

Ultimate Guide to Shed Foundations



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"The success or failure of any outbuilding relies heavily on its foundation. No structure — regardless of how well it's designed or built — will survive for very long on a weak or poorly made base. Therefore, choosing and building a proper foundation is the single most important construction step in the entire project."

On-grade vs. frost-proof foundations

Shed foundations fall into two basic categories: on-grade and frost-proof. On-grade foundations (sometimes called “floating foundations”) sit right on the ground and are sufficient for all but the very largest outbuildings. They’re also the quickest and simplest to build because they don’t require you to dig deep holes or pour concrete footings or piers. On-grade foundations are usually made of pressure-treated lumber or solid-concrete blocks.

Permanent, frost-proof foundations are more difficult to build, but they’re by far the strongest and longest lasting. These types of foundations are designed for cold-weather regions where ground movement caused by freeze/thaw cycles can affect a building.

The best foundation to build for your shed will largely depend on what the building inspector recommends, but keep in mind that it’s often based on three key factors: the shed’s size, the region of the country in which you live, and the type of shed floor you desire.

In this guide, we'll discuss several on-grade foundation solutions

It's no surprise that most sheds are designed to be built with an on-grade foundation. This base is quick and easy to build, relatively inexpensive, and adaptable enough to accommodate all but the most severely sloping sites. In addition, the components are small and light enough to easily set into place and shift around, making it very easy to get everything square and level. Although it's not technically a "permanent" foundation, an on-grade foundation, when properly built, will probably outlast the shed it supports.

Building a Shed Base

*How to Build a Concrete Shed Base Including
Damp Proof Membrane*



I will show you how to build a concrete shed base and also show you how to get it smooth and level and also include a damp proof membrane.

A concrete shed base is without a doubt the strongest and most durable form of shed foundation. It is also the most costly and labour-intensive (however it should be remembered that the foundation can also be used as a concrete shed floor).

At the most rudimentary level, think of a slab foundation as a single piece of thickly poured concrete uniformly shaped with a flat, level surface. Below ground, the pour will typically be thicker and deeper around the edges, giving the slab a strong footing on which to rest.

The slab foundation, though somewhat labor intensive, does not require a high-level of skill or experience to create, yet it offers a handsome look with long-term durability if done properly.

Tools: Like any household or landscaping project, some basic tools will be absolutely necessary. Every builder should have to following handy:

- Measuring Tape
- Level

- Shovel
- Trowel
- Hammer
- All-weather nails
- Drill
- All-weather screws
- Gloves
- A large hoe
- A heavy steel (concrete) rake
- A spool Twine or string

Aside from those essentials, you will almost certainly need the following from the local hardware store:

- Portable cement mixer (usually available for rental)
- Wheelbarrow
- Wooden or steel support pegs*
- Ground-Contact framing lumber*
- Concrete*
- Gravel*
- Steel mesh or basic chicken-wire*

Note: *The necessary amounts for Items marked with a *will be determined by the size and scope of the project.*

We have chosen a standard construction method which allows for a damp proof membrane under the slab to stop damp rising up through it. The slab itself is designed to be above ground and is 6 inches thick.

For small sheds this could be dug into the ground removing the need for any brickwork around the edges. This is more of a cosmetic finish to the base, just to tidy it up.

A basic run down of the process is to dig the hole 300mm wider and longer than your shed floor, 100mm deep (providing the ground underneath is solid) and pour the concrete onto a damp proof membrane you have laid inside the base of the hole.

However you build your shed base you need to make sure the ground is level over the area of the entire base.

Check Ground to Ensure it is Firm Enough for a Shed Base

If it is critical that your foundation does not move I recommend that you consult a local Structural Engineer, who will have knowledge of the most appropriate type of foundation for the prevailing soil in your area. The foundation design will cost a small

amount. This reminds me of a cartoon I once saw of a couple of Renaissance Italians standing in front of the leaning tower of Pisa saying 'I guess we should have paid the extra 1,000 Lira for a proper foundation design'.

Now you need to check if the ground is firm enough to lay a slab without a hardcore sub-base. To do this get a 50mm x 50mm post and without sharpening the end try and drive it into the ground. This should be hard to do beyond 150mm deep.

If the ground is firm enough and the peg is difficult to drive into the ground then carry on with the instructions below.

If the peg goes in too easily then remove 4 inches of soil for an area of ground which is 500mm wider and longer than the floor of your shed and fill this with scalpings.

Scalpings are crushed stone aggregate and available from aggregate and builders merchants. They are a little more expensive than broken brick hardcore but much much easier to lay and compact.

It is necessary to compact the scalpings before adding the concrete so that they are as tightly packed as possible. If not then over time they could move and slump, removing the support for the concrete and causing it to crack as there is no support from below.

If it is necessary to compact scalplings for your base, then a machine called a "whacker plate" or "vibrating plate" can be hired from your local tool hire shop.



Vibrating plate of Whacker Plate Machine

A concrete shed base doubles as a concrete shed floor.

A floating concrete foundation is typically four inches thick (100 mm), which despite moving slightly should last as long, if not longer than the shed built on top. The slab can be plain (un-reinforced) concrete or a light mesh of steel reinforcement can be added for extra strength and to control cracking.

Although this type of foundation is more expensive than other types, a concrete shed floor does have advantages;

- There is no need to build a separate shed floor.
- It can be hosed down if it gets dirty or wet.
- The floor can be built closer to ground level, thus minimizing the need for a shed ramp.
- A concrete shed base is very durable, damp garden machinery can be left there and there is no danger of the floor rotting as a timber floor could.

A disadvantage of concrete floors is that they can be cold on the feet if you are using them as a work shop or hobby room. If you intend to use a shed with a concrete floor for these purposes then a timber sub-floor or an insulated screed will make the floor a lot warmer.

Getting Started

With a general shape in mind, examine your property for an adequate construction site. The ideal space will consist of level, undisturbed and firm soil. Avoid land that doesn't drain well. During the wet season, such ground can not only flood, but shift with increasing saturation.

For those with only unlevel or hilly building space, know that completely leveling your chosen site will be an additional step in the process so plan accordingly.

Once you know where you want to build, take care to mark the area. Pegs and string tend to work best for this, but is not necessarily required, just recommended. Chalk-lining or spray painting are also suitable options, so long as wet weather won't damage the markings.

The area now marked off, check the future corners of your shed to ensure that you've measured out right angles. An easy way to do this is to measure the diagonals—if they are equal to each other, the corners are square.

The main items of work are:

1. Excavation
2. Formwork
3. Mixing concrete
4. Placing and finishing the concrete

Excavation

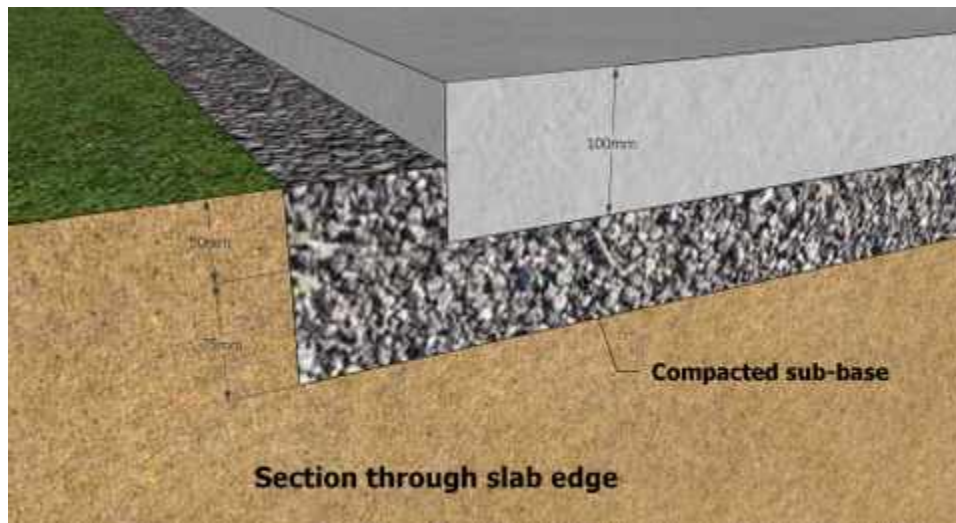
Having already identified and outlined the site of your future shed, it's time to break ground. Keeping the border pegs in place for reference, begin digging out the entire area somewhere between 3 and 4 inches. Make sure that the finished area is as close to level as possible.



At the border of the area marked off, continue removing soil to a depth of 10 to 12 inches, forming something akin to a trench all the way around. The width of this deeper portion need be no wider than a small shovelhead, about 6 inches. This trench will serve as the footing area for the shed.

The bulk of the digging done, begin framing with boards cut-to-length—A veteran tip: wait to purchase the boards until all digging

has been completed. Re-measured for the site again for accuracy and then take those measurements to the hardware store or lumber yard. Have them cut the boards according to your measurements—it will save time and reduce stress.



