

Beautiful Basements

Underpinning Advice Sheet

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BASEMENTS

Basement Build
Conversion
Retro-fit
Waterproofing

Summary

1. History of underpinning

Basements in the UK are often found in houses built in the Victorian / Edwardian era or earlier. A lot of housing, especially terrace housing, built in the 19th and early 20th centuries have some form of basement. Their primary use was coal storage before gas heating became common place.

Some of these basements were built with what we now think to be limited head room, largely due to cost of excavation (especially with terrace / miners' houses), no consideration was given to insulation or flooring finishes and the average height of people was significantly smaller.

Most basements built in this time period have floor to ceiling heights of between 5'10" (1.78m) and 6'4" (1.93m). Whilst this may be enough headroom for storage use (providing it is dry), it is not enough when you consider a modern conversion which will include waterproofing, insulation and finishing layers. These layers, for a habitable room will add up to a reduction in head height of approx. 4½" (110mm).

In some cases, the only option to have a dry useable space in your basement with enough head room, is to lower the floor.

2. Lowering the floor

The foundations in most buildings of this age are referred to as spread footings. These are a series of steps underneath the wall that increase the footprint of the wall. Depending upon how much head room you are seeking to gain in your basement you have two options for lowering the floor.

Option 1 – Lower to the limit of the spread footing

If you are only seeking to gain a small bit of head room, or even have the finished floor exactly where the existing floor is currently, you may be able to lower the floor enough to achieve this. The [Spread footings Explained](#) data sheet goes into more detail about how this can be achieved.

Option 2 – Underpin the walls

If the height you can gain by digging down to the limit of the corbels is not enough, or your wall is constructed in a different way, the only option is to underpin your walls.

3. Underpinning

The process of underpinning walls is quite straightforward and has been done for centuries. The basic process is to excavate a hole in front of a small section of a wall and then dig the full width under the wall. The drawings below show the basic steps for this. The bricks shown in red can usually be removed (please note the rear bricks are often not removed but are not shown on the drawings) Depending upon the depth of the underpin and walls above, steel reinforcing is sometimes placed under the

walls. Concrete is then placed into the excavation under the wall, leaving around 25mm (1") at the very top.

When the concrete is cured, this last section is then filled with "dry pack". Dry pack is very dry concrete, often higher in sand content, pushed into the gap and compacted until it is solid. The whole of this top is filled this way, all the way to the front.

This can be repeated in a few places around the basement, but no more than 25% of the walls can be excavated at the same time, and no two holes can be adjacent. This process is repeated until all walls are excavated, cast, and packed.

Each section of wall that is underpinned is sometimes tied to the one next to it with steel rods.

With all walls lowered, the remaining central part of the floor can be excavated. With this complete, the new reinforce concrete floor can be laid. Usually steel rods are drilled into the newly underpinned walls at low level to connect the walls and floor, making them one cohesive structure and giving maximum lateral, tensile & compressive strength.

4. Enabling works & surveys

Before underpinning can begin, we need to make sure that some elements are suitable, these include:

- Location, depth, and type of current foundations
- Ground conditions (soil / earth make up)
- Water table

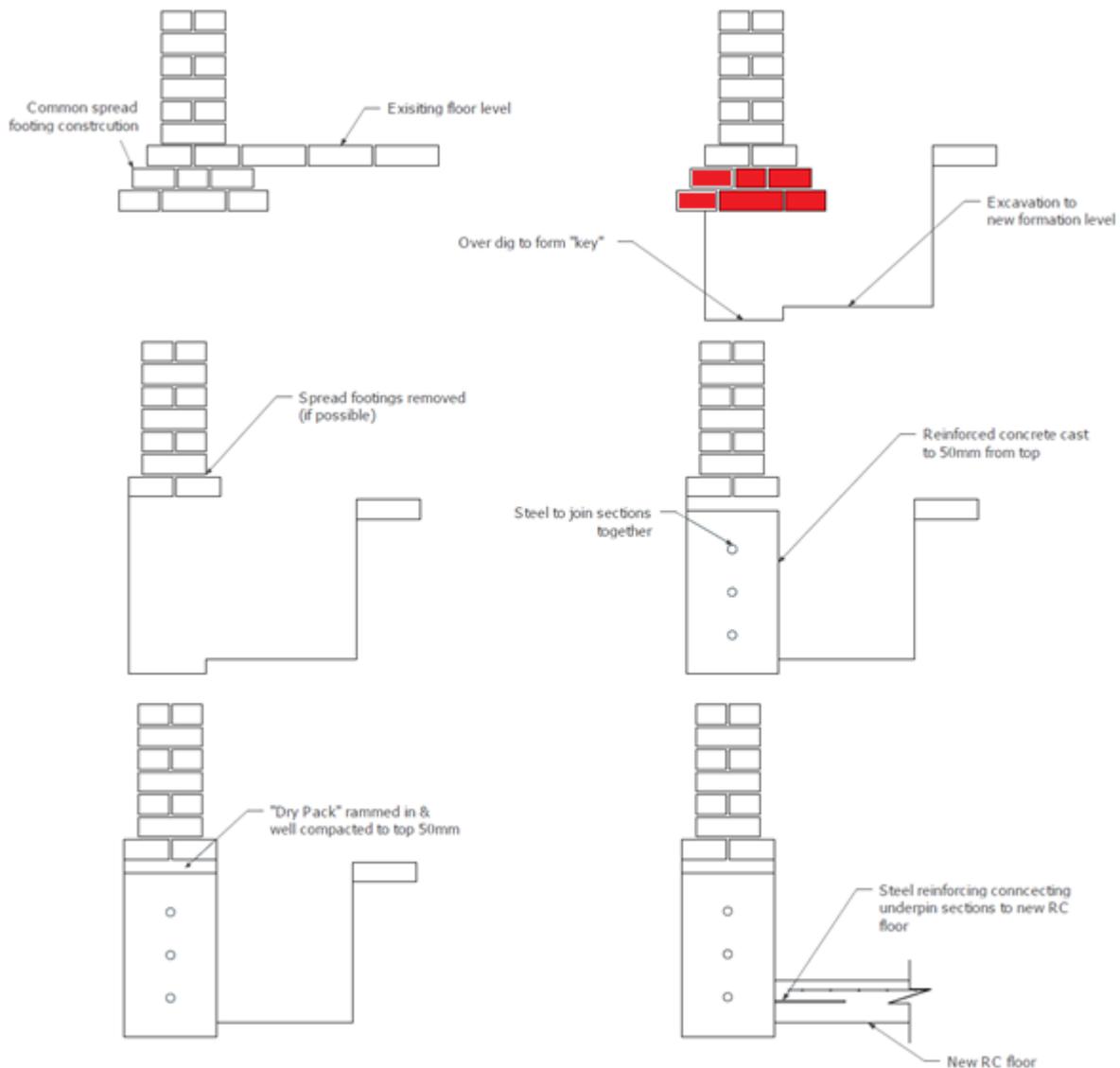
To determine this, a few trial holes will need to be excavated around the basement, usually in corners and against internal walls. This is something that can be carried out by us under our [day rate schedule](#), or by anyone who is willing (including you).

