>another part of the same building which is not part of the dwelling above machinery room or tank room place for any other purpose except if only used occasionally for maintenance or repair</td>
<td></td>
</tr>
<tr>
<td>floor to resist both airborne and impact sound</td>
<td>another dwelling</td>
</tr>
<tr>
<td>another part of the same building which is not part of the dwelling below machinery room or tank room place for any other purpose except if only used occasionally for maintenance or repair</td>
<td></td>
</tr>
<tr>
<td>Dwelling below</td>
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</table>
TYPES OF FLOOR

2.2 This section describes some of the more widely used floor constructions. They are grouped into three main types, as shown in Diagram 4:

**Type 1**
Concrete base with a soft covering — The resistance to airborne sound depends on the weight of the concrete base. The soft covering reduces the impact sound at source.

**Type 2**
Concrete base with a floating layer — The resistance to airborne sound depends mainly on the weight of the concrete base and partly on the weight of the floating layer.
The floating layer also reduces the transmission of impact sound to the base and to the surrounding construction.

**Type 3**
Timber base with a floating layer — The resistance to airborne sound depends partly on the weight of the base with its pugging or absorbent blanket and partly on the weight of the floating layer.
The floating layer also reduces the transmission of impact sound to the base and to the surrounding construction.
A timber floor needs less weight than a concrete floor because the material is softer and radiates sound less efficiently.

2.3 For each type, a selection of specifications for the floor base and for the floating layer is given. Also identified are features to which special attention should be paid if the resistance is not to be greatly reduced.
The page facing the specifications shows where the junctions between the floor and the other parts of the construction are important and details how these junctions can be made.

WEIGHT OF CONCRETE FLOORS

2.4 The weight of a concrete floor is expressed in kilograms per square metre [kg/m²].

2.5 The density of the materials used (and on which the weight of the wall depends) is expressed in kilograms per cubic metre [kg/m³]. The density of a particular material may be taken from a current Agrément Certificate or from the manufacturer. In the latter case the building control authority may ask for confirmation.
Floor type 1 Concrete base (with soft covering)

Floor base specifications

A Solid concrete slab (in situ)
- floor screed if used

B Solid concrete slab with permanent shuttering
- floor screed if used

C Concrete beams with infilling blocks
- floor screed
- ceiling finish if used
- the weight of the base (including any floor screed and any ceiling finish bonded to the concrete) should be at least 365kg/m²
- fill all joints between beams and blocks

D Hollow concrete beams
- floor screed
- ceiling finish if used
- the weight of the base (including the shuttering if it is solid concrete or metal, any floor screed, and any ceiling finish bonded to the shuttering) should be at least 365kg/m²
- fill all joints between the beams

Points to watch
Limit the pathways between elements on opposite sides of the sound resisting floor (to avoid flanking transmission)

Soft covering specification
resilient material or a material with a resilient base
the thickness of the material (including any backing) should be at least 4.5mm
a material is resilient if it returns to its original thickness after it has been compressed
Key junctions in the construction

External wall all types of floor base

- If the area of the openings is 20 per cent or less of the external wall area, the weight of the external wall (or inner leaf of cavity wall) should be at least 120kg/m² (including any plaster but not dry lining).
- If the area of the openings is more than 20 per cent, there are no requirements.

Junction of floor with external wall or cavity separating wall

- If the floor base is Type C or D the first joint should be at least 300mm from the face of the wall.
- Where the floor meets an external wall or a cavity separating wall, pass the floor base through (but not the screed) whether it spans parallel with or at right angles to the wall.

Junction of floor with sound resisting or internal solid wall

- If the wall is a sound resisting or internal solid wall, weighing less than 355kg/m², (including any plaster finishes) pass the floor base through (but not the screed).
- If the wall is a sound resisting or internal solid wall, weighing 355kg/m² or more, (including any plaster finishes) either the wall or the floor base (but not the screed) may pass through. If the wall is passed through, tie the floor base to the wall and grout the joint.