Formwork

The formwork for a concrete shed base will most likely be 18 mm (3/4") plywood with 50x50mm timber stakes knocked into the ground at two feet (600 mm) centres.

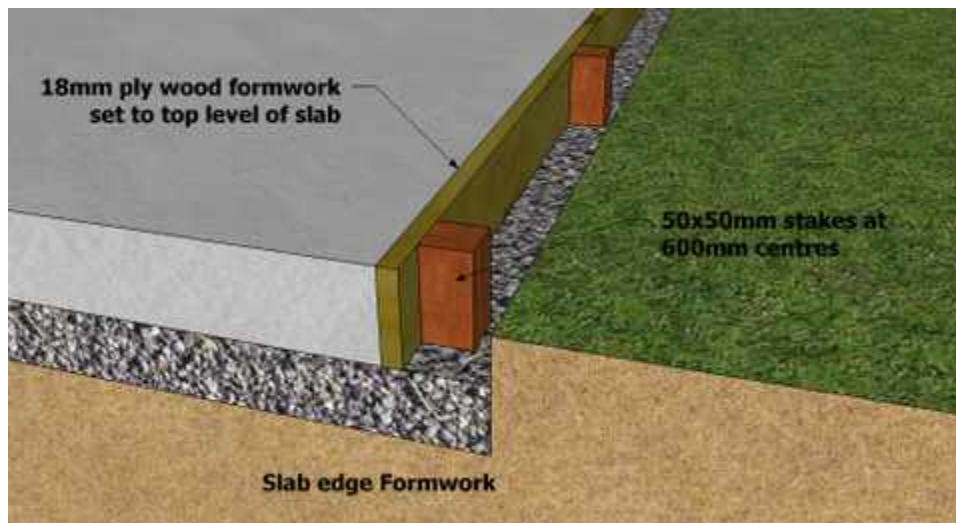
The formwork should be set up off of the level stone/earth base, so that the top is level all the way around and that none of the posts stick up above the top of the formwork.

The formwork needs to be sufficiently robust that it will be able to contain the wet concrete and act as a guide for the timber straight

edge tamper when it comes to leveling the concrete surface. The area of the pour should be lined with a PVC Damp Proof Membrane (DPM). The purpose of this membrane is two fold;

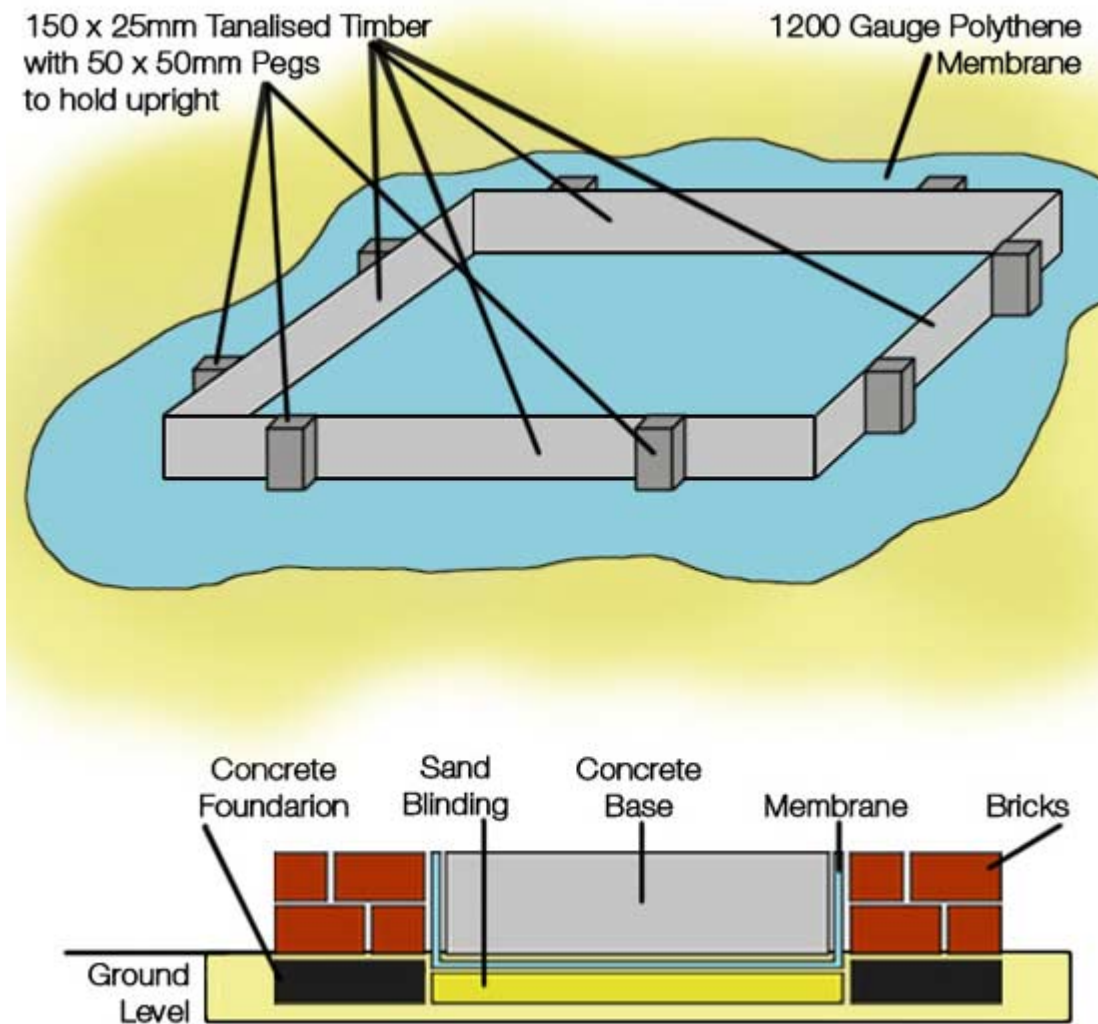
- To stop loss of water from the wet concrete into the ground during pouring (this would weaken the concrete)
- To keep the contents of the shed dry by stopping water from the ground penetrating up through the finished floor.

The specification for the polythene DPM will be 1200 gauge. If laps are needed in the membrane these should be a minimum of 350 mm and sealed with a suitable tape obtained from a builders merchant.



Preparing Timber Formwork for Concrete

Now we have a base area ready. It should, in all cases, be 300mm longer and wider than your shed floor and as level as possible. Using the diagram below follow the instructions for an above ground base.



Dimensions and layout for a shed base

In the diagram above, the damp proof membrane, which should be at least 1000 gauge polythene, is shown going under the formwork (frame) for the base. This is only done so you can see where it goes in relation to the construction. Its actual position is inside the frame.

Using 150mm x 25mm sawn and treated timber, cut the four sides of the formwork for your base. This timber should be 300mm longer than your base and 300mm wider.

Lay the timber out where you want the base and using a heavy "lump" hammer bang in some 50mm x 50mm posts along the line of the timber. These posts will obviously hold the timber on its edge, but more importantly are for stopping the timber bowing out as you place the concrete. The posts should be no more than 900mm apart.

When the posts are banged in you need to use a spirit level to make sure the top of the formwork is level. When it is, fix the boards to the posts using small nails (40mm).

There is no need to use large nails or screws as the concrete will hold the boards in place. If any of the posts stick up above the boards, cut them off using a sharp saw. You will realise the benefit of this when you come to level and "tamp" the concrete.

To make sure the angles of your formwork are at 90 degrees, measure from corner to corner across both diagonals - the measurements should be identical. If they are not then you will need to repeat the above to get them square.

With a level and square frame in place you can now lay 25mm of soft building sand in the bottom. This is to stop the polythene damp proof membrane getting punctured. Next, lay the polythene inside the frame (on top of the sand) and fold as tightly as possible into the corners.

Rather than buy timber to form the shuttering or formwork for your shed base it's always possible to nip down to your local tool hire shop and hire some metal shuttering lengths called Road Forms.

Road Forms are, as the name would suggest, usually used for forming the sides of the concrete sub-base on roads. As with timber shuttering, the Road Forms are laid around the perimeter of the shed base and metal pins are driven through purpose made slots in the forms to stop the concrete pressure pushing them over from inside.

The Forms are levelled in exactly the same way timber is and the top of the Form will act as a great smooth edge for running your tamping bar over.



Road forms can be used instead of timber for concreting shed base

Laying Shed Base Concrete

Begin by layering the entire foundation—including the footings—with 2 to 4 inches of basic gravel or crushed rock. Any decent hardware store should have at least a few material options to choose from.



Once the gravel layer has been poured and re-leveled, strongly consider placing 1 or 2 layers of square steel mesh (or if it's a small project, chicken wire) on top of the foundation area. Though it's technically an optional component, the mesh helps to reinforce the concrete and prevent post-cure cracking and shifting. Sit the mesh up on broken pieces of cinder block or plastic chairs so that it will rest in the middle of the slab.

