

BCI® Joist Floor Construction to Meet the Requirements of Parts B, E and L1 (Fire, Sound and Air Leakage) of The Building Regulations

Recent changes to Part E of The Building Regulations (Resistance to the passage of sound – 2003 Edition) coupled with earlier changes to Part L1 (Conservation of fuel and power – 2002 Edition) together with the continuing need to meet the requirements of Part B (Fire safety) mean that when considering prospective floor constructions for a project it is necessary to select appropriate floor deck, joists and ceiling products that result in a floor system that meets all regulatory requirements.

The Requirements

Sound Resistance

The 2003 edition of Approved Document E sets improved sound insulation standards for floors within dwellings and between dwellings, and their junctions with separating walls. In addition, separating floors between dwellings will require pre-completion testing if not constructed in accordance with Robust details^[A]. The sound insulation performance that floors must achieve is shown in the table below.

Sound Resistance Required for Floors				
Floor Type	Sound Resistance Required		Pre-completion testing required?	Boise Solution
	Airborne dB min.	Impact $L'_{nT,w}$ dB max.		
Intermediate	$R_w \geq 40$ ^[B]	-	No	See below for intermediate BCI® Joist floors that meet the requirement of Building Regulation E2
Separating	$L_{nT,w} + C_{tr} \geq 45$ ^[C]	≤ 62 ^[C]	No – if floor constructed in accordance with Robust details. Yes – if floor not constructed in accordance with Robust details	See detail below for I-joist separating floor that conforms to Robust details. Note that both floor and separating wall must be compatible Robust details to avoid pre-completion testing. Refer to 'Robust details Part – E Resistance to the passage of sound,' January 2005

^[A] The use of Robust details by builders is subject to the terms and conditions set out by Robust Details Limited.

^[B] The requirement is for a laboratory sound reduction of 40dB.

^[C] The requirement is for on site sound reduction, met by either complying with Robust details or pre-completion testing.

Compliance with the sound resistance requirements for BCI® Joist floors is provided by laboratory sound tests in respect of intermediate floors, and adherence to Robust details in respect of separating floors.

Fire Resistance

Approved Document B to The Building Regulations requires floors to achieve the periods of fire resistance noted in the table below. Fire resistance is usually defined in three parts: structure, integrity and insulation. Broad definitions are as follows: **Structure** – the construction shall not fail during the required resistance period. **Integrity** – the construction shall not allow combustion gases or smoke to pass through during the required resistance period. **Insulation** – the construction shall not allow excessive heat to pass through during the required resistance period.

Fire Resistance Periods for Floors		
Building Type	Floor Type	Required Resistance (Min)
House - detached, semi, terrace, not more than three storeys	Intermediate ^{[1] [2]}	30
Flats	Separating	60
Maisonettes	Intermediate (within a maisonette)	30
	Separating (between maisonettes)	60

For all other building uses refer to Approved Document B

^[1] The intermediate floor in a 2-storey house may have a modified 1/2-hour fire resistance; 30 minute structure, 15 minutes integrity and 15 minutes insulation.

^[2] The intermediate floor above a basement should have at least 1-hour fire resistance.

The walls between semi-detached or terraced houses, and between flats, are separating walls and should have at least 1-hour fire resistance.

Compliance with the fire resistance requirements for BCI® Joist floors is provided by the results of full-scale structural fire tests.

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The Requirements (continued)

Air Leakage

Approved Document L1 (2002 Edition) requires buildings to limit unwanted air leakage, and in the absence of performance criteria refers to the use of Robust Details contained in the publication 'Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings'. The primary area affected with regard to floors is in their junctions with external walls and in particular masonry walls. Timber frame floors and walls remain largely unaffected. To ensure compliance with the approved Document, the Robust Details show joists supported at external walls in masonry hangers. Alternatively, a construction detail that involves building joists into the wall and sealing all air paths with silicone sealant is accepted by Regulatory Authorities subject to good site workmanship. Additionally, proprietary details that can be shown by laboratory tests to meet or exceed the air leakage performance of the silicone sealant detail may also be used.

Compliance with the air leakage requirements for BCI® Joist floors is provided by the use of either a proprietary detail (I-bloc™), the silicone sealant detail, or by supporting joists in masonry hangers.

Meeting the Requirements

The following details showing floor constructions and floor/wall junctions have been prepared to meet the current Building Regulation requirements with regard to Part B, Part E and Part L1. Each detail gives reference to relevant test data or Robust Details in validation of the performance.

Intermediate floors

General Floor Construction

The diagrams and table below specify intermediate floor constructions that meet the Building Regulation requirements for Sound and Fire.

