



BUILDSTORE
FOR SMART HOMEBUILDERS



GUIDE

CARPENTRY AND JOINERY

CARPENTERS AND JOINERS

The carpenter or joiner is one of the most important trades on site. They usually work on a labour-only basis so all the materials and fixings will have to be supplied by you, the self-builder.

The work of a carpenter or joiner is usually broken down into three main sections; first fix, roof and second fix and priced accordingly.

There is no natural or rigid division between these various elements of the trade, and the stages do not follow on from each other, overlapping to a considerable degree.

- Cutting and laying the first-floor joists and trimmers
- Scarfing the wallplate
- Fixing door linings and window boards
- Fixing garage door frames
- First-floor decking
- Making and erecting studwork partitioning
- Assembly and erection of staircase
- Making up on loft traps and tank stands
- Boxing out for soil and vent pipes

THE ROOF

This has largely been covered in Build Stage 8 but as you can see from the above list some of the items in First Fix have to be done before the roof is on and others have to wait until it is finished or even tiled. Decide whether or not your stair treads are to be carpeted or exposed before ordering so that they are made of the correct wood finish.

Second Fix includes the following;

- Hanging of internal/external doors and patio doors
- Fitting the garage door
- Fixing skirtings, architraves and decorative mouldings
- Finishing off the staircase, balustrading and aprons

In addition, there are various other tasks that the carpenters are often called upon to carry out as extras to the above:

- Tacking up of plasterboard to ceilings
- Fixing of insulation to the roof void and between joists or studwork
- Fitting of kitchen units and fitted bedroom or bathroom furniture

TIPS

1

Make sure that you have nails, screws and the various fittings on site.

2

Stack timber up on blocks and cover it lightly.

3

Make sure that you have the appropriate glues on site – these are necessary for things like staircases.

4

Decide whether or not your stair treads are to be carpeted or exposed before ordering so that they are made of the correct wood finish.

5

Ensure that the suppliers of kitchen, bedroom and bathroom units or fitted furniture deliver them just before they are required. You do not want them hanging around on-site to get stolen or damaged.

6

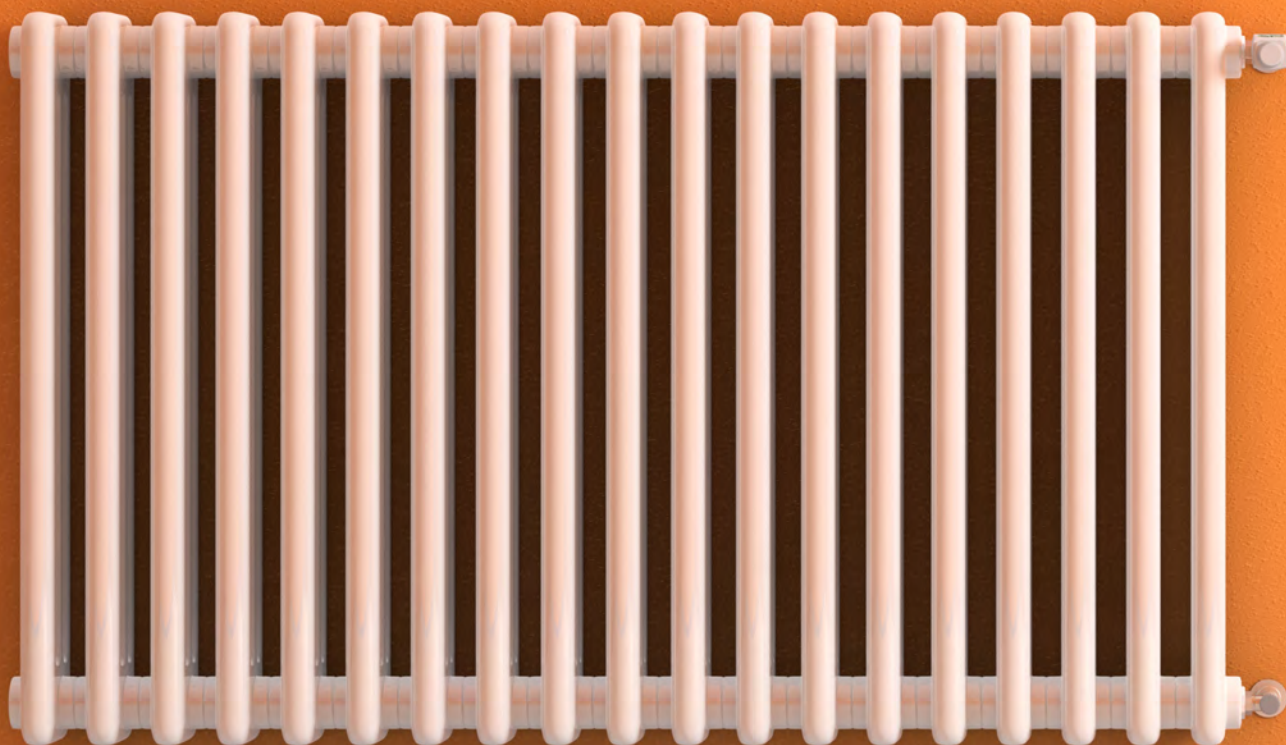
Think about kitchen design early on in the project to ensure that doors and windows are in the right place.

7

Ascertain whether the kitchen suppliers, as well as those supplying fitted bathroom and bedroom furniture, are fitting the units within their price, or whether you will have to obtain an additional quotation from the carpenter.



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CENTRAL HEATING

Most self-builders will use the same plumber for the central heating as they use for the domestic hot water but, there are separate heating engineers. If separate tradesmen or companies are used, then it is important that they liaise with each other and with the electrician.

A heating engineer should be able to take your plans and design the most effective system for your home, taking into account wall thicknesses, insulation values, room sizes and window and door openings.

STANDARD HEATING SYSTEMS

The most commonly used and perhaps most cost-effective and efficient system for hot water and central heating is the combination of a boiler and radiators. The efficiency of this partnership significantly increases by the use of thermostatically controlled radiator valves (TRV's). These allow each room to be set at the required temperature and react to changes in temperature caused by sunshine or other extraneous factors.