The good news is you'll only need enough mesh to cover the central part of the foundation, leaving roughly 4 to 6 inches of space the between the border form and end of the mesh.

For those unsure about what type of mesh to use, talk to the professionals at your hardware store about the details of the project. Based on what you're trying to do, they should be able to provide the best recommendation for strength and quantity.

Now it's time to mix and place the concrete in the frame.

Rent a mixer or—if the shed plan is large enough—order ready mix concrete, which will be delivered to your property ready-to-pour from a truck.



- Whether mixing it yourself or getting it delivered directly, make sure to put gloves on and wear clothes that can get ruined.
- Unless the shed is absolutely tiny, don't use quick setting concrete. Just purchase ordinary concrete.
- If a truck or mixer isn't pouring concrete directly into your worksite, use a wheelbarrow to transport the concrete to the foundation frame.

At this point it's a good idea to get the help of a friend or a second person. Using a piece of timber laid across the top of the frame and concrete (with one person at either end of the timber), wiggle it about to get the top of the new base level.

Stand the timber upright on its edge and push and pull it backwards and forwards across the frame while dragging it from one end to the other and this will level it roughly. Next, lift the board at both ends about 4 inches above the frame and tap it back down on the frame, moving up and down the frame as you do so. Try and tap together so both ends of the board hit the frame at the same time.

This vibrates the concrete into place and it will find its own level - This is called tamping (See image below for an example).

Lastly, have a wander around the frame tapping gently on the outside all the way round with a clawhammer. This will vibrate out any air bubbles trapped between the frame and the concrete.



Tamping down the concrete

Building Brick Wall Border

Concrete will usually begin to set in about two or three hours, so make sure that you'll have an uninterrupted window to work once the mixing and pouring has begun.

While the concrete is going hard, without disturbing the posts (of which there should be at least 300mm in the ground) dig a small trench all the way around the base, right next to the frame, about 5 inches wide and 2 inches deep. Fill this with concrete also. This will form the foundation for the brick wall which surrounds the base.

This brick wall serves two purposes, it holds the damp proof membrane up so no ground water can seep between the underside of the slab and the membrane and it also gives a much better looking side to the slab.

We are assuming this base is for keeps so you want it to look good as well as being completely functional!

When the concrete is hard after a day or so, pull the timber up and away from the base.

Keeping the polythene held up, lay two courses of bricks around the base

Lay the top course of bricks with any frog (brick indent) facing down so that you have a nice flat top. When these are laid, cut off any surplus polythene just below the top of slab/bricks then push plenty of mortar (soft sand and cement mixed at 4 to 1) into the joint between bricks and slab.

Point up the brickwork and you should have a good looking base for your shed

Give the concrete 24-72 hours to cure completely before removing the forms. A pry or crowbar generally helps expedite this process. Once the forms are off, step back and admire your handiwork.

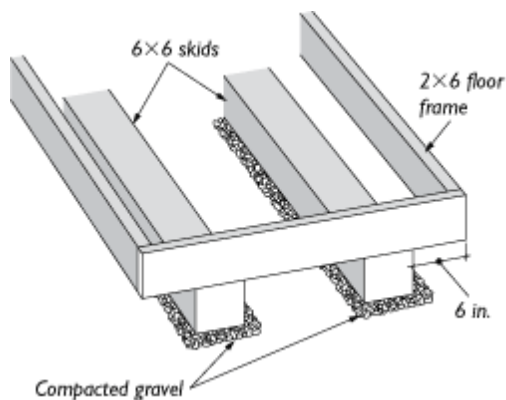
Positioning Your Shed on the Base

Ideally, when you build your shed it should sit on the concrete base. The bricks are for decoration but if they are well laid it doesn't matter if the shed sits on them too, going right to the edge, as the decorative part of the brick is its face.

There are no hard and fast rules, so this is really up to you and how you want your finished shed and base to look.

Skid foundations





Skid Foundation: A skid foundation is a simple and effective way to support the floor frame of a small shed.

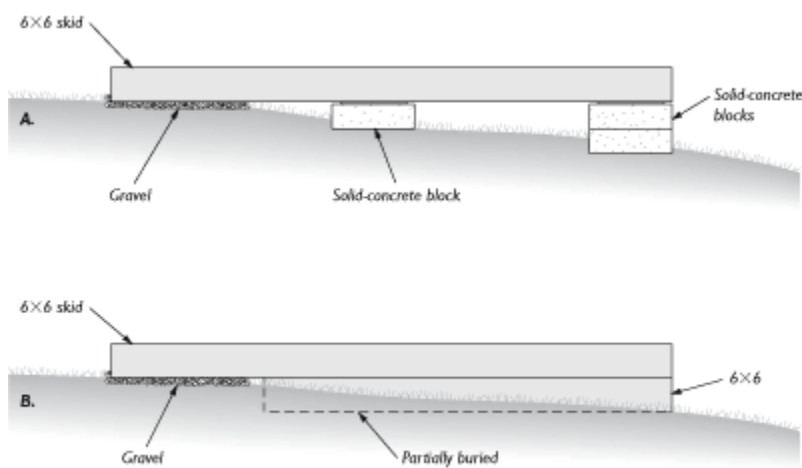
When it comes to time-tested building methods, it's hard to beat a skid foundation. Builders have been using this type of on-grade foundation to support outbuildings for more than three centuries.

The technique is surprisingly simple in both concept and application: Two or more long, straight timbers (skids) are laid on the ground in parallel, evenly spaced positions. The building's floor frame is then built on the skids, which are sometimes called runners or deadmen.

Skid foundations are still popular today, and it's easy to see why: They're very fast and easy to build; and they distribute the building's weight evenly over a broad surface. Unfortunately, because the timbers are long and straight, this type of foundation is suitable only for sites that are relatively flat.

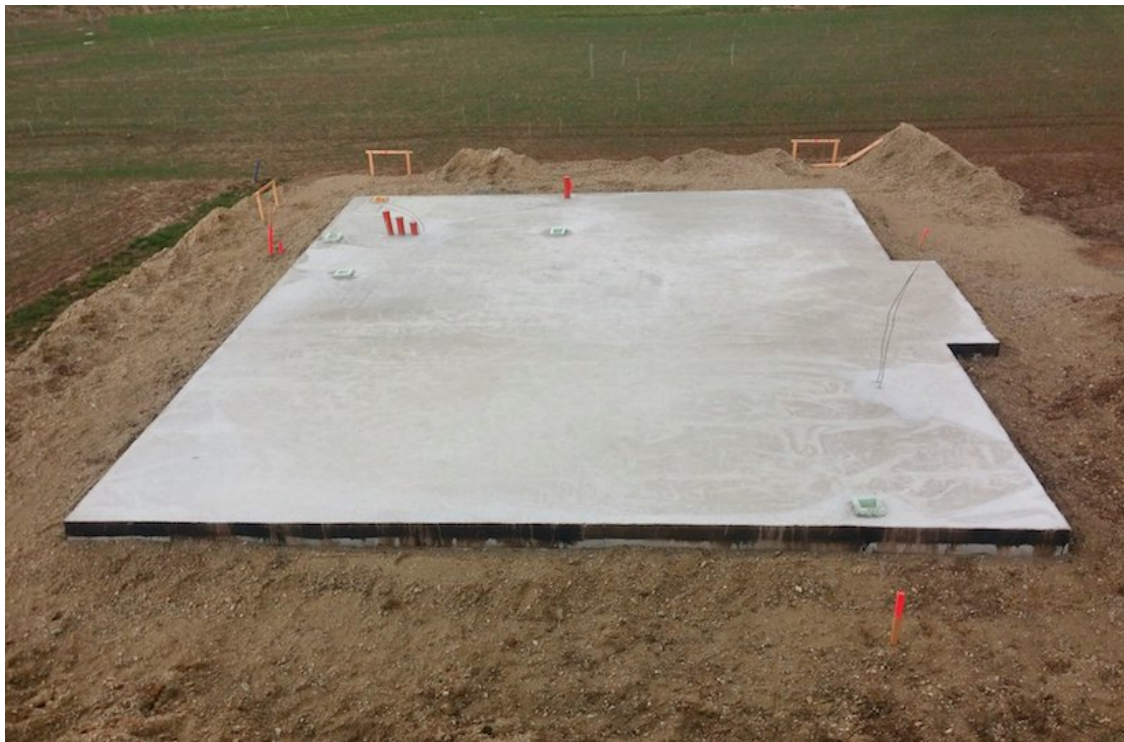
Originally, skids were nothing more than logs placed on the ground. Today, they're usually made of pressure-treated 4x6s, 6x6s, or 8x8s. You can also make skids by gang-nailing together three or four 2x6s or 2x8s and setting them on edge.