Intermediate Floor Constructions			
	Section Through Floor	Layer and Material	Justification
In-1	<p>Floor deck.</p> <p>BCI® Joists.</p> <p>Ceiling / Absorbent Layer.</p>	<p>Floor Deck: 22mm P5 Chipboard</p> <p>Joist: Any BCI® Joist 241mm or deeper at 600mm centres</p> <p>Ceiling/Absorbent Layer: 15mm Type 1 plasterboard^[1] 12.5mm Type 1 plasterboard +3mm skim^[1] 12.5mm Type 5 fire resisting plasterboard^[1] (all inclusive 1 downlighter per 1.5m² floor area)</p>	<p>Sound:- Lab tests in accordance with BS EN ISO 140-3:1995, and expert sound consultant assessment of results.</p> <p>Fire:- ½ hour structural fire test in accordance with BS 476-21:1987 and expert fire consultant assessment of results.</p>
In-2	<p>Floor deck.</p> <p>BCI® Joists.</p> <p>Ceiling / Absorbent Layer.</p>	<p>Floor Deck: 22mm P5 Chipboard</p> <p>Joist: Any BCI® Joist 241mm or deeper at 400mm centres or greater</p> <p>Ceiling/Absorbent Layer: 15mm Type 1 plasterboard^[1] +1mm skim 12.5mm Type 1 plasterboard^[1] +4mm skim 12.5mm Type 5 fire resisting plasterboard^[1] +1mm skim (all inclusive 1 downlighter per 1.5m² floor area)</p>	<p>Sound:- Lab tests in accordance with BS EN ISO 140-3:1995, and expert sound consultant assessment of results.</p> <p>Fire:- ½ hour structural fire test in accordance with BS 476-21:1987 and expert fire consultant assessment of results.</p>
In-3	<p>Floor deck.</p> <p>BCI® Joists.</p> <p>Ceiling / Absorbent Layer.</p>	<p>Floor Deck: 22mm P5 Chipboard or 22mm cement bonded particle board, or any board with a surface mass of 15kg/m²</p> <p>Joist: Any BCI® Joist at any centres</p> <p>Ceiling/Absorbent Layer: 15mm Type 1 plasterboard^[1] 12.5mm Type 1 plasterboard^[1] +3mm skim 12.5mm Type 5 fire resisting plasterboard^[1] plus 100mm mineral wool insulation min density 10kg/m³</p>	<p>Sound:- Approved Document E clause 5.23 deemed to satisfy construction.</p> <p>Fire:- ½ hour structural fire test in accordance with BS 476-21:1987 and expert fire consultant assessment of results.</p>

^[1] Plasterboard to have a minimum surface mass of 10kg/m².

BCI® Joist Floor Construction to Meet the Requirements of Parts B, E and L1 (Fire, Sound and Air Leakage) of The Building Regulations (continued)

Junction with Masonry Separating Wall

The following construction meets The Building Regulation requirements for Sound, Fire and Air Leakage.

Intermediate Floor Junction with Masonry Separating Wall		
InMs-1	InMs-2	InMs-3
<p>Wall construction to be in accordance with Robust details E-WM-1,2,3,4,5, or 6.</p> <p>Floor to comply with regulation E2 selected from Boise Intermediate Floor table.</p> <p>Boise I-bloc push fitted to end of BCI® Joist. Ensure good motor key between masonry, I-bloc, and joist web.</p>	<p>Mortar joint struck and recessed and filled with silicone sealant.</p> <p>Ply/OSB filler pieces with all joints filled with silicone sealant.</p> <p>Fix fillers to joist using a min. of 3-No nails driven through and clenched.</p> <p>90mm min. bearing providing lateral wall restraint.</p>	<p>BCI® Joists supported in masonry hangers</p>
Justification		
<p>Sound:- Accepted as Robust detail, Appendix A by virtue of meeting air leakage requirements of Approved Document L1.</p> <p>Fire:- 1hr fire resistance – expert fire consultant assessment.</p> <p>Air Leakage:- Meets air leakage requirements of Approved Document L1.</p>	<p>Sound:- Robust detail, Appendix A</p> <p>Fire:- To be assessed by Building Designer.</p> <p>Air Leakage:- Meets air leakage requirements of Approved Document L1.</p>	<p>Sound:- Robust detail</p> <p>Fire:- 1hr fire resistance from uninterrupted masonry wall.</p> <p>Air Leakage:- Robust detail.</p>