UNDERFLOOR HEATING

Underfloor central heating is increasingly popular with self builders and there are several companies that specialise in these systems. However, in general, they all come down to a series of pipe loops set within the floor zone and controlled by room thermostats. While radiator systems work at relatively high temperatures (65/80 degrees), underfloor systems work at relatively lower temperatures - 45/55 degrees. This suits the condensing type boilers, which are at their most efficient at the lower temperatures.

TIPS

Consider your lifestyle before deciding on the best heating system for your new home

A heated towel rail on a separate circuit with individual time controls is an inexpensive added feature for the bathroom

If you opt for underfloor central heating don't forget to advise your designer which flooring medium you'll be using. Carpets and underlay are not as efficient at transmitting heat as tiles

Consider putting a radiator or towel rail in the linen or airing cupboard. Modern cylinders with thermal lagging do not give off much heat

Always use a plumber who is familiar with the systems you have chosen. Do not become the teacher



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CONSTRUCTING YOUR SUBSTRUCTURE OR UNDER BUILDING

UNDER BUILDING CONSTRUCTION

The standard form of underbuilding construction uses two skins of dense concrete blockwork for all external walls. This is built centrally off the foundation concrete to the ground floor, or damp proof course level otherwise known as DPC. If a facing brick is to be used for the external leaf it is usual for the outer leaf, of the blockwork to stop just below ground level with the inner leaf taken up to DPC level to support your chosen or specified flooring system.

Special foundation blocks are available which negate the need for a cavity to go up to ground level, but in most cases, the two skins of blockwork are built with a cavity that reflects the width of the intended superstructure walling. The two leaves are tied together with metal wall ties to provide structural integrity, and this is further increased by filling the cavity with lean mix concrete to ground level or at least 225mm below DPC. Care must be taken with backfilling trenches before this fill has been installed and allowed to go off.

INTERNAL WALLS

Internal loadbearing partition walls are built as single skin walls, which are founded in just the same way as for the external walls, although the width of the concrete can sometimes be lessened. Where a suspended timber ground floor is to be employed, sleeper walls are built to provide interim support. These can be founded on normal strip foundations, but it is more usual for them to be built off a concrete slab known as oversite or solum.

The oversite is built on the levelled out and compacted ground within the building and it is thickened out beneath the dwarf or sleeper walls. These are built-in 'honeycomb' fashion with air holes to allow a free flow of air within the void. Drains or services that pass through walls must be sleeved or allowed to pass freely through openings created by the use of concrete exit lintels. You will need to determine precise positions and levels of all of these.

BASEMENTS

Basements need to be carefully thought out and designed by qualified engineers. There are various means of construction, including pre-formed concrete, poured concrete, blockwork and hollow Styrofoam blocks filled with concrete. These need to be reinforced and integrated with any flooring system. All basements must be tanked or waterproofed, and once again, there are various methods. Most involve the application or building in of a waterproof membrane, but others employ a sump and pump system, which channels moisture harmlessly away.

VENTILATION

All suspended ground flooring systems must be ventilated. With timber flooring systems employing a concrete solum, this is provided by means of air bricks built at intervals and sleeved through the external cavity wall. Beam and block or suspended concrete systems, allow the oversite to remain as compacted subsoil, and cranked ventilators are used. This allows the free passage of air without letting light in, thus prohibiting any vegetable growth.

TIPS

If you are having a timber frame erected the under building size is critical as the tolerances must not exceed 12.5mm on any length, width or diagonal and 20mm on level

The substructure or underbuilding is that largely hidden section of the building which is built off the foundations to the ground floor level

Brick or blockwork must be positioned centrally on the foundations. If the positions are close to the inner or outer edge of the concrete foundation when setting out the positions, consult your architect or engineer

Always ensure that at least 150mm from the finished ground level to the damp course is maintained

Concrete burns the skin, always wear protective gloves and footwear



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CONSTRUCTING YOUR ROOF



OPTIONS FOR CONSTRUCTING YOUR ROOF

Constructing the roof on-site is time consuming and therefore costly and many houses these days are built with a pre-fabricated trussed roof. These trusses come in two basic forms; those which are simply designed to act as the support for the roof covering and those, attic trusses, where the roof void can be occupied.

Timber frame companies almost always include the complete pre-fabricated roof within their package. Those building traditionally have to order their roof separately and can choose between ordering a complete pre-fabricated roof or just the trusses with the ancillary timber being purchased separately.

The more complex a roof is, the more expensive it will be. Occupying the roof space by the use of attic trusses or a cut and pitch roof will increase the overall costs of the roof construction. However, this is a very good and relatively inexpensive way of providing extra space within the home.

ROOF TYPES

Flat roofs are often considered as potentially high maintenance areas, and in design terms, they have fallen out of favour. However, they still have their place. A flat roof can have a concrete or timber deck. In previous times most flat roofs were constructed as 'cold roofs' where the insulation was beneath the decking. This is now banned in Scotland and frowned upon in the rest of the UK and instead, roofs are usually built with the insulation on top of the decking beneath the waterproofing. The traditional waterproofing is two or three layers of felt laid onto hot bitumen, finished off with a layer of protective chippings. Modern alternatives use four layers of glass reinforced polyester bonded permanently to each other and the decking, with no joints or seams.

'Cut and Pitch' roofs are constructed on-site from loose sawn lumber delivered to site. This style of roof is sometimes referred to as a purlin and spar roof because the construction usually takes the form of timber or steel purlins spanning between gable walls supporting rafters or spars between the wallplate and

the ridge. Such a roof has to be designed by an expert who will calculate the various sizes of timber needed to perform the many different functions such as purlins, rafters, ceiling tiles, collar ties, hip and valley trees.

INSULATING YOUR ROOF

All roofs must be insulated. A cold roof has the insulation at ceiling joist level and, unless a breathable membrane underlay is used, the roof void must be ventilated by the use of proprietary soffit, eaves and ridge ventilation in order to prevent condensation.

A warm roof has the insulation directly below the roof covering making condensation unlikely; it does not require ventilation.