Although skids are often set directly on the ground, I prefer to lay them on a bed of gravel. The stone creates a very stable base that's not likely to settle or wash away. Begin by laying the skids in position on the ground, then mark around each one using spray paint or flour sprinkled from a can. Move the skids out of the way, then use a flat shovel to remove the sod and about 2 in. of soil from the marked areas. Check the excavated areas to make sure they're close to being level. If they're not, remove a little more soil from the high spots. Next, add 3 in. to 4 in. of gravel. Compact the gravel with a hand tamper or gas-powered plate compactor, then replace the skids.



Concrete Raft Foundations

How They are Constructed, When they Should be Used and the Advantages and Disadvantages of Raft Foundations



In this chapter, we'll find out about concrete Raft foundations; find out what they are and when they are typically used.

This project will help you to make the decision to use a raft for your footing. We will help you to understand the advantages and disadvantages of using raft foundations.

Raft Foundations

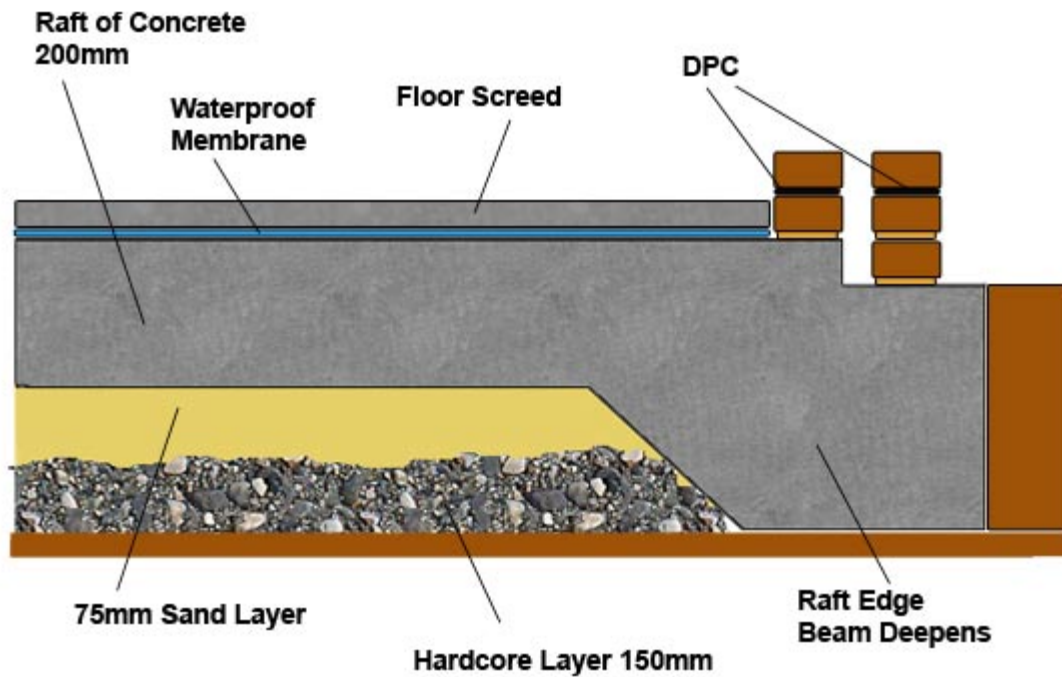
Raft foundations (sometimes known as Mat Foundations) are a large concrete slab which can support a number of columns and walls.

The slab is spread out under the entire building or at least a large part of it which lowers the contact pressure compared to the traditionally used strip or trench footings.

Because of the speed and volume of houses required after the second world war, the raft foundation was widely used. The raft foundation was cheaper, easier to install and most importantly, did not require as much excavation as the usual strip foundations.

When the Building Regulations were introduced in 1965 there were no generic rules for raft foundations as there were for strip foundations.

This meant that to use a raft foundation, it had to be designed and approved by Building Control. This made the entire operation much more difficult and time consuming so raft foundations became less widely used almost overnight.



Raft Foundations - How raft foundations are made

When Are Raft Foundations Used

Rafts are most often used these days when the strata is unstable or (because of this) a normal strip foundation would cover more than 50% of the ground area beneath the building. There are also situations (usually in areas where mining has occurred) where there may be areas of movement in the strata.

They are much more commonly used in the construction of commercial building than they are for domestic homes, but can be used very successfully in both situations. To understand when it is better to use raft foundations, you need to understand how they work.

How Do Raft Foundations Work?

A raft foundation spreads the weight of the building over the whole ground floor area of that building. The raft is laid on a hardcore, or scalping bed and usually thickened at the edges, especially in very poor ground. Rafts are most suitable when the ground is of good load bearing capacity and little work is required to get a solid foundation.

Raft Foundations are built in the following steps:

1. The soil removed down to correct depth

2. The foundation bed is then compacted by ramming
3. Lay reinforcement on spacers over the foundation bed
4. Pour the concrete over the reinforcement

The foundation may be stiffened by ribs or beams built in during construction which will add extra strength and rigidity.

When Raft Foundations Are Used?

A raft foundation is usually preferred under a number of circumstances:

- it is used for large loads, which is why they are so common in commercial buildings which tend to be much larger, and therefore heavier, than domestic homes
- The soil has a low bearing capacity so the weight of the building needs to be spread out over a large area to create a stable foundation
- The ratio of individual footings to total floor space is high. Typically if the footings would cover over half of the construction area then raft foundation would be used
- If the walls of the building are so close that it would cause the individual footings to overlap, then raft foundations should be used

Advantages and Disadvantages of Raft Foundations

Raft foundations tend to be cheaper and quicker to use than traditional footings. There are a number of reasons why this is the case:

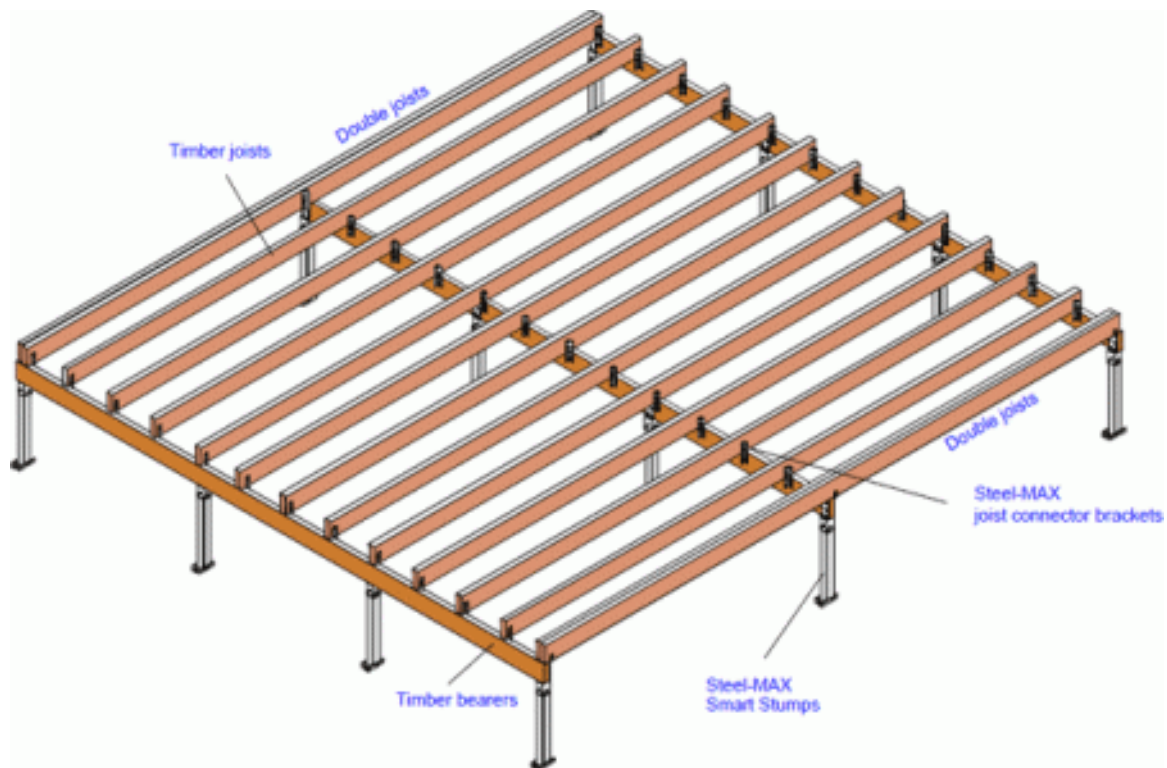
- The foundation and floor slab is combined, which saves time and materials
- Less excavation is required

Other reasons that make raft foundations preferable to footings are due to their engineering benefits. They are ideal for poor ground condition where normal footings would not cope well as they cannot spread the load as effectively.

Related to this is that raft foundations can reduce differential settlement, where settlement occurs at different rates across the ground surface of the building, which reduces cracking and other more serious problems.

The main disadvantage is that they can be prone to edge erosion if they are not treated properly. They are not effective if the load of the building is going to be focused on a single point, although this is rare in domestic construction, so this isn't generally of concern.