Pipe penetrating floor

- Wrap the full height of the pipe and any branches in the duct with at least 25mm mineral fibre.
- Case the duct with a board material weighing at least 15kg/m².

Note
Appendix B gives examples of wall constructions meeting the wall weights specified above.
The resistance to airborne sound depends mainly on the weight of the concrete base and partly on the weight of the floating layer. The floating layer also reduces the transmission of impact sound to the base and to the surrounding construction. The weight of the floor should be calculated from the weights of the components and materials being used. Any of the bases can be combined with either of the resilient layers and either of the floating layers.

**Points to watch**

Limit the pathways between elements on opposite sides of the floor (to avoid flanking transmission).

---

**Floor base specifications**

**A Solid concrete slab (in situ)**
- floor screed if used
- ceiling finish if used
- the weight of the base (including floor screed and ceiling finish if bonded to the concrete) should be at least 220kg/m²

**B Solid concrete slab with permanent shuttering**
- floor screed if used
- ceiling finish if used
- the weight of the base (including the shuttering if it is solid concrete or metal, floor screed and ceiling finish if bonded to the concrete) should be at least 220kg/m²

**C Concrete beams with infilling blocks**
- floor screed if used
- ceiling finish if used
- the weight of the base (including the blocks if they are clay or concrete, floor screed, and any ceiling finish bonded to the beams or blocks) should be at least 220kg/m²
- fill all the joints between beams and blocks

**D Hollow concrete beams**
- floor screed if used
- ceiling finish if used
- the weight of the base (including floor screed and ceiling finish if bonded to the beams) should be at least 220kg/m²
- fill all joints between the beams

---

**Floating floor specifications**

**E Timber raft**
- timber boarding or wood-based board
- timber batten
- the boarding or boards should be at least 18mm thick
- fix the boards to the battens so that the nails do not go through the batten (to maintain isolation)
- use tongued and grooved boards (to avoid air paths)

**F Screed**
- reinforcement
- the screed should be at least 65mm thick if it is cement/sand; or 40mm thick if it is synthetic anhydride
- prevent the screed entering the resilient layer by laying it over a sheet of building paper or over a resilient layer which is faced with building paper
- control cracking in the screed with 20–50mm wire mesh reinforcement (to avoid air paths)

---

**Resilient layer specifications**

**G Flexible material**
- mineral fibre with a thickness of at least 13mm and a density of at least 30kg/m³
- lay with rolls tightly butted (to avoid air paths)

**H Board material (only for floor specification F)**
- pre-compressed expanded polystyrene (impact sound duty grade)
- lay boards tightly butted (to avoid air paths)
Key junctions in the construction

External wall all types of floor base

If the area of the openings is 20 per cent or less of the external wall area, the weight of the external wall (or inner leaf of cavity wall) should be at least 120kg/m² (including any plaster but not dry lining)

If the area of the openings is more than 20 per cent, there are no requirements

Junction of floor with external wall or cavity separating wall

If the floor base is Type C or D the first joint should be at least 300mm from the face of the wall

The finish to the wall may be plaster or dry lining

Carry the resilient layer up against the wall to isolate the floating floor

Leave at least 3mm gap between floating floor and skirting where the floor meets an external wall or a cavity sound resisting wall pass the floor base through (but not the screed) whether it spans parallel with or at right angles to the wall

Junction of floor with sound resisting or internal solid wall

If the wall is a sound resisting or internal solid wall weighing less than 355kg/m², pass the floor base through (but not the screed)

If the wall is a sound resisting or internal solid wall weighing 355kg/m² or more, either the wall or the floor base (but not the screed) may pass through.

If the wall is passed through, tie the floor base to the wall and grout the joint

Pipe penetrating floor

Wrap the full height of the pipe and any branches in the duct with at least 25mm mineral fibre

Leave at least 3mm gap between floating floor and skirting, and seal gap with acrylic caulk or neoprene

Case the duct with a board material weighing at least 15kg/m²

Whatever the weight of the wall, pass the floor base through

Note
Appendix B gives examples of wall constructions meeting the wall weights specified above.
Floor type 3  Timber base (with floating layer)

This type of floor is similar in concept to Floor Type 2, but the construction is entirely of timber.