TIPS

Check that the roof is properly ventilated with all soffit or fascia vents fitted.

Always use the proper fixings.

Never cut a pre-fabricated truss.

Always ensure that the roof trusses are properly braced both structurally and in accordance with the drawings and temporarily during erection, especially in windy conditions.

Check that the wallplates are level and properly tied down with strings.



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ELECTRICAL INSTALLATION

This trade should only ever be carried out by an expert. It is a specialist skill and safety is extremely important. Most suppliers will not connect the power until such time as the system is checked and certified by a qualified electrician.

YOUR ELECTRICIAN

The electrical trade is normally carried out on a supply and fix basis and is divided into two parts:

- **First Fix** concerns the general carcassing where the wires are simply run into position down the walls and through the middle of any timber flooring to the outlets.
- **Second Fix** which happens after plastering is complete, concerns the fixing of faceplates the wiring up and fixing of light fittings and the wiring and testing of the boiler in conjunction with the plumber.

POWER POINTS AND FITTINGS

Most self builders will want to ensure that they have sufficient power points and that the lighting is designed to give them the ambience they want in their new home.

It is easy to go over the top with electrical fittings but, it should be borne in mind that it is much easier and cheaper to put things in at the early stages than it is to add them later. When you do have a price from the contractor, get prices for extra points and switches.

Building regulations require that all power sockets must be no lower than 450mm from the floor. All light switches are required to be no higher than 1200mm from the floor. New regulations bring electrical works within the ambit of the Building Regulations and require that works to domestic premises must be carried out by a 'competent person', defined as 'A person registered under an electrical self certification scheme or a competent electrician capable of signing a BS7671 Electrical Installation Certificate'. This would normally preclude a DIY private individual or even a general builder's own right to provide the load bearing wall element of a package deal house.

TIPS

- Mark up a plan and then, before the contractor starts, mark the positions on the walls of the house, imagining as you do, the furniture layout. You may find that you want to alter things a little at this stage
- Only use a fully qualified electrician
- Think about shaver points, TV aerial points, telephone and computer modem points and trunking
- Don't forget to fit lights in cupboards and the loft
- Be creative with your lighting. Lights can change the mood of a house at the flick of a switch
- Don't forget outside and security lighting
- Always keep a copy of your electrical completion certificate safely with your other house documents
- Circuits should be clearly marked on the consumer unit



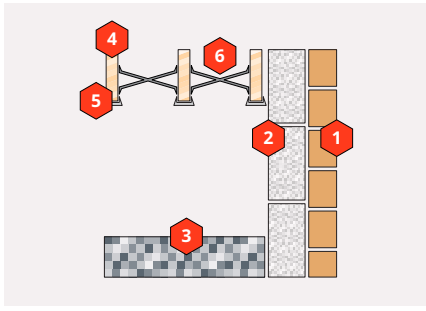
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FLOOR STRUCTURE

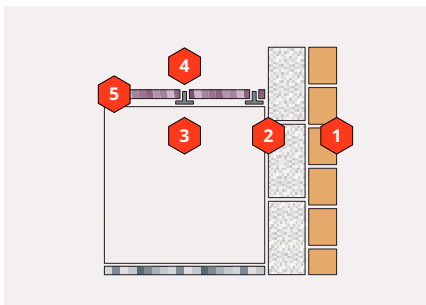
There are 3 main types of flooring available for domestic housing: Suspended Timber Floor, Beam and Block Floor and Solid Concrete Oversite Floor.



1. Outside Wall
2. Concrete Block Inner Wall
3. Concrete Oversight
4. Wooden Joist
5. Metal Joist Hanger
6. Herringbone Strut

SUSPENDED TIMBER FLOOR

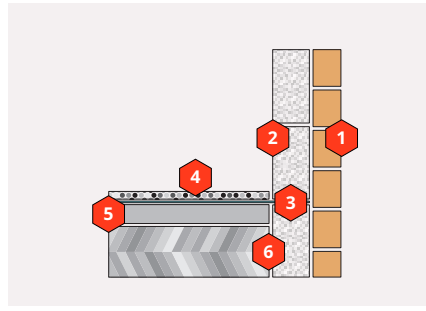
A Suspended Timber floor at ground or intermediate level is created by timber joists spanning from wall to wall to support the floor decking or boarding. The joists are supported on the outside walls using metal joist hangers built into the brickwork. Interim support is also provided by the sleeper walls already referred to. Many houses now employ manufactured 'I' beams instead of timber joists. These provide greater strength and eliminate creaking. Timber frame companies may supply flooring panels in lieu.



1. Outside Wall
2. Concrete Block Inner Wall
3. Sleeper Wall
4. Concrete Beam
5. Concrete Block

BEAM AND BLOCK FLOORING

Beam and Block floors can be utilised at ground or intermediate level. With a Beam and Block floor, inverted 'T' shaped concrete beams span from wall to wall. These walls must be founded. The beams are infilled with concrete blocks to provide a stable suspended floor, which can often support internal partition block walling.



1. Outside Wall
2. Concrete Block Inner Wall
3. Hardcore Infill
4. Sand Blinding
5. Damp Proof Membrane
6. Min 100mm Concrete Oversight

A SOLID CONCRETE OVERSITE

Basements need to be carefully thought out and designed by qualified engineers. There are various means of construction, including pre-formed concrete, poured concrete, blockwork and hollow Styrofoam blocks filled with concrete. These need to be reinforced and integrated with any flooring system. All basements must be tanked or waterproofed and, once again, there are various methods.

Most involve the application or building in of a waterproof membrane, but others employ a sump and pump system, which channels moisture harmlessly away.

INSULATION OPTIONS

Flooring systems need to be insulated at the ground floor level: Timber ground floors are usually insulated by means of glass fibre or mineral wool between the joists, supported by netting. Alternately, ridged foam insulation can be cut between the rafters, supported by battens.