Timber Bearers



A storage shed foundation for small and medium sized sheds (up to about 8'x6') on level ground can be built quickly and cheaply using crushed stone and pressure treated timber bearers.

Building a shed base begins with the setting out

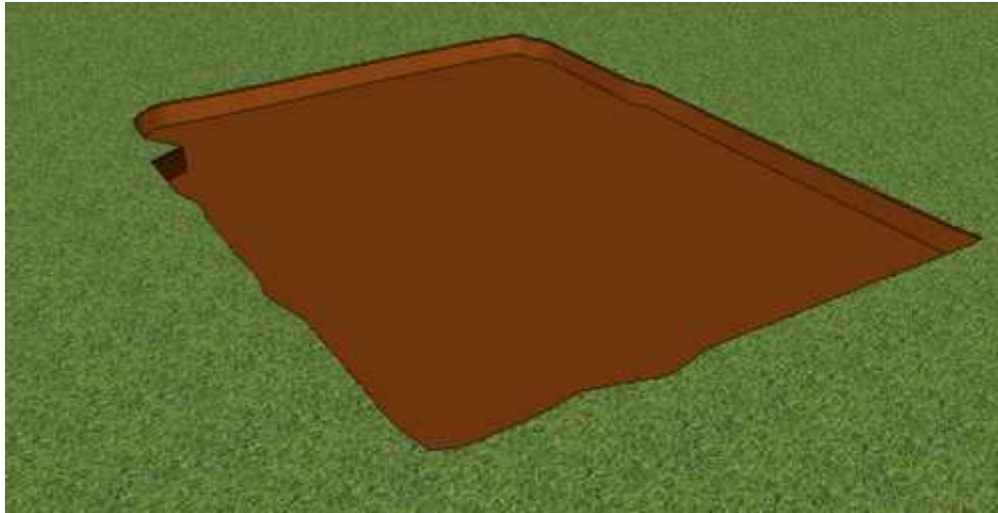
Start by marking out the corners of the shed. It is best to use timber pegs made from 2"x2" (50x50mm) timber, sharpened at one end. Knock a nail into the centre of each peg and set up a string-line around the perimeter. Check the rectangular shape that you have marked out by measuring across the diagonal. If the dimensions across each diagonal are equal then the corners are true squares.

There are many ways of controlling the level of an excavation, using sighting rails and optical levels. However for a small excavation like this it is best to keep it simple - a spirit level used together with a long (8' or 2.4m) 4x2 timber will be fine.

Using a spade, do an initial strip of the turf and top soil to a depth of 50mm (you can use the soil for landscaping elsewhere in the garden).

Excavate to the finished depth of 75mm in one corner and then, resting the end of the long 4x2 on this corner peg, measure down to ground level. Cut a piece of timber to this measured length. Continue

the excavation, checking at intervals using the 4x2, spirit level and measured length of timber that you are not going too deep.

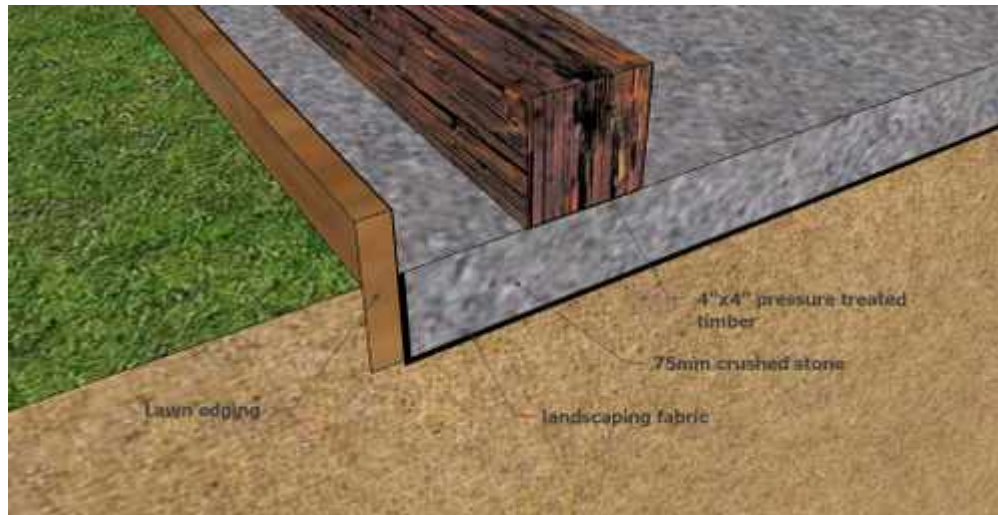


Selecting crushed stone for a shed base

The stone to be used for constructing the storage shed foundations should be what is known as 'well graded material'. This means that there is a good mix of stone sizes from about 40mm diameter down to very fine dust.

The best material for this in the UK is sold as Department of Transport Type 1. However, for the purposes of constructing a shed, crushed stone, or pulverized concrete should be adequate. Just make sure that you don't use gravel for a shed base or a single sized aggregate as this will not compact or lock together.

This sketch shows a detail through the edge of the storage shed foundation. The underside of the timber should be above the general ground level. The lawn edging has been included to give the shed foundation a neat appearance and make it easier to cut the grass.



Use of landscaping fabric is optional here for two reasons:

☐ The main purpose of the fabric is to keep the stone separate from the soil. Over time, without a separation layer, the stone can sink into the ground and the foundation soften (particularly on clay ground).

☐ Weeds and vegetation will have a hard time growing beneath the shed due to a lack of light, but as the stone can extend about six inches beyond shed wall, the fabric may help a bit in keeping the weeds down.

If used, the landscaping fabric should be a heavy duty material which will allow water to drain away.

Placing the crushed stone layer.

Before compacting the stone, rake it as level as possible. To compact the stone you could hire a vibrating plate, but if you need a bit of exercise use a hand tamper to compact the ground.

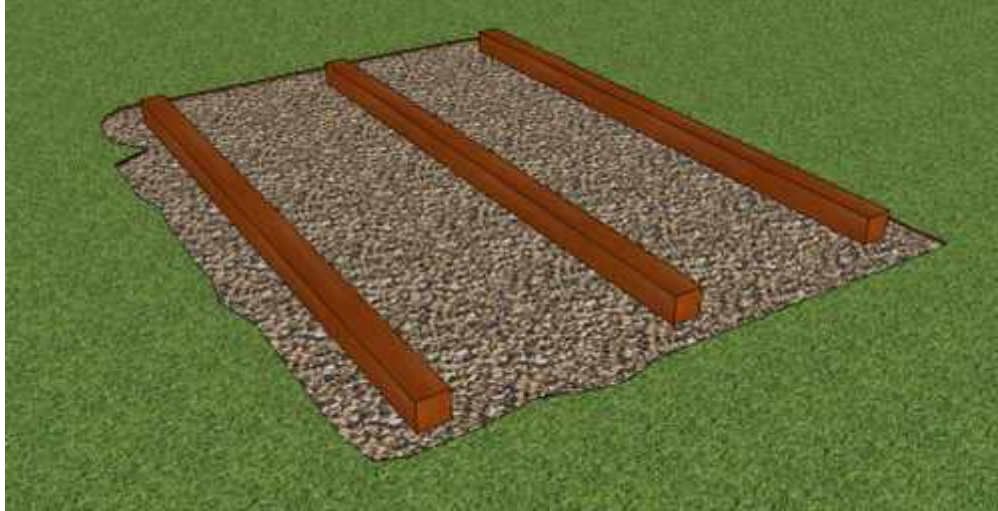
Hand tampers comprise a 10kg weight with an area of approx 4"x4" (100x100mm) which you raise and drop repeatedly to compact the stone. Pound the stone down until it's compacted and even, remembering to keep checking the levels in the same way that you did for the excavation. Add or remove material where necessary to achieve a level platform.

Laying the pressure treated wood foundations

Check that you lay these timbers perpendicular to the direction of the floor joists in the shed floor. The pressure treated timbers should be 4"x4" (100x100mm), to allow ventilation beneath the shed.

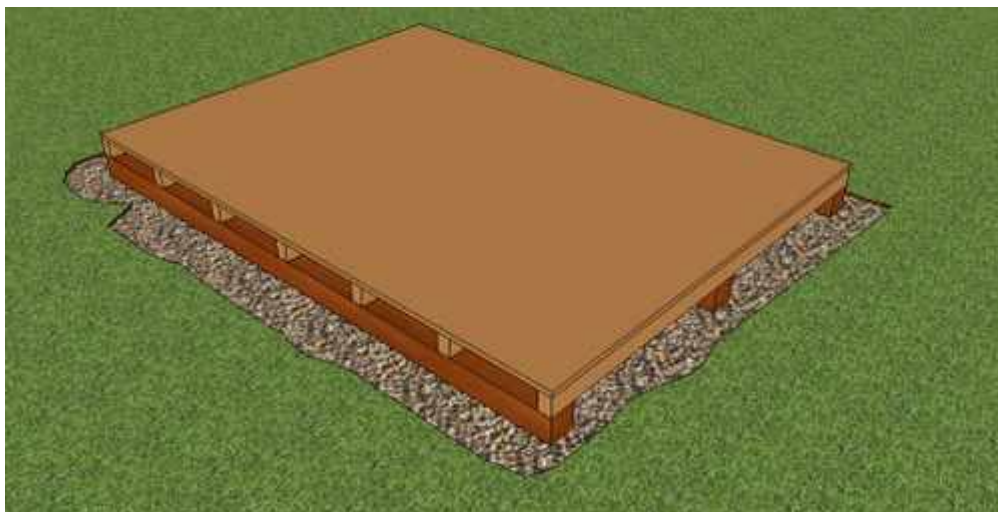
Pressure treated timber has a long life when in contact with the ground, installing the weed barrier and stone should prolong the life of the timber. Moisture is the element that starts decay, so any thing you do to keep the timbers dry will prolong their life.