Timber floors need less weight than concrete floors because the materials used radiate sound less efficiently.

The reduction of airborne sound depends partly on the structural floor and the absorbent blanket or pugging, and partly on the floating layer which reduces the transmission of impact sound to the floor and the surrounding construction.

Points to watch
Limit the pathways between elements on opposite sides of the sound resisting floor (to avoid flanking transmission).

Floor specifications

A  Platform floor with absorbent blanket

<table>
<thead>
<tr>
<th>floating layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>resilient layer</td>
</tr>
<tr>
<td>floor base</td>
</tr>
</tbody>
</table>

absorbent blanket

floating layer of at least 18mm thick timber or wood-based board on substrate of at least 19mm thick plasterboard, or material with at least the same weight, on

resilient layer of at least 25mm thick mineral fibre having a density between 60–80kg/m², on

floor base of at least 12mm thick timber or wood-based board deck nailed to timber joists with ceiling of at least 50mm plasterboard in two layers with joints staggered and with

an absorbent blanket of at least 100mm thick mineral fibre having a density of not less than 12kg/m² laid on the ceiling

B  Ribbed floor with absorbent blanket

<table>
<thead>
<tr>
<th>floating layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>resilient strip</td>
</tr>
<tr>
<td>floor base</td>
</tr>
</tbody>
</table>

absorbent blanket

floating layer of at least 18mm thick timber or wood-based board (with joints glued) on substrate of at least 19mm thick plasterboard or material with at least the same weight nailed to timber battens at least 50mm (nominal) wide, on

resilient strip of at least 25mm thick mineral fibre having a density between 90–140kg/m², on

floor base of timber joists at least 50mm (nominal) wide with ceiling of at least 30mm plasterboard in two layers with joints staggered, and with

an absorbent blanket of at least 100mm thick mineral fibre having a density of not less than 12kg/m² laid on the ceiling

Note
Take care that the nails fixing the timber of wood-based board layer do not go through the timber battens and pierce the resilient strip

C  Ribbed floor with heavy pugging

<table>
<thead>
<tr>
<th>floating layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>resilient strip</td>
</tr>
<tr>
<td>floor base</td>
</tr>
</tbody>
</table>

pugging

plastic sheet

floating layer of at least 18mm thick timber or wood-based board (with joints glued) nailed to timber battens at least 50mm (nominal) wide, on

resilient strip of at least 25mm thick mineral fibre having a density between 70–140 kg/m², on

floor base of timber joists at least 50mm (nominal) wide with ceiling of at least 19mm of dense plaster on expanded metal, and with

pugging of dry sand or fine gravel with a weight at least 80kg/m² laid on the ceiling
Key junctions in the construction

**Junction of floor with timber frame external wall or sound resisting wall**

- **timber frame wall**
- **seal the gap between wall and floating layer with mineral fibre or plastic foam strip glued to the wall**
- **leave at least 3mm gap between skirting and floating layer**
- **at the junction of floor with wall use any construction which will block air paths between floor and wall cavities when the floor joists are at a right angle to the wall the spaces between the joists should be blocked with timber spacers**
- **floor**
- **seal the junction of the ceiling and the wall lining with tape**

**Junction of floor with heavy solid masonry (weight 360kg/m² or more) external, internal or separating wall**

- **heavy masonry wall**
- **the wall finish may be plaster or dry lining**
- **seal the gap between wall and floating layer with mineral fibre or plastic foam strip**
- **leave at least 3mm gap between skirting and floating layer**
- **use any method of connecting floor to the wall**
- **floor**
- **seal junction of ceiling and wall lining with tape**