SOLID CONCRETE OVERSIGHT INSULATION

Solid Concrete Oversights can be insulated with rigid foam type insulation boarding laid below it, above it or in a combination of the two. When laid below, an additional layer of damp proof membrane is laid over the insulation prior to the concrete being poured. If it is exclusively below, then vertical perimeter insulation is needed between the slab and the outside walling. If it is laid on top, then it can support either tongued and grooved flooring as a floating floor or a sand and cement screed laid on a damp proof membrane.

BEAM AND BLOCK INSULATION

A Beam and Block ground floor usually has the rigid foam insulation laid on top, and this is either screeded or has a floating floor as above. When used at intermediate level, although it is not strictly necessary to incorporate insulation, it is normal practice beneath either screed or a floating floor.

Insulation and decking laid on top of a concrete or beam and block floor are usually left until later on in the building process. If underfloor central heating is to be employed, the pipes are also laid within the screed or the insulation at this later date. Timber floors receive their decking at the same time as they are laid and therefore, any necessary metal baffle or spreader plates, together with the central heating pipework, will need to be laid prior to the decking going down.

TIPS

- If you are using chipboard flooring as a surface, it is important that you follow the manufacturers recommended fixing instructions: includes sufficient nailing and glueing of joints.
- Ensure the floor is fully insulated
- If you have a block and beam floor, you should ask the supplier if you will require a crane on site to offload and position the beams.
- With a floating floor ensure you leave a 10mm expansion gap around the perimeter.
- If some rooms are to be screeded while others are to have a floating floor, make sure that the flooring is set at the right height to maintain the same levels.



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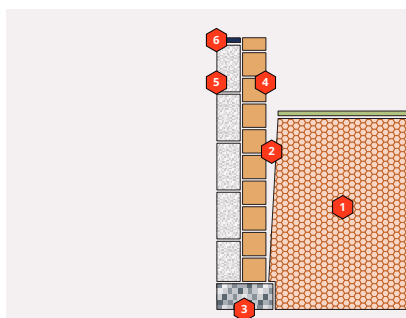
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FOUNDATIONS

There are four types of foundation: Deep Strip, Raft, Trenchfill and Piled. Wherever possible, establish ground conditions by means of a survey in order to pre-determine the foundation method best for your site.

DEEP STRIP FOUNDATIONS

Deep Strip foundations are the least expensive and are used when ground conditions are good. A concrete strip, sometimes reinforced with steel mesh, supports the walls. The trench depth is variable but in most cases should be at least 1m with a width of 600mm. The concrete should have a minimum depth of 225mm.

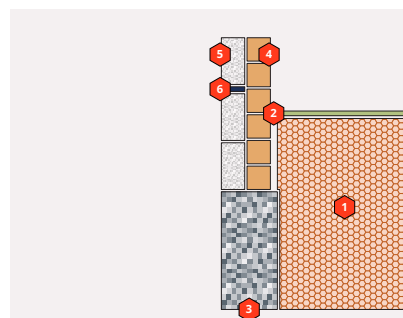


Deep Strip Foundation Construction

- 1 Land
- 2 Foundation Trench
- 3 Deep strip Foundation
- 4 Outside Wall
- 5 Inner Wall
- 6 Damp-Proof Course

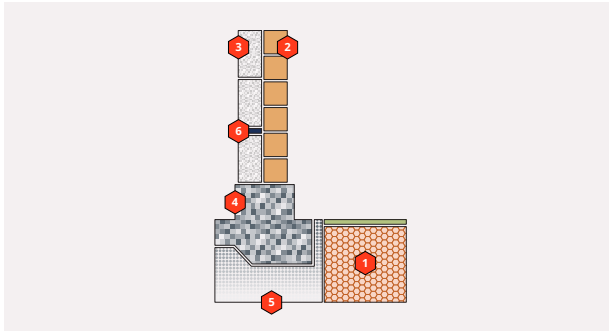
RAFT FOUNDATIONS

Raft foundations are used where the ground is inherently stable but where conditions deep below the surface, such as mining, might lead to ground movement. The reinforced raft is cast on top of consolidated hardcore and is shaped at the edge to provide a step upon which both leafs of the wall are constructed.



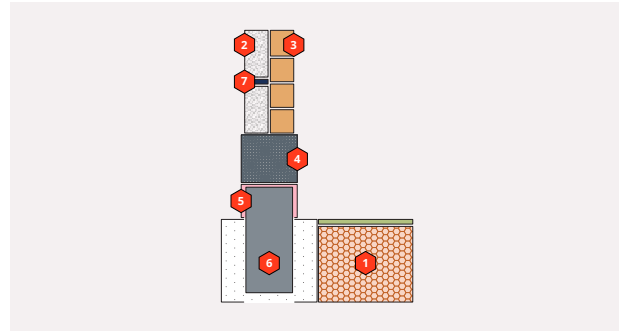
Trenchfill Foundation Construction

- 1 Land
- 2 Foundation Trench
- 3 'Trenchfill' Foundation
- 4 Outside Wall
- 5 Inner Wall
- 6 Damp-Proof Course



Raft Foundation Construction

- 1 Land
- 2 Outside Wall
- 3 Inner Wall
- 4 Hardcore Infill
- 5 Raft Foundation
- 6 Damp-Proof Course



Piled Foundation Construction

- 1 Land
- 2 Inner Wall
- 3 Outside Wall
- 4 Reinforced Concrete Groundbeam
- 5 Compressible Material
- 6 Concrete Pile
- 7 Damp-Proof Course

PILED FOUNDATIONS

Piled foundations are used where good bearing ground can only be found at deeper levels or where physical restraints make other forms of foundation impossible. A Piled foundation is usually carried out by specialist contractors. The piles can be dug, bored or driven into the ground. They support a concrete ring beam or ground beam that spans from pile to pile, upon which the house is built. This ring beam can be prefabricated, but if it is cast on site, it may be necessary to have reinforcement cages ready-made up to an engineer's specification. In certain situations, it may also be necessary to have compressible materials on hand to line the underside or sides of the beam.

OVERCROWDING ON SITE

Bear in mind that during the build a number of items may be needed at short notice such as scaffolding, diggers, dumpers or cranes, so ensure there is adequate space for them. It is also a good idea, if you have room, to position a skip on site for the gathering and regular removal of rubbish as the build progresses.

