CARPENTRY & JOINERY

Community College HACKNEY

FCA

CARPENTRY & JOINERY

THEORY

07 SUSPENDED TIMBER GROUND FLOORS

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INTRODUCTION

It is the trend for modern domestic dwellings to have solid concrete ground floors which consist of in situ concrete slabs of beam and block with a concrete screed.

However, there are still domestic dwellings which incorporate timber floors. These houses are usually older or have been designed to include a timber floor.

There are three types of timber floors:
- Suspended timber ground floors.
- Solid ground floor with a timber covering.
- Suspended timber upper floors.

Suspended Timber Ground Floors

As the name implies, this is a floor suspended above ground level. The main construction aspect of this type of floor is to prevent any timber from coming in contact with any form of moisture.

The floor consists of a series of joists arranged parallel to each other and supported at their ends on small sleeper walls and at intervals along their length on honeycomb sleeper walls. The honeycomb walls are constructed in such a way as to allow a continuous passage of air to flow beneath the suspended joists. To give access to this air, air bricks are built into the outer structural walls of the building. This constant flow of air is necessary to keep the timber dry and prevent the possibility of dry or wet rot occurring.

The sleeper walls are placed to support the joists which are designed to carry any dead loads (the self weight of the floor) and any live loads (such as people, furniture etc) that are likely to be imposed on the floor. If placed correctly, the sleeper walls will also prevent the joists from flexing or ‘bouncing’ when anyone walks across the floor.

Positioning And Loading Of Joists

The building Regulation Approved Document ‘A’ and ‘D’ states what loading in relation to the clear span of the joists is acceptable as well as the recommended joist spacing to carry certain imposed loads.

Definition Of Joist Spans

There are two distinct terms in relation to joist span:
- Effective span – This is the distance between the centres of the joists supports.
- Clear span – This is the clear distance between the two supporting walls.

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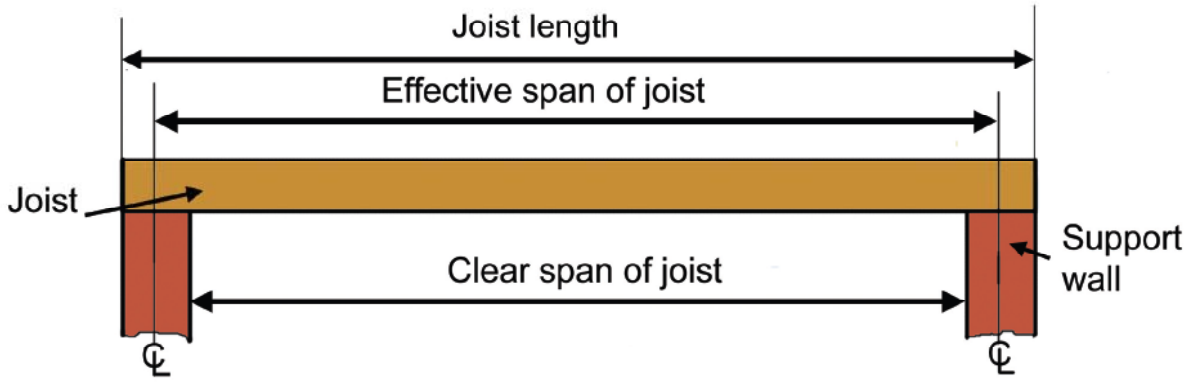
The Spacing Of Joists

Joist spacing is commonly called joist centres as it is the distance between the centre of adjacent joists (referred to as centre to centre or c/c).



The distance between the centres of joists is usually between 400mm and 600mm. This distance will usually depend upon:

- The loads imposed on the floor.
- The span of the joists.
- The cross sectional size of the joist.
- The strength and quality of the timber used for the joists.
- The type of decking material used to cover the joists.

If sheet material such as chipboard or plywood is used as a decking material, the joists usually spaced to coincide with the size of the sheets.