Junction with Masonry External Wall

Intermediate Floor Junction with Masonry Exterior Wall		
InMe-1	InMe-2	InMe-3
<p>Floor to comply with regulation E2 selected from Boise Intermediate Floor table.</p> <p>Boise I-bloc push fitted to end of BCI® Joist. Ensure good motor key between masonry, I-bloc, and joist web.</p>	<p>Mortar joint struck and recessed and filled with silicone sealant.</p> <p>Ply/OSB filler pieces with all joints filled with silicone sealant.</p> <p>Fix fillers to joist using a min. of 3-No nails driven through and clenched.</p> <p>90mm min. bearing providing lateral wall restraint.</p>	<p>BCI® Joists supported in masonry hangers</p>
Justification		
<p>Sound:- No specific requirement.</p> <p>Fire:- ½ hour required. 1 hour fire resistance to outside is provided by expert fire consultant assessment.</p> <p>Air Leakage:- Meets air leakage requirements of Approved Document L1.</p>	<p>Sound:- No specific requirement.</p> <p>Fire:- ½ hour fire resistance provided by ceiling plasterboard.</p> <p>Air Leakage:- Meets air leakage requirements of Approved Document L1.</p>	<p>Sound:- No specific requirement.</p> <p>Fire:- 1hr fire resistance from uninterrupted masonry wall.</p> <p>Air Leakage:- Robust detail.</p>

BCI® Joist Floor Construction to Meet the Requirements of Parts B, E and L1 (Fire, Sound and Air Leakage) of The Building Regulations (continued)

Junction with Timber Frame Separating Wall

The following construction meets The Building Regulation requirements for Sound, Fire and Air Leakage.

Intermediate Floor Junction with Timber Frame Separating Wall	
	<p>Wall construction to be in accordance with Robust details E-WT-1 or E-WT-2.</p> <p>Floor decking may run under sole plates.</p> <p>Floor to comply with regulation E2 selected from Boise Intermediate Floor table.</p> <p>Close spaces between BCI Joists with full depth VERSA-LAM Rim blocking and ply web fillers where joists are at right angles to wall.</p> <p>Seal all perimeter joints with tape or caulk with sealant.</p> <p>VERSA-LAM Rim boards.</p>
Justification	
<p>Sound:- Robust detail Fire:- TRADA Technology 'Timber frame construction Chapter 5'</p> <p>Air leakage:- Meets air leakage requirements of Approved Document L1</p>	

Junction with Timber Frame External Wall

The following construction meets The Building Regulation requirements for Sound, Fire and Air Leakage.

Intermediate Floor Junction with Timber Frame External Wall	
	<p>PVC gasket or bead of sealant.</p> <p>Insulation.</p>
Justification	
<p>Sound:- No specific requirement Fire:- Generic timber frame detail Air leakage:- Robust Detail</p>	

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Separating Floor Construction

General Floor Construction

The diagram and table below specifies separating floor constructions that meet the Building Regulation requirements for Sound and Fire.

Separating Floor Construction			
Se-1			
	Section Through Floor	Layer and Material	Justification
Se-1	<p>Floating floor.</p> <p>Floor decking.</p> <p>Joists.</p> <p>Ceiling.</p>	<p>Floating Layer: 18mm (min) t&g flooring board 19mm plasterboard (13.5kg/m²) 70mm resilient composite deep battens 25mm mineral wool between battens</p>	<p>Sound:- Robust detail E-FT-1. Floating layer as described or alternative that must achieve lab performance of $\Delta R_w + C_{tr} = 13dB$ and $\Delta L_w = 15dB$.</p> <p>Deck and joist layer as described.</p>
		<p>Floor Deck: 15mm min floor deck</p> <p>Joist: Any BCI® Joist 241mm or deeper</p> <p>Ceiling/Absorbent Layer: Metal resilient bars at 400mm c/c 2 layers plasterboard min 23kg/m², typically 19mm Type 1 plank and 12.5mm Type 1 plasterboard</p>	<p>Ceiling/Absorbent layer as described or alternative that must achieve lab performance of $\Delta R_w + C_{tr} = 17dB$ and $\Delta L_w = 16dB$.</p> <p>Fire:- 1 hour structural fire test in accordance with BS 476-21:1987 and expert fire consultant assessment of results.</p>
<p>Notes: 1/. This is Robust detail 'Separating Floor - Timber I-joists E-FT-1'. 2/. This floor construction would not require pre-completion testing if used in conjunction with Robust detail 'Separating Walls – Timber Frame EW-T-1 or EW-T-2'. 3/. This floor construction would require pre-completion testing if used in conjunction with either a Robust detail masonry wall, or any other non Robust detail masonry wall or timber frame wall.</p>			

Junction with Timber Frame Separating Wall

The following construction meets The Building Regulation requirements for Sound, Fire and Air Leakage.