TIPS

1

Concrete burns the skin so always wear protective gloves and footwear.

2

Ensure the base of any foundation trench is clean, level, dry and free of any loose material. Trench sides should be cut square with the base. The ideal situation is to excavate the trenches and pour the concrete the same day. Special mixes that flow around the whole channel are available, which do away with barrowing.

3

Foundations poured in winter conditions must be done following strict guidelines and should be covered over.

4

It is best to consult a weather forecast for possible frost conditions because overnight frost can ruin concrete.

5

If you decide to use a concrete pump to place concrete, give the suppliers plenty of warning of your intention.

6

Locate your nearest hire depot for urgent requirements such as a water pump in the event of flooding.



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HARD AND SOFT LANDSCAPING

This is one area of the home that many self builders fail to consider properly. This is a pity because the garden should not be considered as separate from the house but rather, should be thought of as an extension to the home; a room in the open air.

REGULATORY REQUIREMENTS

The requirements for disabled access in the Building Regulations also impinge on the garden area where the design of pathways has to facilitate wheelchairs being able to approach and enter the house via a level threshold.

- Ramps should not be longer than 10 metres with a slope of up to 1:15 or 5 metres for slopes up to 1:10.
- Normally steps are not allowed except on steeply sloping sites where they must have a rise of no more than 150mm and a minimum width of 900mm.
- Additionally, the rise between landings must be no greater than 1.8 metres.
- A level threshold and approach pathway are required to the main or at least one entrance on the main entrance floor. This will require a hidden drain or gully to prevent the ingress of water.

PLANNING YOUR GARDEN

Large amounts of soil have to be taken away from some sites. Think about whether this can be kept on site and used to form the landscaping with banks, terraces, rockeries and ponds.

You can claim the VAT back on most materials purchased for hard landscaping within the garden of a new house or conversion, including fencing, paving and walls.

It is also possible to reclaim the VAT on certain soft landscaping such as turfing or planting, so long as they were included or required within the planning consent.

TIPS

- Many local authorities refuse to issue a completion certificate until a proper driveway is installed. They must also insist on pathways, including disabled access, and bin stores being completed
- Stand in the rooms and view the gardens from as many angles as you can to ensure that trees and shrubs are planted in the optimum position
- Choose hard landscaping that, if it doesn't match the house materials exactly, at least compliments them
- When choosing patio, pathway and drive surfaces, be careful about just how slippery some things like brick pavers can get in the winter



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INSTALLING DRAINAGE

The decision on whether to construct your drains once you have reached oversite or damp proof course (DPC) level with the underbuilding is a tricky one. It may seem best to get drains out of the way and backfilled at the same time as all of the other groundworks are taking place. On the other hand, if work on the superstructure is to continue, they may be in the way, prevent the erection of scaffolding or get damaged by the ensuing works.



Talk to your Key Account or Sales Development/Branch Manager about the many different options for treatment which exist. In certain circumstances you may need to pump your drainage, our partners have specific products to help with this.

FOUL DRAINAGE

Foul drainage is best disposed of to the 'mains drains', which may be adopted or private at the point of connection. If mains drainage is available, you will be required to connect, even if this is not the cheapest option. If a sewer is not available, there are at least three other options:

- **Onsite septic tank:** this passes partially treated effluent into subsoil irrigation
- **Treatment plant:** this passes more refined semi-sterile effluent into subsoil irrigation, a soakaway or a watercourse
- **Cesspool:** this is where the household effluent is stored for collection and off site disposal

Surface water is usually dealt with by taking it to soakaways constructed 5 metres from the home. These are often simple holes filled with rubble but in areas of poor drainage may have to be more complicated brick or concrete chambers. If a watercourse is available, this is the best option. Consider recycling your rainwater, not only is it ecologically friendly but with our partner's tank and assembly kit, it offers a simple alternative.

SURFACE WATER

Most self builders opt for plastic-type drainage, which is easier to handle on site and stand to test. Drains must be laid in carefully dug trenches and surrounded by clean pea gravel. All routes must follow straight lines and all changes of direction must be made at a manhole or inspection chamber. Falls are usually 1-40 but can go as low as 1-100 if plastic drainage is used. No drains can be backfilled before inspection and testing.

TIPS

Consider recycling your rainwater, not only is it ecologically friendly but with our partners tank and assembly kit it offers a simple alternative.

The Environment Agency will need to approve the use of a septic tank, treatment plant or cesspool. They will expect you to have undertaken your own soil porosity test as evidence for your election.

Surface water is usually dealt with by taking it to soakaways constructed 5 metres from the home. These are often simple holes filled with rubble but in areas of poor Take care when siting off mains drainage systems as all of them need to be emptied or maintained at times and tankers can only reach 60 metres.



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INSTALLING YOUR DOMESTIC PLUMBING

Due to the complexity and number of the fittings and fixtures needed to install domestic systems, it is normal for the plumber to quote this trade on a supply and fix basis. However, many self builders will want to supply their own sanitaryware and perhaps the boiler.

GENERAL

Cold water is supplied directly into your home from the mains via a stopcock positioned within the highway. The supply must be at least 600mm below ground to avoid frost and, it is brought up within the house to the most convenient stopcock position, usually below the kitchen or utility room sink. The groundworker will bring the drainage pipes up through the oversite. The plumber then takes over and takes the soil and vent pipes up to connect to the domestic waste water outlets.

The plumber is also responsible, in conjunction with the roofer for the vent pipes and skirting through the roof and for any necessary leadwork to the roof, liaising with the bricklayer for any pointing.

The plumber will usually be responsible for the installation of any gas piping. Plumbers installing and commissioning gas fired systems must be CORGI (Council for Registered Gas Installers) registered. Plumbers installing and commissioning oil fired systems should be OFTEC (Oil Firing Technical Association) registered. The plumber is usually responsible for the fitting of guttering and downpipes, once the fascias are decorated, liaising with the roofers and groundworkers.