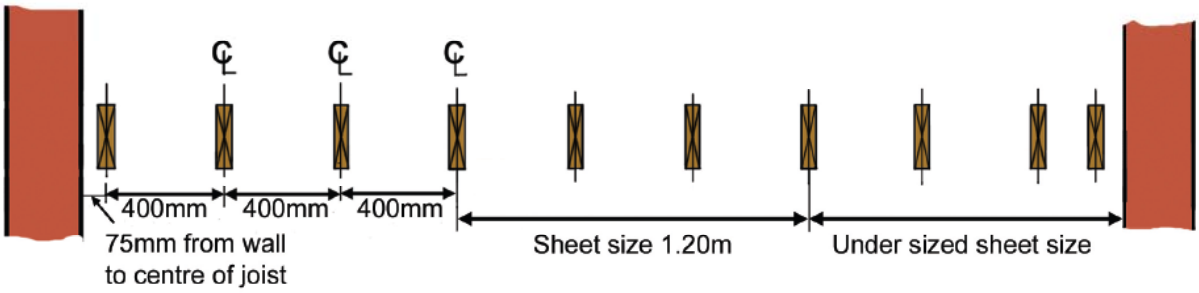
As a rule, joists are always laid to span the shortest span, but if the building has intermediate supporting walls, the joists can span from one supporting wall to another with ends of the joists abutting or overlapping.

To determine the number of joists required and their centres, adopt the following procedure:

- Measure the distance between the adjacent walls of the room.
- The first and last joists are always kept away from the walls to avoid contact with them, thus avoiding moisture penetration. This distance is usually approximately 50mm.
- The centres of 50mm joists would therefore be 75mm away from the wall.
- The distance between the end joist centres is then measured and the joist centres calculated as follows.

Example:
Consider a room with span of 3.45m or 3450mm and if the specified joist spacing is 400mm then:
3450 – (2 x 75mm) This is the distance the joist is from the wall, plus half the thickness of the joist.

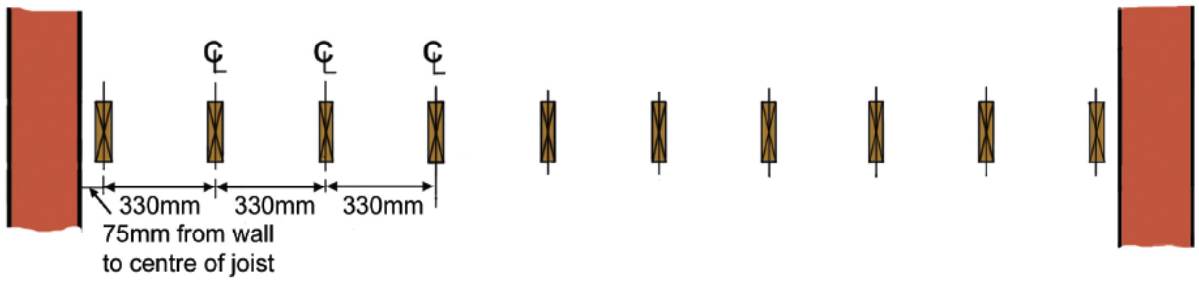
Therefore distance used to calculate centres = 3300mm
3300 ÷ 400 = 8.25 spaces rounded up to 9 spaces.
Add 1 for the joist against the wall then 10 joists are required.



Evenly Spaced Joists

Where T&G boarding is used as a floor covering, the joists can be spaced evenly. Provided the joists are spaces at recommended centres for the boards, they can be cut and butt jointed on the nearest joist, and all the joints should be staggered. The cut ends can be incorporated in the floor but the shortest piece should cover at least three joists.

For joists evenly spaced but to no required centre, the calculation would be:
3450 – (2 x 75mm) = 3300 ÷ 10 = 330mm centres and all centres will be equal.



Joist Spacing According To Decking Material

There three types of decking material commonly used, all of which are tongued and grooved:
• Flooring grade chipboard.
• Softwood T&G boarding.
• Plywood sheets.

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The following table is a guide to determine the joist spaces according to the decking material.

Decking material	Finished thickness (mm)	Max. spacing of joists (mm)	Reference
T&G Softwood boarding	16	450	The building regulations Approved Document 'A'
	19	600	
Flooring grade chipboard sheets	18/19	450	
	22	600	
T&G Plywood sheeting	12.5	300	
	16	400	
	19	600	

Where a sheet material is used as a joist covering, the joists are normally placed at centres which coincide with the sheet sizes so that the edges are supported on the joist and, in some cases, noggings are fixed to support the ends.