Separating Floor Junction with Timber Frame Separating Wall	
SeTs-1	
<p>Sound:- Robust detail Fire:- TRADA Technology 'Timber frame construction Chapter 5' Air leakage:- Meets air leakage requirements of Approved Document L1</p>	

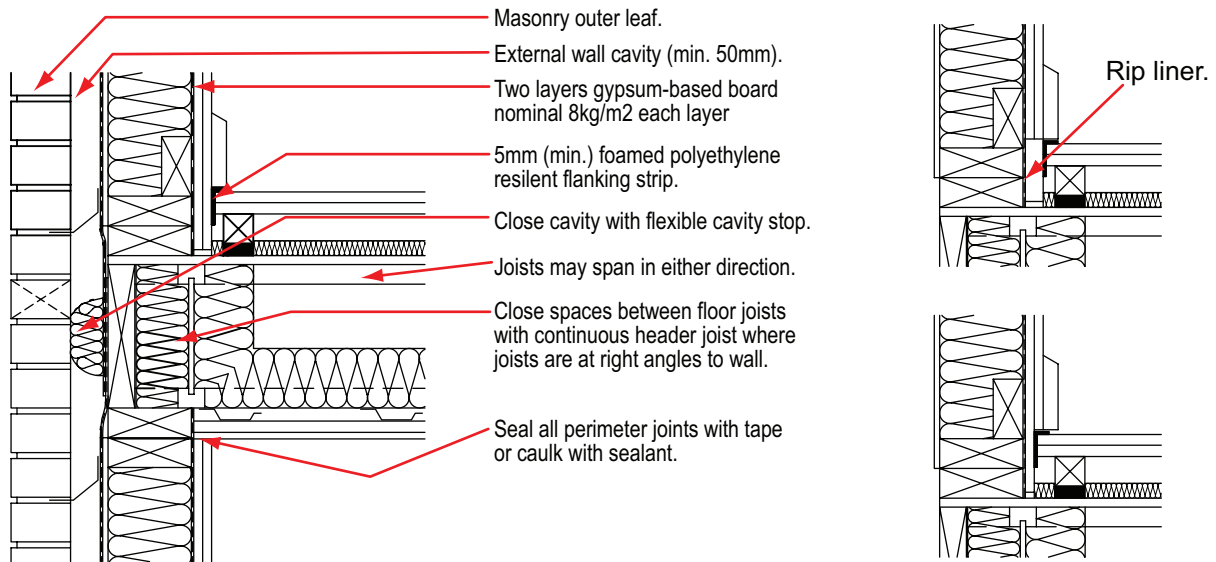
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Junction with Timber Frame External Wall

The following construction meets The Building Regulation requirements for Sound, Fire and Air Leakage.

Separating Floor Junction with Timber Frame External Wall

SeTe-1

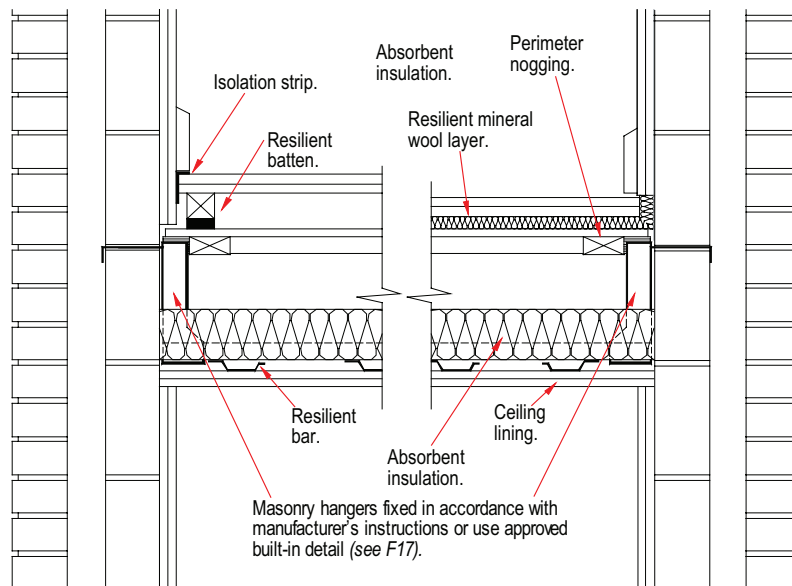


Sound:- Robust detail E-FT-1 Fire:- TRADA Technology 'Timber frame construction Chapter 5 Air leakage:- Robust detail

Junction with Masonry Walls

There is currently no authoritative guidance on satisfying the requirements of Approved Document E (Sound) with regard to I-joist separating floors and their junctions with masonry walls. Generic details are shown below, but specialist acoustic advice should be sought where this type of construction is proposed. Pre-completion sound testing will be required.

Separating Floor Junction with Masonry Wall



Generic detail only, seek specialist advice for sound reduction performance.