VENTED AND SEALED HEATING SYSTEMS

Most of the older housing stock has a vented system, which employs storage and header tanks in the roof that take up any expansion as an overflow and top up and return water to the system. Most new homes are now built with a sealed system delivering hot water to the tap at mains water pressure. These systems do away with the need for tanks in the loft and, instead, any expansion is taken by an expansion vessel connected to a hot water cylinder that is capable of storing hot water under mains pressure.

HOT WATER CYLINDERS

Many homes have an indirect hot water cylinder where the hot water within the primary system from the boiler passes through a coil or heat exchanger within the tank, which in turn heats the main body of water. This 'secondary' water is then drawn off to the tap. An alternative is the 'thermal store'. Here the main body of water within the cylinder is heated by the boiler and cold water, passing through a coil, is heated up to provide mains pressure hot water.

TIPS

Make sure that you order sanitaryware and kitchen units in good time so as not to delay the trades.

Make sure that the ducting, if not the water supply piping is set through the oversite. If it is convenient to do so, a temporary tap can be put on the end to act as a standpipe for the build until such time as the proper stopcock is installed.

Ensure all plumbers dealing with gas piping or boiler installation are CORGI registered.

The plumber should be on site as soon as the roof is weathertight in order to notch out the top of the joists and lay the carcassing pipework prior to the floor decking going down.



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INSULATION, ENERGY EFFICIENCY, ECO AND GREEN ISSUES

For those interested in Green issues there is probably no better way to make your home ECO friendly than to spend the money on increased insulation and, unlike many of the other options, this one is the most likely to provide an immediate and worthwhile payback.

Insulation in its various guises and uses has featured in most of the Build Stages that precede this section. However, insulation is just one part of the whole equation that goes towards the energy requirements for your new home.

The SAP (Standard Assessment Procedure) measures the space and hot water heating costs per square metre of the floor area, taking into account a - whole host of different factors such as the size, the heating system and what type of boiler is used with which type of fuel, the ventilation characteristics plus the expected occupation and heating requirements.

The results are converted into a rating from 1-100 and, in order to comply with the Building Regulations, homes must achieve a minimum SAP value of 60, although most modern houses achieve far higher.

There are three main methods of demonstrating compliance with the Building Regulations:

THE ELEMENT METHOD

The most publicly understood method of heat loss calculation is the 'U' value, which measures the heat loss in watts for every square metre of the material in relation to each degree of temperature difference between the inside and the outside. The lower the 'U' value, the more thermally efficient the material is. The elemental method lays down specific 'U' value targets for each element of the building.

	Floors	Walls	Standard Roofs	Sloping Roofs	Windows	Flat Roofs
England & Wales	0.25	0.35	0.16	0.20	2.0	0.25
Scotland	0.25	0.30	0.16	0.20	2.0	0.25

Metal framed windows can have an average 'U' value of 2.2. In Scotland, the level of 'U' value achieved is dependant upon the type and efficiency of the boiler.

TARGET 'U' VALUE METHOD

This method is slightly more complicated but allows for greater flexibility in design. It calculates an average 'U' value for the home.

CARBON INDEX METHOD

This provides the greatest flexibility of the three in terms of design, but it is not easy to understand, and it requires extensive data on the construction and location of the home.

TIPS

When choosing green materials for your build look for those which take the least energy in manufacture and which are either recycled or can be recycled

1

Sheep's wool and recycled newspaper products can be used for insulation

2

There is a wide range of good environmentally friendly paints and stains to choose from

3

When choosing appliances for your new home make sure that they are low energy and where appropriate low water consuming

4

Many package suppliers offer an energy efficient upgrade to their standard products and there are some companies who specialise only in low energy homes

5

A wind turbine could be useful for a remote and exposed house and might provide a significant proportion of the home's electricity needs

6

Alternative water and waste systems such as reed bed sewage systems and the collection and cleaning of rainwater for washing machines and flushing toilets can be considered

7

45%

Homes can benefit from up to a 45% uplift in energy efficiency

90,000

Over 90,000 homes benefitted from new insulation in 2018

79%

79% of UK homes could improve their energy efficiency



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GUIDE

TRADITIONAL BUILD HOMES & MASONRY CONSTRUCTION

The term 'traditional build' is most often used to describe a dwelling where the internal load bearing leaf of the walling is of masonry construction, tied with stainless steel ties to an outer leaf of either block or brick.

MASONRY CONSTRUCTION VS TIMBER FRAME KITS

Despite the many advantages of timber frame, most homes in the UK and most self built homes use the masonry construction form of building. The most obvious disadvantage to masonry construction relates to the fact that there is very little that can be pre-fabricated off site and therefore the construction process is largely dependent upon the weather. Perhaps this is why in Scotland the situation is reversed, and most new homes are built using a timber frame. Although there are package deal companies dealing in traditional construction, by and large, most self builders opting for this built route choose to go it alone.

TYPES OF BRICK

Bricks come in many varied forms and colours. Common clay bricks can be used in foundations and for internal load bearing walls. Common concrete bricks are used to course blockwork.

- **Facing bricks** are common clay bricks that have a sand face added to them in order to provide them with a weathering surface. They are only suitable for use within a wall and cannot withstand individual exposure to frost.
- **Stock bricks** are dense clay hard fired bricks that are suitable for most applications and can usually present any face to the weather. Wirecut bricks are similar but are faced on one side and both ends.
- **Handmade bricks** are made from clay thrown by hand into a mould to create the desired creases, known as 'smiles'.
- **Engineering bricks** are very hard bricks that are used in high load bearing situations and in manhole construction. They can also be used as part of a Damp Proof Course and as the capping for a wall.

BLOCKWORK CHOICES

As with Timber Frame, there are many varied forms of construction. Blocks take many different forms.

- **Dense Concrete Blocks** have a high strength factor and they are therefore used for foundations, external leafs of walls that are to be rendered and for internal load bearing partitions. They do not, however, have a very high insulation value.
- **Lightweight Aerated (Aircrete) Blocks** are suitable for foundations, internal and external leaves of cavity walls, solid walls, internal walls and party walls. They provide a far greater thermal efficiency but usually have to be combined with some sort of insulation either in the cavity or on the internal face, in order to bring the home up to the requirements of the regulations. They can also be used as the infill with a beam and block floor.
- **Thin Joint Systems** have been designed to speed up the build process. Using aircrete blocks engineered to exact sizes, they can be used for all the same applications. The blocks are laid using a proprietary mortar (instead of sand/cement) which is applied using a special scoop or sledge. The system allows a single leaf to be taken up to roof height without waiting for the external leaf matching the speed of timber frame.