The spacing of the timber bearers should be in the instructions for the shed kit you are building or in the shed plans if you are building a shed from scratch.



My tip to prolong the life of your shed floor is to install a plastic or bitumen Damp Proof Membrane (DPM) on top of timber and nail it down. This will stop moisture getting in to your shed floor from contact with the timber skids.

Before the storage shed foundation can be considered complete do a final check for level along the length of each timber and between timbers.



Building Your Foundation on Concrete Blocks

A shed foundation that will last



It is possible to build your storage shed foundation by just placing paving slabs or concrete blocks onto well compacted ground.

This approach may be successful depending upon site conditions, climate etc.

This article describes a method of improving the ground so the foundation can be more durable and give a better long term performance.

The sort of foundation described here, where a complete level platform is created would be a good way to build a foundation for a plastic storage shed or any storage shed where the shed floor is of relatively light weight construction.

Building a shed base begins with the setting out

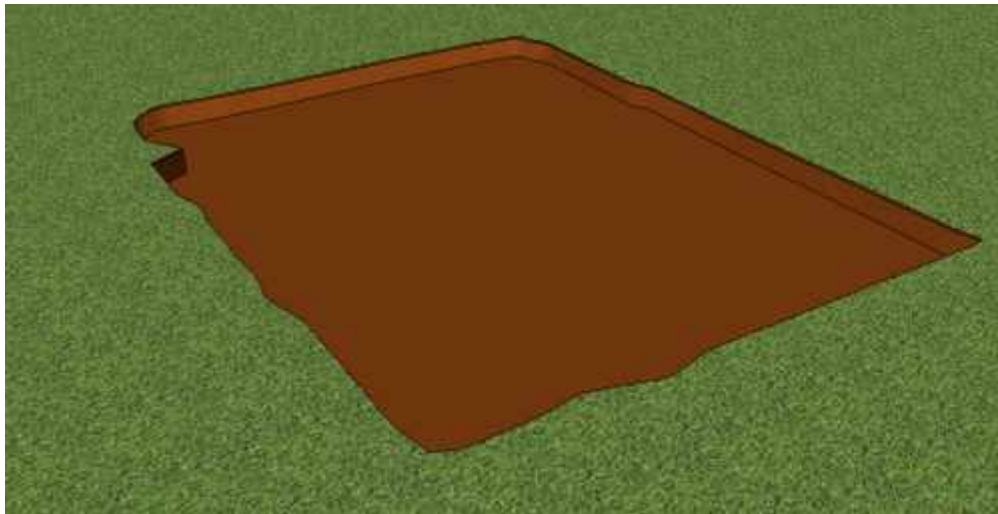
Start by marking out the corners of the storage shed foundation. Use timber pegs made from 2"x2" (50x50mm) timber, sharpened at one end. Knock a nail into the centre of each peg and set up a string-line around the perimeter. Check the rectangular shape that you have marked out by measuring across the diagonal. If the dimensions across each diagonal are equal then the corners are true squares.

There are many ways of controlling the level of an excavation, using sighting rails and optical-levels. However, for a small excavation like

this it is best to keep it simple a spirit level used together with a long (8' or 2.4m) 4x2 timber will be fine.

Using a spade, do an initial strip of the turf (you can use the soil for landscaping elsewhere in the garden).

Excavate to the finished depth of 50mm in one corner and then, resting the end of the long 4x2 on this corner peg, measure down to ground level. Cut a piece of timber to this measured length. Continue the excavation, checking at intervals using the 4x2, spirit level and measured length of timber that you are not going too deep.



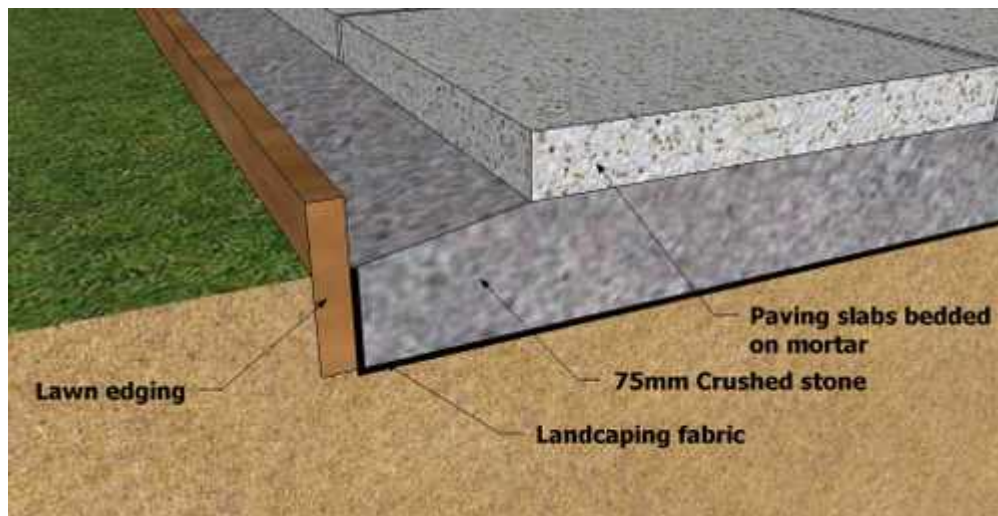
Selecting crushed stone for a shed base

The stone to be used for constructing the storage shed foundations should be what is known as 'well graded material'. This means that there is a good mix of stone sizes from about 40mm diameter down to very fine dust. The best material for this in the UK is sold as

Department of Transport Type 1. However for the purposes of constructing a shed, crushed stone, or pulverized concrete should be adequate. Just make sure that you don't use gravel for a shed base or a single sized aggregate as this will not compact or lock together.

This section below through the edge of the storage shed foundation shows a lawn edging to keep the stone separate from the grass (it also makes it easier when it comes to trim the grass).

The crushed stone is about 50 mm deep at the lawn edge but thickens to 75 mm after about 150 mm. The thickening helps the foundation to shed water and places the top of the shed foundation about 75 mm above the general ground level.



I have shown a landscaping fabric as a separating layer between the ground and the stone. You should make your own decision as to whether this is necessary based on the following information. If the

ground on which you are building is firm and dry, leave it out. If the soil is damp and soft, particularly if it is a clay soil, it is a good idea to use it. The purpose of the fabric is to stop the mixing of stone and soil, which over a period of years could lead to a softening of the foundation.

For the landscaping fabric use a heavy duty material which is permeable to water (lets water drain away through it). Do not use a PVC damp proof membrane (DPM) at this point as it will only allow water to build up, creating a pond underneath your shed. This would cause damp problems, exactly the opposite of what we are trying to achieve!

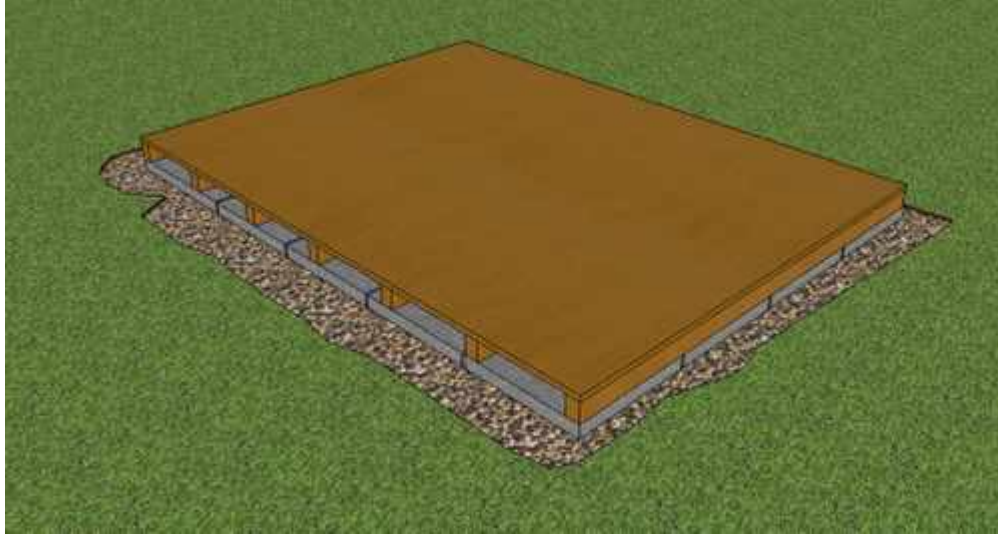
Placing the crushed stone layer for your storage shed foundation

Before compacting the stone, rake it as level as possible. To compact the stone you could hire a vibrating plate, but if you need a bit of exercise use a hand tamper to compact the ground. Hand tampers comprise a 10kg weight with an area of approx 4"x4" (100x100mm) which you raise and drop repeatedly to compact the stone. Pound the stone down until it's compacted and even, remembering to keep checking the levels in the same way that you did for the excavation. Add or remove material where necessary to achieve a level platform.