**Junction of floor with light solid masonry (weight less than 360kg/m²) external, internal or sound resisting wall**

- **light masonry wall**
- **lightweight wall weighing at least 20kg/m² either cellular core with both sides plasterboard or plasterboard on frame fixed only at top and bottom at least 25mm from the masonry wall**
- **place absorbent curtain of at least 25mm mineral fibre with density of not less than 12kg/m³ between masonry and lightweight walls**
- **seal the gap between wall and floating layer with mineral fibre or plastic foam strip glued to the lightweight wall**
- **leave at least 3mm gap between skirting and floating layer and seal gap with acrylic caulking or neoprene**
- **use any method of connecting floor to the wall which will block air paths between floor and wall cavities**
- **floor**
- **lightweight wall**
- **absorbent curtain**
- **light masonry wall**
- **seal the junction of the ceiling and the wall lining with tape**

**Pipe penetrating floor**

- **wrap the full height of the pipe and any branches in the duct with at least 25mm mineral fibre**
- **case the duct with a board material weighing at least 15kg/m²**
- **leave at least 3mm gap between skirting and floating layer (or, alternatively, the floor base if the floor is Type A), and seal gap with acrylic caulking or neoprene**
- **floor**
- **casing**
- **seal junction of ceiling and duct casing, for example with tape**

**Note**

Appendix B gives examples of wall constructions meeting the wall weights specified.
Section 3
Similar construction

3.1 This Section describes ways of meeting the requirements by repeating a construction which has already been built.

3.2 It will be necessary to show that the performance of the existing wall or floor is acceptable and that the existing and proposed design have sufficiently similar features.

PERFORMANCE OF THE EXISTING CONSTRUCTION

3.3 The performance of the existing wall or floor will be acceptable if the values given in Table 1 are achieved when the following test programme is carried out:

(a) test each wall or floor between at least four pairs of rooms. Each pair should include at least one habitable room, and

(b) take only one set of measurements between the rooms in each pair, and

(c) if both rooms in a pair are habitable rooms and one is larger, the sound source should be put in that room, and

(d) if one room in a pair is a non-habitable room the sound source should be put in that room, and

(e) carry out the tests in accordance with the method given in BS 2750 Methods of measurement of sound insulation in buildings and of building elements, Part 4: 1980 Field measurements of airborne sound insulation between rooms and Part 7: 1980 Field measurements of impact sound insulation of floors and determine the Standardised Level Differences $D_{T}$ for airborne sound transmission and Standardised Impact Sound Pressure Levels $L'_{IT}$ for impact sound transmission, and

(f) calculate the Weighted Standardised Level Difference $D_{T,w}$ for airborne sound and the Weighted Standardised Sound Pressure Level $L'_{IT,w}$ for impact sound as defined in BS 5821: British Standard Method for rating the sound insulation in buildings and of building elements, Part 1: 1984 Method for rating the airborne sound insulation in buildings and of building elements, Part 2: 1984 Method for rating the impact sound insulation.

3.4 Table 1 gives the sound transmission values which should be achieved.

SIMILAR FEATURES

3.5 The sound insulation between walls on either side of a sound resisting wall or floor depends not only on the wall or floor specification but also on other factors, including the size and shape of the rooms. For buildings made from masonry, the positions of doors and windows may also be important in reducing flanking transmission.

3.6 For walls and floors, the following features in the proposed building should be similar to those in the existing building, but they do not need to be identical:

(a) the specification of the sound resisting walls and floors,

(b) the construction of other walls and floors adjacent to the sound resisting walls and floors,

(c) the general arrangement of windows and doors adjacent to the sound resisting wall or floor when in an external wall with a masonry inner leaf,

(d) the general shape and size of the rooms adjacent to the sound resisting wall.

3.7 For walls only, the extent of any step or stagger should be similar to that in the existing building. Where there is none in the existing building one may be provided in the new building.