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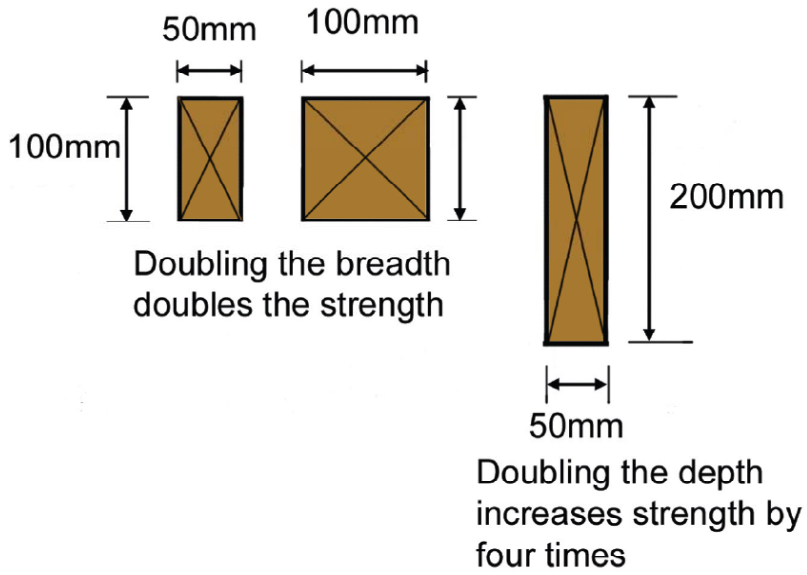
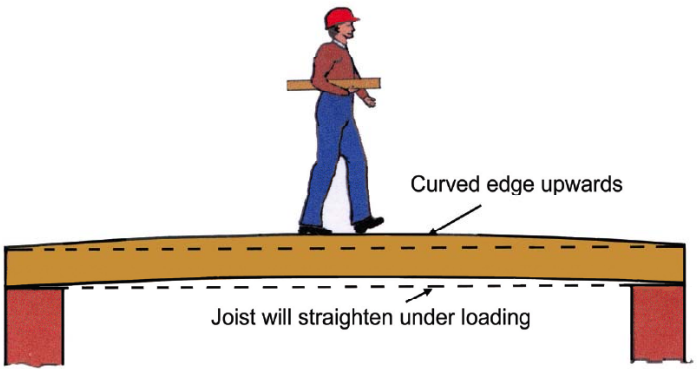
Joist Sizes

The strength of a joist is directly related to its cross sectional size. For example, consider a joist with a cross sectional size of 50mm x 100mm. If the breadth of the joist is doubled then the strength of the joist will be doubled. However, if the depth of the joist is doubled then the strength will be quadrupled.
Therefore, a joist measuring 50mm x 200mm will be four times stronger than a joist measuring 50mm x 100mm. For this reason, joists are placed so that the depth is greater than the breadth.



Distorted Joists

Any joists which are not straight, should be positioned with the curved edge upwards. When this type of joist is subjected to any loading, it will tend to straighten. Any joists which have large edge knots should also be positioned with the knots on the upper edge.



Joist laid with camber upwards

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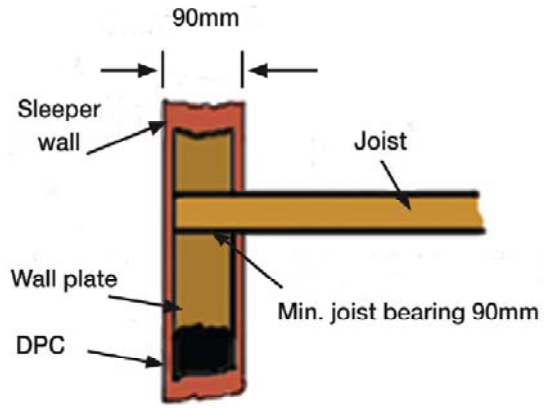
Supporting Joists

All joists require supporting at their ends and, in case of ground floor joists, at intermediate points along their length. The use of these intermediate supports reduces the clear span so that joists of smaller section can be used.

For ground floor joists, the distance between these intermediate supports ranges from 1.5m to 2.0m.