On top of the crushed stone place a 1" (50mm) layer of a dry sand/cement mix (This is made up of one part cement to eight parts sand). Spread the mix evenly and rake level. The purpose of this weak mortar mix is to partially fill any surface gaps in the crushed stone layer and prevent loss of sand over time into the stone. Also it should form an even uniform bedding for the paving slabs.

Lay the paving slabs starting from one corner. Work outwards from the corner, placing the slabs with a 10 mm gap between them (use wood spacers for this). Level each slab with a spirit level in two directions as you go. Any adjustment to the slab level is best made by tapping the paving slab with a rubber mallet. Keep checking each row as you go with your long 4x2 straight edge, to make sure the base is level in all directions.





Another type of solid concrete block foundation method is using a series of solid-concrete blocks laid out in straight even spaced rows

The number of blocks needed and the spacing between them is determined by the size of the shed and the lumber used for the floor joists.

It's important to note that you must use only solid-concrete blocks for this type of foundation. Standard wall block or any other hollow block will eventually crack and crumble under the weight of the shed. If you have trouble finding solid blocks at a home center or lumberyard, visit a masonry supplier.

The blocks measure 8 in. wide by 16 in. long and come in 4-in.- and 2-in.-thick units. The thicker blocks are placed first, with the thinner

“patio” blocks laid on top when you need to raise one block even with the others. In some cases, you may need to stack two or three 4-in. blocks on top of each other to raise the lowest corner of the foundation so it is even with the highest corner.

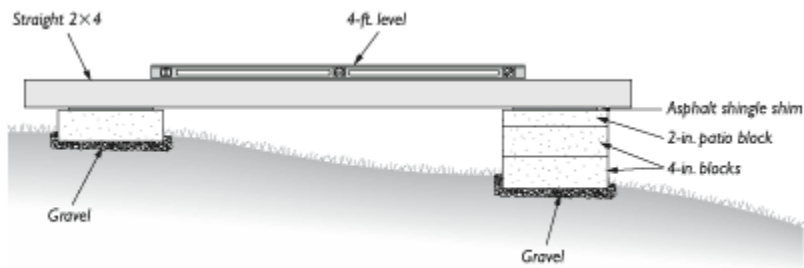
If the building site is high and dry, you can set the blocks directly on the ground. However, if there’s any chance that rain runoff will occasionally drain under the shed, you’ll need to use a shovel to remove a patch of grass under each block, compact the soil with a hand tamper, then cover the exposed dirt with 2 in. or 3 in. of gravel before setting the blocks. The gravel bed will ensure that the soil beneath the blocks won’t wash away or become soggy.



In most cases, you’ll need both 2-in.-thick patio blocks and 4-in.-thick solid-concrete blocks to build an on-grade foundation.



A shallow bed of gravel placed underneath concrete foundation blocks aids drainage and helps prevent them from sinking into the soil.



Shed Pier Foundation



What is a Shed Pier Foundation?

A shed pier foundation is not strictly a permanent foundation it comprises of a series of concrete blocks laid directly on the ground (occasionally a shallow hole is dug and filled with crushed stone), the tops the blocks are then levelled to support the main floor beams of the shed.

The Advantages of Pier Foundations Are Many:

- They are each cheaper than laying a concrete slab as a lot less concrete is required.
- They are simple to build so a specialist contractor is not required.
- They offer environmental benefits as much less concrete is needed and you will not be adding any foreign materials to the soil on which you are building.
- There is very little excavation that is required to begin building.
- There is very little spoil to dispose of from the build site.
- It can also save you a good deal of time as you can immediately begin to build once you have your materials gathered.
- They can increase longevity of your shed by lifting the shed floor off the ground so that moisture from the ground cannot rise and damage the timber structure.

All the above add up to mean that using a shed pier foundation can save you both time and money.

These foundations are useful for large and heavy sheds. By forming a series of pads to support the timber foundation beams they provide support while requiring less materials. Foundations such as these are also extremely useful if you have to build on a sloping site. Each of the separate parts can be easily adjusted through the use of interlocking parts and screw thread. Also if the need arises to move your shed then the foundations can be taken up and easily moved.

Installing Pier Foundations

You must first do a bit of excavation to level up the ground at the location of each pier. The exact location of the piers is dependant on the size and layout of the floor beams. If the ground around the shed is very wet it will pay to dig the hole a few inches deep and fill with crushed rock. If you are building on either rocky soil or gravel then this is not necessary.

The simplest form - Concrete Blocks

The simplest form of pier foundation uses standard concrete building blocks. The concrete blocks are laid one on top another and bonded together with mortar so that they cannot shift. To get the tops of the blocks level shims made up of sections of paving slab or pressure treated timber can be used for the finer adjustment. The timber floor joists are then supported on this grid of concrete blocks.

Proprietary Foundation Systems

Dek-Blok

In the United States there is the Dek-Blok brand of pier blocks.

These are a roughly pyramid shaped block with a flattened top that is bisected by two channels. These channels are perfect for accepting a standard flooring timber so that the timber sits level. They also have a square recess in the top that can accept a 4"x4" post so that if the ground slopes very steeply a timber post can be used cut to length to support the floor beams.

Swift Foundations

Another type of pier block system common in the UK is made by Swift Foundations. Their system comprises three main components a base stone that is capped by a top stone with a screw adjusting bracket. Foundation height is adjusted coarsely by stacking the interlocking base stones, the top stone and bracket allow for fine adjustment of level to your floor timber.

Each of these foundation systems has benefits in that they are easier to assemble than just using the simple concrete block. They are

more expensive than a concrete block but this is more than made up for in time and labour savings.

Precast pier blocks

This building method is similar to the solid-concrete block foundation discussed above. However, instead of using flat blocks, a series of precast concrete pier blocks are used to support the shed's floor frame. The pyramid-shaped blocks are designed for building decks, but they work great for sheds, too — provided you choose the right type.

There are a few styles of pier blocks available, including one that has a square hole molded into the top through which a vertical 4×4 post can be inserted.

Another type has a flat wood block set into the top so you can toenail a joist in place. For building shed foundations, I prefer to use Dek-Block piers. Each block measures 8 in. high by 11 in. sq. and weighs about 45 lbs. Molded into the top surface are a 3 1/2-in.-sq. recessed socket and a pair of 1 1/2-in.-wide slots.

The socket accepts a 4×4 post; the slots are used to support a 2x floor joist. Because Dek-Block piers can accept either a joist or a

post, they can be used on very uneven sites and badly sloping terrain.



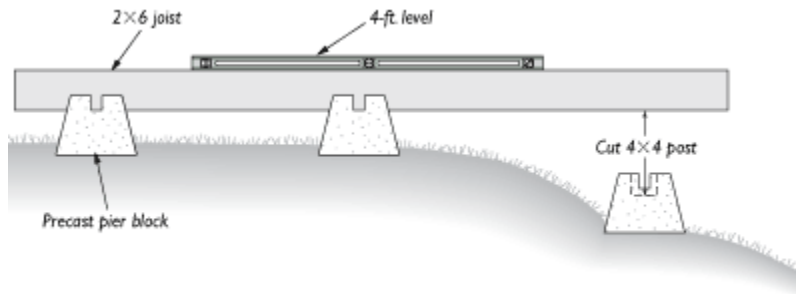
A series of precast pier blocks, arranged in three straight rows, provides a simple, secure way to support a floor frame.

Courtesy of DekBrands



A 2x joist fits into a slot molded in the top of this Dek-Block pier; the concrete pier will also accept a vertical 4×4 post.

Courtesy of DekBrands



Building a shed on uneven ground

It can be quite a challenge! Here are some solutions

When building a shed on unlevel ground, as the foundation grade becomes steeper the problem becomes greater. The two main solutions to build a shed foundation on sloping ground are:

- The deck.
- The retaining wall.

Note: If you are lucky your shed site will be relatively level. Small slopes can be accommodated in the paving slab and timber sleeper foundation by cutting into the slope slightly on one side and building up the crushed stone on the other.