---

Table 1  Sound transmission values

<table>
<thead>
<tr>
<th>Type of performance</th>
<th>Individual values</th>
<th>Test in at least 4 pairs of rooms</th>
<th>Test in at least 8 pairs of rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airborne sound (minimum values)*</td>
<td>49 (walls)</td>
<td>53 (walls)</td>
<td>52 (walls)</td>
</tr>
<tr>
<td></td>
<td>48 (floors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact sound (maximum values)**</td>
<td>65</td>
<td>61</td>
<td>62</td>
</tr>
</tbody>
</table>

Notes

* Airborne sound – Weighted Standardised Level Difference ($D_{T,w}$)

** Impact sound – Weighted Standardised Sound Pressure Level ($L'_{IT,w}$)
ALLOWABLE DIFFERENCES

3.8 For walls and floors, the differences in the following can be allowed when considering paragraph 3.6:

(a) the construction of the outer leaf of a masonry cavity wall, and
(b) the construction of the inner leaf of a masonry cavity wall provided that the construction is of the same general type and that the weight of the inner leaf is not reduced.

3.9 For walls only, differences in the following can be allowed:

(a) the material and thickness of the flooring of a floor with a concrete base and a floating layer (Type 2) or a timber floor (Type 3), and
(b) a small reduction in the size of step or stagger between dwellings in the proposed dwelling may be acceptable and an increase will be beneficial, and
(c) the type of timber floor where it is not a sound resisting floor.

LIMITS ON THE USE OF TEST EVIDENCE

3.10 The test procedure is intended to enable satisfactory evidence to be provided by a person intending to use the method of similar construction, and the values in Table 1 are provided to enable an existing construction to be assessed before new construction is undertaken. A failure of new construction to achieve the values in the Table is not in itself evidence of a failure to comply with the requirements of the Regulations.
Appendix A
Masonry separating walls

A1 This Appendix deals with masonry separating walls. For masonry walls abutting separating floors see Appendix B.

A2 Each of the wall types described in Section 1 and using masonry specifies a minimum weight for the wall including finishes where relevant. Table A below gives the average weight of brick or block which should be used in order to achieve the specified weight of wall.

A3 Homogeneous concrete walls (in-situ or large precast panels) are not dealt with in Table A. The density of the concrete used should be at least:
- natural aggregate concrete - 2300kg/m³
- no fines concrete - 1760kg/m³ both at a moisture content of 3 per cent by volume.
Mortar density and plaster weight should be the same as specified in the Notes to Table A.

Table A  Weights for bricks

<table>
<thead>
<tr>
<th>Material and dimensions [mm]</th>
<th>Specified weight at least [kg/m²]</th>
<th>Plaster finish</th>
<th>Average weight of brick to be used [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickwork</td>
<td>300</td>
<td></td>
<td>1.84 (frogs down)</td>
</tr>
<tr>
<td>brick size [mm] 65 x 102.5 x 215</td>
<td></td>
<td></td>
<td>1.47 (frogs up)</td>
</tr>
<tr>
<td></td>
<td>355</td>
<td></td>
<td>1.93 (frogs up)</td>
</tr>
<tr>
<td></td>
<td>375</td>
<td>2 light weight</td>
<td>1.93 (frogs up)</td>
</tr>
<tr>
<td></td>
<td>415</td>
<td>2 gypsum</td>
<td>1.81 (frogs up)</td>
</tr>
<tr>
<td></td>
<td>255</td>
<td>2 light weight</td>
<td>2.42 (frogs up)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 gypsum</td>
<td>2.31 (frogs up)</td>
</tr>
</tbody>
</table>

Notes
* The weight is increased to achieve the minimum density.
The average weight of the brick or concrete block to be used depends on achieving at least the following values for mortar and plaster:
  (a) mortar - 1800kg/m³ in joints 10mm thick
  (b) plaster - lightweight 10kg/m²
gypsum 17kg/m².
Take the weight of concrete blocks at a moisture content of 3 per cent by volume.
### Table A: Weights for blocks

<table>
<thead>
<tr>
<th>Material and dimensions [mm]</th>
<th>Thickness</th>
<th>Wall Specified weight at least [kg/m²]</th>
<th>Plaster finish Number of sides</th>
<th>Type</th>
<th>Average weight of block to be used [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B Concrete blockwork</strong></td>
<td>160</td>
<td>2</td>
<td>lightweight</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td>block size [mm]</td>
<td>200</td>
<td>2</td>
<td>gypsum</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>415</td>
<td>2</td>
<td>lightweight</td>
<td>10.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>415</td>
<td>2</td>
<td>gypsum</td>
<td>9.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250</td>
<td>2</td>
<td>lightweight</td>
<td>18.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>gypsum</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>215</td>
<td>2</td>
<td>lightweight</td>
<td>31.2*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>gypsum</td>
<td>36.0</td>
</tr>
</tbody>
</table>