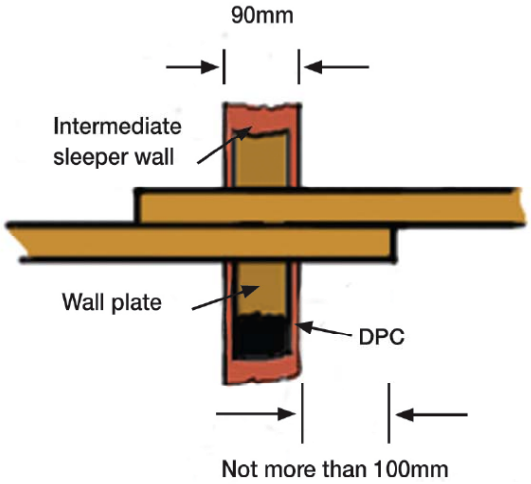
Joists should have a minimum bearing point of not less than 90mm at any position.



Minimum bearing point

Bearing Point On Intermediate Walls

If the joists are to be jointed at intermediate walls, the joist ends must not project more than 100mm beyond the wall.



Bearing point on intermediate walls

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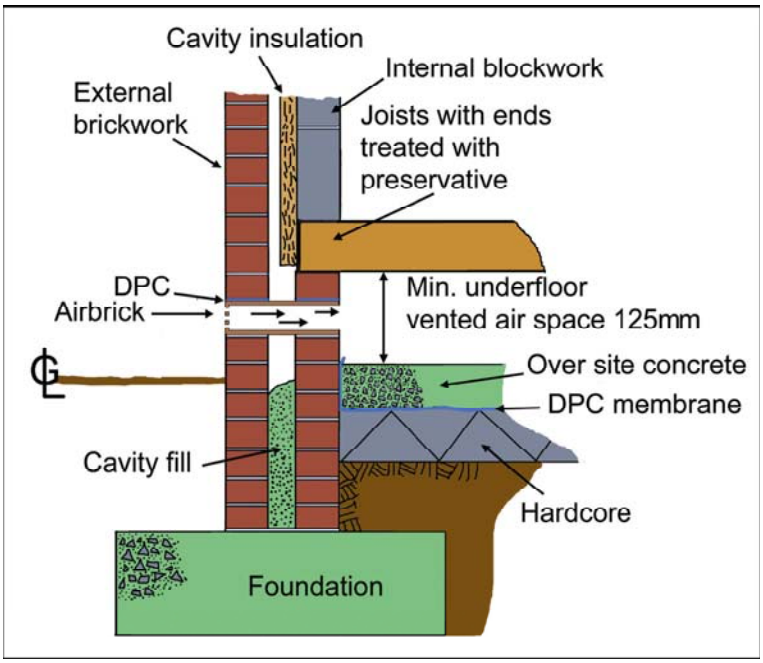
Joist Supports

There are a number of ways to support the ends of joists. They can be:
- Built into brickwork.
- Supported on wall plates.
- Supported on joist hangers.

Joists Built Into Brickwork

Joists supported in this way are built into the inner leaf of the cavity wall. The minimum bearing or end support must be not less than 90mm. The ends of the joists can be cut square or splayed but they must not extend into the cavity where they can accumulate mortar droppings and eventually bridge the cavity, leading to dampness and rot.

All the ends of joists used in this type of construction must be treated with a timber preservative to protect them from dampness and rot.