There are also thin joint blocks that do away with the need for the cavity, creating a solid wall construction. Most blockwork construction is subsequently rendered on the outside.

WINDOW AND DOOR OPENINGS

Timber windows and doorframes are usually built in as work progresses using proprietary cavity closers, which maintain the wall insulation and prevent cold bridging. UPVC frames are often put in at a later date, and instead, special cavity closers or formers are built in as work progresses. Lintels are needed to support brick or block work above openings. A cavity tray is essential where there is an abutment to a house and the cavity wall is interrupted. This channels any moisture that might find its way into the cavity through weepholes and harmlessly to the outside.



TIPS

- If expansion joints are needed in blockwork or facework using concrete bricks, consider concealing them behind downpipes.
- Always keep your bricks, blocks and sand covered when on your site.
- Store cement in a dry place up on pallets.
- Always use the correct lintels and steels as specified by the architect/engineer.
- Stack bricks for use by taking them from a mix of packs in order to avoid problems with slightly different shades or colours.
- If frost threatens, drape hessian over all new work.
- Turn back the first scaffold board at night to avoid mortar being splashed on bricks if it rains.

PACKAGE HOME SYSTEMS

Almost invariably these revolve around a 'Timber Frame' package where the frame is manufactured off site and usually erected to the shell stage by the suppliers.

OPEN PANEL SYSTEM

Most timber frame companies use an Open Panel system. These are structural panels forming the inside load bearing leaf of the cavity wall, which are manufactured in factory conditions and then brought to site and fixed together to form a rigid structure. They are made from softwood timber framing over which a structural sheet material such as plywood or orientated strand board, known as the sheathing, is fixed with a vapour permeable but waterproof membrane, fixed to the outside.

They are delivered open on the inside, hence the name. Windows and door frames are usually fixed on site. Once the house is weathertight, and the electrical and plumbing carcassing has been completed, the insulation is installed between the studs before a vapour proof barrier is tacked up followed by the plasterboard.

CLOSED PANEL SYSTEM

The closed panel system is favoured by some of the Scandinavian style frame companies. The panels are delivered fully furnished and insulated with the services in and the windows and doors already fixed. The advantage is an airtight structure with on site

work reduced to a minimum. The disadvantage is the fact that minds have to be made up regarding services and outlets at a very early stage of the design.

AISLE FRAME SYSTEM

The Aisle Frame system uses massive structural timbers to provide the main load bearing support with the open panels, thus free to act independently. This system is often employed as single skin construction, particularly where a rendered finish with timber plants is required.

GREEN OAK FRAMING

Green Oak Framing uses a massive oak skeleton that is then infilled with urethane panels and made waterproof by a system of perimeter trims and water bars before being rendered on the outside leaving the timbers exposed. Some exponents also clad the outside, with Structural Insulated Panels (SIPs) leaving the oak timbers exposed only on the inside face. These Structurally Insulated Panels (SIPs) are made by bonding rigid foam insulation in a sandwich between boarding. They are increasingly being utilised in their own right to provide the load bearing wall element of a package deal house.

TIPS

- Make sure you know what is and isn't included in the package deal.
- Never modify a structural element without first consulting the suppliers.
- Make sure that if the breather membrane is damaged it is repaired immediately.
- Check when and what payments are required and co-ordinate these with your cash flow.
- Tile the roof before commencing the outer brickwork skin to allow for movement.
- Wherever possible try and ensure that your package supplier erects the timber frame on site. This way you know the materials are all correct and constructed within prescribed tolerances.



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GUIDE

PLASTERING AND RENDERING

This is one of the most important trades as it provides both the finishing standard to the interior of your new home and, where the outside is rendered, provides the final weathering coat.

Internally the choice, for self builders, is whether to opt for hard plaster (a sand and cement render coat with smooth plaster finish) or dry lining (a plasterboard finish). In the past this choice was often dictated by whether the home was built using traditional masonry construction or was timber framed. Timber framed properties can only be dry lined but those using building traditional masonry construction have the choice and increasingly, they are opting for dry lining.

HARD PLASTER

Hard plaster requires one, sometimes two coats of sand and cement render with a finishing coat of smooth plaster. The sand and cement render can be replaced by proprietary plasters of differing types, each one of which is formulated for use a different substrate. The advantage of hard plaster is that it is extremely durable. The principal disadvantage is that it puts enormous amounts of water into the structure and this can lead to long drying out times.

DRY LINING

Dry lining uses plasterboard fixed to the walls and is therefore a relatively dry process, which can be decorated shortly after completion. With a timber framed home the plasterboard is tacked directly to the timber studs. When used in traditional masonry construction, it can either be stuck to the walls by means of dabs of plaster or tacked to battening, firmly fixed to the substrate. Dry lining can be taped and jointed using special paper tape or it can be skim coated with a thin coat of plaster to provide a surface finish that is indistinguishable from hard plaster.

The standard plasterboard can be replaced by the more durable Gypsum Fibre Boards, which provide greater sound insulation properties and are strong enough to take fixings directly.

CEILINGS

Ceilings to be Artexed are usually tacked with plasterboard and taped with paper scrim prior to the finish being applied from the floor using special applicators and patterning tools. Any decorative mouldings or covings are put up before the Artex is applied.

Plastered, or 'set', ceilings are jointed with a silk scrim and then finished with a thin coat of smooth plaster. This is applied by a hand held trowel and there is therefore the need for a 'board or foot scaffold'. Any decorative mouldings or covings are put up afterwards.

FLOOR SCREEDS

If a floor is to be screeded it is the job of the plasterer. A screed can be mixed on site from sharp sand and cement or it can be brought in ready mixed in truck loads. Screeds that are bonded directly onto an oversite or concrete base can be as thin as 50mm. Those that are laid on top of insulation have to have a minimum thickness of 65mm. Screeded garage floors have to have reinforcement mesh within them.