**Notes:****

* The weight is increased to achieve the minimum density.
* The average weight of the brick or concrete block to be used depends on achieving at least the following values for mortar and plaster:
(a) mortar – 1900kg/m³ in joints 10mm thick
(b) plaster – lightweight 10kg/m²
    gypsum 17kg/m².
* Take the weight of concrete blocks at a moisture content of 3 per cent by volume.
Appendix B
Masonry walls abutting separating floors

B1 This Appendix deals with masonry walls abutting separating floors. For masonry separating walls see Appendix A.

B2 The weights required for certain masonry walls abutting separating floors Type 1 and Type 2 are given for each floor type. Table B gives specifications which will meet most needs.

B3 Homogeneous concrete walls (in-situ or large precast panels) are not dealt with in Table B. The density of the concrete used should be at least:
- natural aggregate concrete - 2300kg/m³
- no-fines concrete - 1760kg/m³ both at a moisture content of 3 per cent by volume.
Mortar density and plaster weight should be the same as specified in the Notes to Table B.

Table B Weights for bricks and blocks

<table>
<thead>
<tr>
<th>Material and dimensions [mm]</th>
<th>Wall</th>
<th>Orientation</th>
<th>Specified weight at least [kg/m²]</th>
<th>Number of sides</th>
<th>Type</th>
<th>Average weight of brick or block to be used [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Brickwork</td>
<td></td>
<td>355</td>
<td>-</td>
<td>2</td>
<td></td>
<td>1.64</td>
</tr>
<tr>
<td>brick size [mm]</td>
<td></td>
<td></td>
<td>1</td>
<td>lightweight</td>
<td>1.85</td>
<td></td>
</tr>
<tr>
<td>65 × 102.5 × 215</td>
<td></td>
<td></td>
<td>2</td>
<td>lightweight</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>215</td>
<td></td>
<td></td>
<td>2</td>
<td>gypsum</td>
<td>1.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>gypsum</td>
<td>1.64</td>
<td></td>
</tr>
</tbody>
</table>

| B Concrete blockwork        |      | 120         | -                                 | 2               |      | 11.0                                          |
| block size [mm]             |      |             | 1                                 | lightweight     | 9.9  |
| 100 × 215 × 440             |      |             | 1                                 | gypsum          | 9.2  |
|                              |      |             | 2                                 | lightweight     | 15.4 |
|                              |      |             | 1                                 | gypsum          | 15.0 |
|                              |      |             | 2                                 | gypsum          | 14.6 |
|                              |      |             | 2                                 | gypsum          | 13.8 |
|                              |      | 215         | 355                               | -               |      | 33.4                                          |
|                              |      |             | 1                                 | lightweight     | 32.4 |
|                              |      |             | 1                                 | gypsum          | 31.7 |
|                              |      |             | 2                                 | lightweight     | 31.4 |
|                              |      |             | 2                                 | gypsum          | 29.9 |

Notes:
The average weight of the brick or concrete block to be used depends on achieving at least the following values for mortar and plaster:
(a) mortar - 1800kg/m² in joints 10mm thick
(b) plaster - lightweight 10kg/m², plaster 17kg/m².
Take the weight of concrete blocks at a moisture content of 3 per cent by volume.
British Standards referred to

E1/2/3

**BS 2750** Methods of measurement of sound insulation in buildings and of building elements,
Part 4: 1980 Field measurements of airborne sound insulation between rooms,
Part 7: 1980 Field measurements of impact sound insulation of floors.

**BS 5821** British Standard method for rating the sound insulation in buildings and building elements,
Part 1: 1984 Method for rating the airborne sound insulation in building and of internal building elements,
Part 2: 1984 Method for rating the impact sound insulation.