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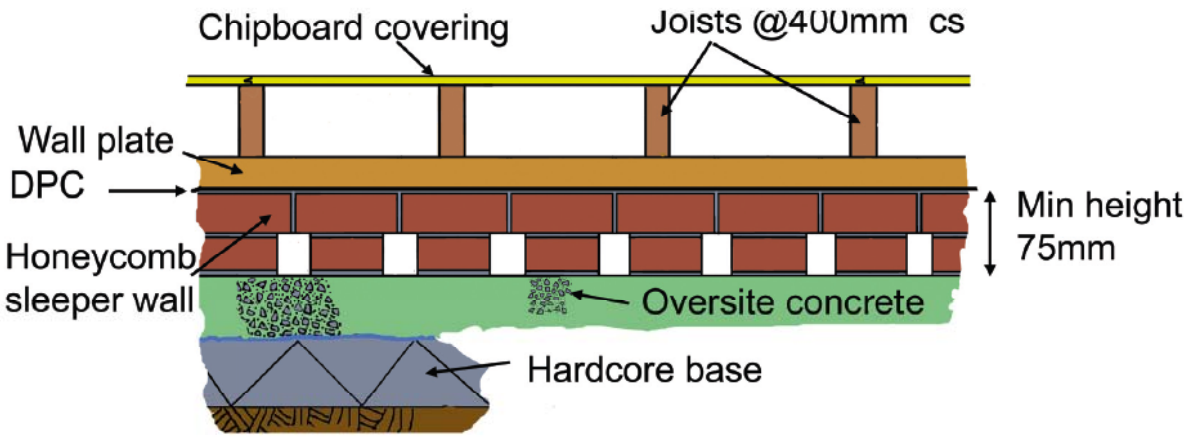
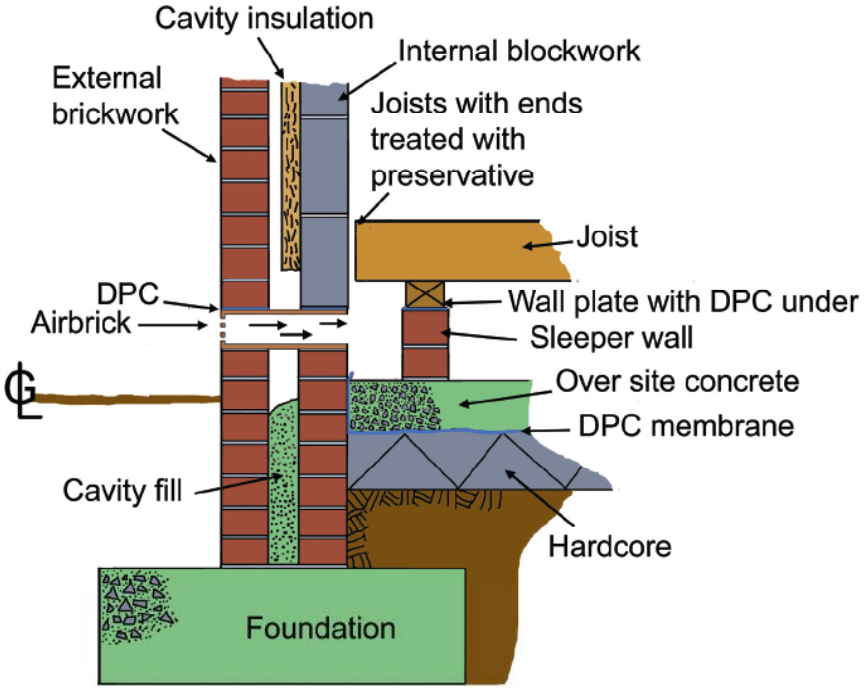
Joists Supported On Sleeper Walls

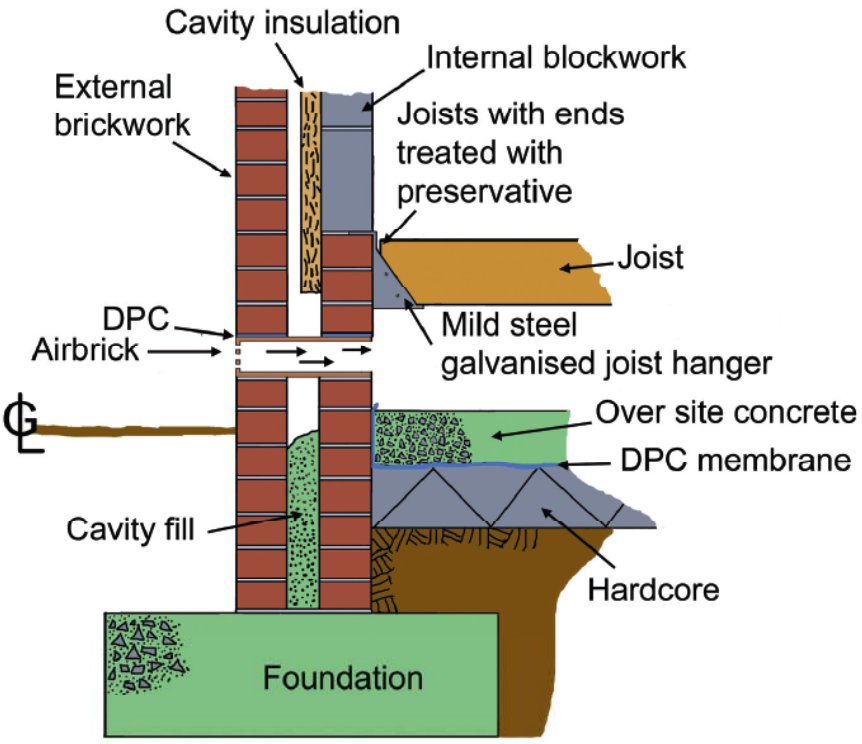
Joists can be supported on small walls which have gaps built into them to allow a free fl ow of air under the joists. The walls are known as honeycomb or sleeper walls.
The joists are supported and fi xed to wall plates attached to the top of the sleeper walls.