We will carry out a survey of the property to ensure that all factors are understood. That will include, but not be limited to:

- Party walls
- Storeys above walls to be underpinned
- Ground floor walls above basement
- Lateral support for walls
- Apertures in the basement and ground floor

5. Process of underpinning

The below sketches show the basic steps for underpinning a wall. Please note these are for illustrative purposes only and must not be used as designs.



6. Risks & abatement measures

The act of underpinning a house or wall comes with inherent risk, i.e. we are disturbing what has held up that wall for hundreds of years. The main risk that surrounds underpinning is that of settlement. As we disturb the ground below the walls, this ground can heave or settle.

It is reasonable to expect some minimal movement if the foundations of a 100+ year old house are being removed and replaced.

Shallow underpinning (lowering the floor between 100-600mm) very rarely causes cracking.

Cracks are usually associated with creating new apertures, removing a chimney stack or walls, or where steel beams relax / deflect after they are loaded. However, in 95% of projects there are no ill effects of underpinning whatsoever, though the risk potential is there.

The potential risk can cause movement within the walls and can lead to cracks appearing. The type of crack that appears will indicate the amount of movement that has occurred.

There are two main types of cracks:

1. Decorative cracks

- These often appear around the top corners of apertures such as doors or window. They tend to spread at around 45° from the frame and are usually hairline but may occasionally have a width of around 1mm. Cracks can also show in plasterwork on walls and ceilings.
- If there is any existing cracking this may progress or increase as a result of the works.
- Should decorative cracks occur, we think it reasonable to split the cost of decorations 50/50 with our clients as some very tiny movement is to be expected when cutting the foundations out below walls over 100 years old. Note that decorations beyond the areas / panels of any cracking and general associated decorations (woodwork etc) are the client's responsibility).
- Where decorative cracks appear or progress its not uncommon for doors to stick in frames or locks to become misaligned and we will adjust these as a matter of course.

2. Structural cracks

- These can appear around any wall that has been underpinned or is connected to one that has been. The cracks are wider and often follow construction lines (e.g. brick joints & bonds)
- This issue is more serious and is entirely covered by Beautiful Basements and / or our insurers.

Where cracks are thought to be structural not decorative, an engineer's report must be commissioned. This will dictate and guide any remedial works that are required. Should the report show no remedial works beyond redecoration are required (meaning the cracks are decorative) the cost of the report commissioned will be borne by the client.

Beautiful Basements has 20+ years' experience in underpinning and carries specialist insurance just for it and the associated works. If you'd like to know more, please visit www.beautiful-basements.co.uk/customerinfo for more details.

To abate these risks every underpinning project is designed with a sequence and full method statement, in some cases full structural calculations are drawn up.

In areas with very soft ground or a high / active water table we will put sacrificial props into each section as soon as the original ground has been removed so no part of the house is ever unsupported for more than 10 minutes. These props remain after concrete and give even more strength to the new walls.

7. Party Wall Act & Planning permission

Some regions within the UK require planning permission to carry out underpinning works. Prior to any works, it is strongly advised that you check with your local authority as to their individual requirements. Building regulations approval will always be required for structural works like underpinning.

If any of the walls to be underpinned are shared with a neighbour, are within 3m of a neighbour, or any excavations intersect a 45° angle from their lowest foundation, then you will require some form of party wall agreement. These can be either formal or informal, depending upon the nature and scope of the works and your relationship with your neighbour.

It is important to note that a neighbour cannot stop the works, but may require their own, independent engineer and surveyor to verify the planned works.

We cannot begin any works until some form of agreement is in place. If no formal party wall act award is going to be sought, a detailed photographic condition survey of your house and your neighbours is needed.

For more information about the Party Wall Act (1996) please [click here](#)