RENDERING

It is also the plasterer's job to render the outside of a building. This means that an independent scaffold should be employed if you are not to incur heavy charges for moving and altering the scaffold.

Rendering is normally carried out with a one or two, occasionally three, coat render of sand and cement. For a smooth finish, the final coat is rubbed up with a float or trowel. Pebbledash is created by thickening the final coat and then dashing (throwing) pebbles into the mixture and pushing them home with a trowel. Tyrolean is created by a hand held machine that dashes a mixture of pebbles and render onto a first coat of render.

Don't forget that the plasterer will need a foot scaffold for setting ceilings

TIPS

If you opt for hard plaster, don't forget to give plenty of time to dry out naturally before decorating

Remember that bagged plaster has a limited shelf life. Don't buy or use old plaster

No amount of paint or wallpapering will cover bad plastering - choose your contractor with care

If you are rendering the outside, use an independant rather than a putlog scaffold



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GUIDE

PRELIMINARY PREPARATION AND PLANT HIRE

Before you start building your own home there are a number of things that have to be organised. Your site will need to be cleared, so a digger and a lorry for soil removal will be needed. Safety is important during your build, both for people working on the site and for members of the public.

SAFETY FIRST

Do you need to hire lockable storage & site fencing? Your insurance may not cover you if you don't. A safety fence to keep the site and materials stored on it secure, and the general public out, is a good idea. If you have no secure storage available, a lockable store for tools and equipment will be needed.

ENTRANCE AND ACCESS

If you have arranged for delivery of ready-mixed concrete is your site accessible? Don't just think about your site, what about the roads on the approach?

If you are considering using a timber frame or SIPs system, can an articulated lorry reach your plot? Nearly all system homes are delivered on articulated trucks, as are many trusses. Make sure your suppliers are aware if you think access might be difficult. Get them to check!

If you are building in the winter a driveway or entrance can become a quagmire, will you need to put some hardcore down as temporary access on site?

HEALTH & SAFETY

Who is responsible for site safety? If you are employing a number of different sub-contractors rather than one main contractor, it may well be you who is responsible.

BUILDING CONTROL APPLICATION

Generally, you can't start work without approval by your local council; you can, however, apply to start under a 'Builders Notice' giving them 48 hours warning. It will all depend on the type of project you are undertaking.

ELECTRICITY & WATER SUPPLY

Electricity is not essential in the early stages but is very useful as the building progresses. Many hand tools use re-chargeable batteries, but heavy-duty tools need power. If you cannot arrange for a temporary supply, you might need to hire-in a generator. Remember that many tools on-site are 110 volts and you might need to make sure that you have a transformer.



Water is essential on-site, and if you haven't already arranged for a stopcock and standpipe, you will need to locate a temporary source by agreement with a neighbour to fill the water butts. Alternatively, you can hire a bowser.

EQUIPMENT

Have you hired or purchased the key equipment you will need? If you are building a timber frame house; you will need a crane. Some suppliers will arrange this for you; some don't.

Who's organising the scaffolding? What size mixer do the brickies want? Bear in mind that during the course of the build, a number of these items may be needed at short notice so ensure there is adequate space for them.

Site Insurance

Accidents and theft from building sites can happen make sure you have site insurance before starting.

1

Access

The way into the site needs to be at least 3m wide to allow lorries to get in.

2

Overhead cables

Watch out for any overhead cables. They may have to be moved or sleeved.

3

Tree Preservation Orders (TPOs)

Before clearing the site check whether or not any of the trees on site have TPO's on them.

4

Services

Check for existing site services (gas, electricity and water).

5

Structural Warranty

Make sure that this has been arranged if you intend to sell your property within 10 years.

6

Site investigation

Is one necessary or advisable?

7

Health & Safety Guidelines

Have you identified who is responsible for site safety?

8



GUIDE

TILING OR SLATING THE ROOF

In England and Wales, a waterproof underlay is laid across the trusses and held down by the roofing or tile battens. In Scotland, there is a requirement for sarking boarding beneath this underlay with counter battens beneath the roofing battens.

TYPES OF TILES

- Interlocking concrete tiles are perhaps the most cost-effective of the roof coverings. These are large tiles that cover around ten to the metre. They are laid as a single lap, side by side with the grooves on the underside of the one tile resting within those on the upper side of the preceding tile.
- Plain tiles come in both concrete and clay forms with the hand made clay tiles being the most expensive. The coverage rate is around sixty to the square metre, so there is a consequent increase in labour. Additionally, as the tiles are laid double or treble lapped (i.e. each tile has part of up to two other tiles beneath it) there is a great deal more battening needed and the weight on the roof is significantly increased. Plain tiles are often used for tile hanging.
- Pantiles are usually made from clay. Traditionally, they are single lapped with the downward roll of each tile simply rolling over the upward roll of the preceding tile. Modern alternatives in both clay and concrete often emulate the look of the pantile while using the technology of the interlocking tile.

TYPES OF SLATE

Slates vary from region to region. They are usually laid treble lapped with each slate nailed to the batten. These days, slates are imported from places as far away as China, Spain and Canada. Additionally, there are many man-made slates on the market made from either fibre and cement or moulded with a mixture of slate dust and glass fibre resin. Some of these combine with the technology of the interlocking tile in order to create a slate effect single lapped roof.

Perhaps the most expensive mainstream roofing option is to use stone slates. These are enormously heavy slabs of natural stone laid in slightly different patterns from region to region. They are most commonly seen in areas such as the Cotswolds and the Pennines. They are very expensive to both buy and lay. Once again man has stepped in to copy them, and there are now acceptable concrete moulded imitations. However, these copies are by no means cheap.

In Scotland, all roofs must be covered with a rigid sarking board over which the underslating felt is laid with a counter batten beneath the roofing battens. If a breathable membrane slating/sarking felt is used then the need for ventilation at the ridge or soffit may be negated so long as there is a counter batten creating clear space below and above the membrane.