Joists Supported on Wall Hangers

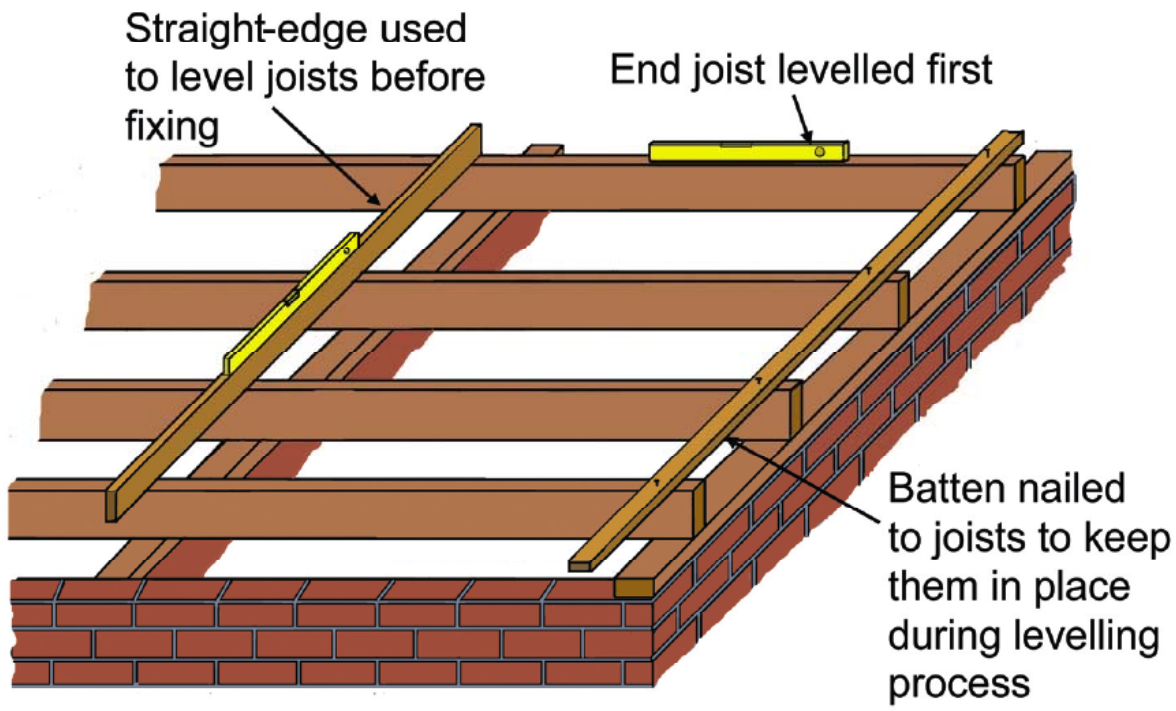
The ends of ground floor joists can also be supported on galvanised steel joist hangers which are built into the inner wall. The advantage of using these hangers is that they can be positioned to suit any joist centres, and they can be positioned independently of the building process.



Levelling Joists

Joists are designed to be placed across the shortest span of the floor. After the joist centres have been measured and the joists positioned in place, they are levelled by means of a straightedge and level. The end joists are levelled first along their length, and then the intermediate joists are lined through and levelled across using a straightedge and level. If the joists are bowed when the joists are levelled, they are secured in place using battens nailed across them.

They are then built in place at the ends, and secured to the wall plate of any sleeper walls.



Levelling ground floor joists