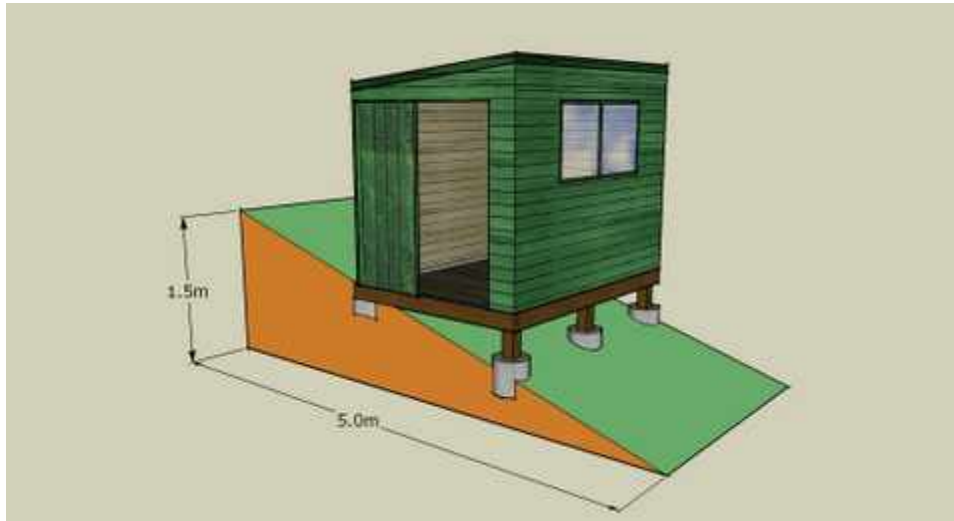
Post and pier shed foundations

This option will accommodate the steepest slopes and involves building a post and beam type timber deck to form a level platform on which to build the shed. The picture below shows the up slope side of the shed supported on a timber beam on crushed stone. The down slope side of the shed is supported on timber posts on concrete pads.

Post and pier shed foundations

This option will accommodate the steepest slopes and involves building a post and beam type timber deck to form a level platform on which to build the shed. The picture below shows the up slope

side of the shed supported on a timber beam on crushed stone. The down slope side of the shed is supported on timber posts on concrete pads.

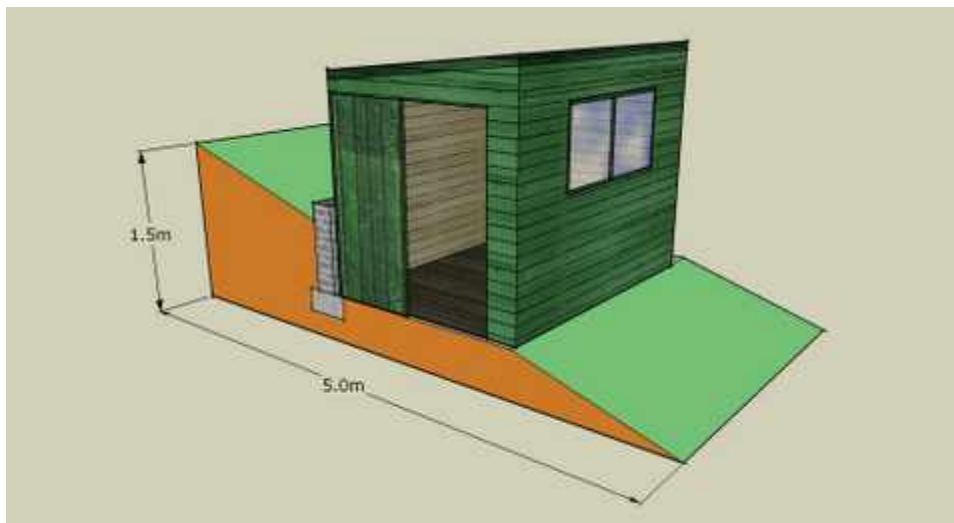


There are a variety of methods for forming these pads. Ready-made blocks of concrete are made by specialist companies. These sit on the ground and have a recess ready to receive the timber post, they also have a leveling/shimming facility.

The more DIY approach and one more suited to steeper slopes is to dig a hole at each post location and fill it with concrete. To achieve a nice circular appearance above ground a paint tin or plastic bucket is cheap and gives a good finish when removed. A post anchor base keeps the end of the post above any moisture and stops post rot. The exact sizing of post and decking beams depends on the size and use of the shed.

The retaining wall

This solution for building a shed on unlevel ground is OK for shallower slopes and involves cutting into the slope to create a level platform with the ground above the shed being held back by a retaining wall. The picture below shows all of the ground in cut, this soil would then have to be used to level somewhere else in the garden or disposed of by skip.



A more balanced solution is to balance the cut and fill by using the soil dug out of the slope to build up the platform for the shed.

This has two problems, first of all compacting the excavated material may be difficult and secondly a second retaining wall may be needed. Depending upon space requirements.

Building a block retaining wall is a perfectly do-able DIY project. A brick or block retaining wall is suitable for walls of up to about 0.9 m.

For retaining wall designs above 0.9m I would recommend getting professional advice about ground stability and wall design from a builder/ engineer.

Of the two solutions for building a shed on unlevel ground the deck solution is the cheaper and easier. The retaining wall solution can involve moving surprisingly large quantities of earth.. but sometimes it just has to be done!!

Factors to consider when building a shed on unlevel ground:

- Where to put the shed door - my tip is to make the access as level as possible. For the deck solution you would enter from the top of the slope or from the side. For the retaining wall solution you would enter from the lower side of the slope or from the side.
- Access around the perimeter of the shed for maintenance. - This applies to the retaining wall solution. Do not place the shed too close to the retaining wall as you will not be able to

get access for maintenance and the wall of the shed may become damp from rain splashing of the wall top.

- Planning regulations - This is very dependant on the part of the world you are in wherever you are make sure your plans do not break any local planning laws
- Height of the shed above ground - this relates to the planning regulations again some local authorities have a limit on the height of the shed above ground level. Dependant on where you measure from this might influence which option you go for.

Alternative ways to build a shed floor

I'll talk about two types of shed floor; the type that you would use on a large timber shed and the other is more like a shed base that will form a flat level and stable surface to build a pre-fabricated metal or plastic shed on.

Both types of shed floor are essential to the strength of your shed.

A floor that is not strong enough will start to ripple and squeak. A floor that is not detailed correctly will start to rot and sag. Both of these will make your shed unsatisfactory.

Factors you need to consider before you start:

1. Good choice of materials
2. Good shed floor plan
3. Good workmanship

Get the choice of materials and the design of the shed floor plan right and you're over halfway there!

1. Materials

The material options for the deck include;

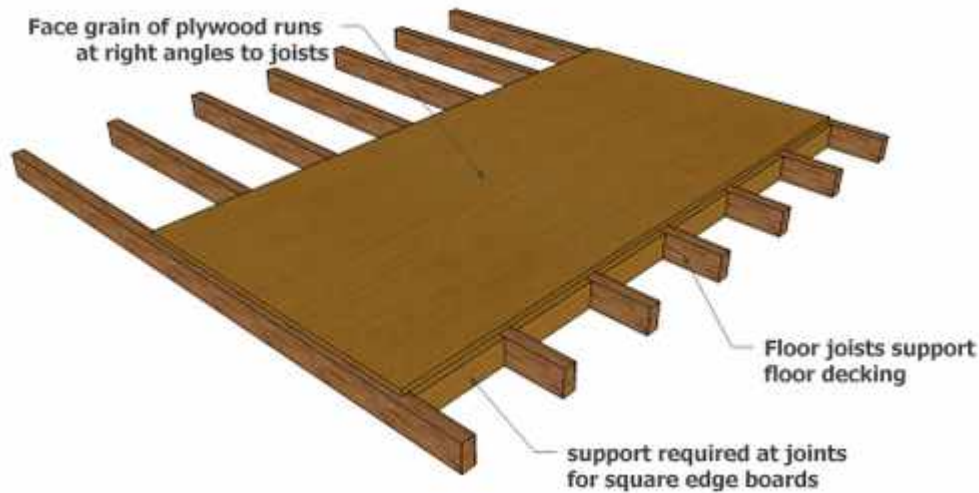
- Timber floor boards

- Plywood
- OSB (oriented strand board)

Timber floor boards are normally tongue and grooved. The tongue and groove is used in flooring to make adjoining boards work together and prevent adjacent boards deflecting relative to one another, forming a small step in the floor surface.ep

If you are using sheet materials such as plywood or OSB, more than likely the boards will be square edged. A tip to help the floor work really well here is to support the edges where two boards meet, as in the picture below.

Also remember when using plywood or OSB that they have a strong and weak direction. With plywood make sure that the face grain is at right angles to the floor joists. With OSB, sheets are normally 1.2 x 2.4m, the strong direction is the long direction.



For fixing the floorboards to the joists beneath use a nail which has a good pull-out resistance. I recommend an annular/improved ring Shank nail (see photograph). The length of the nail should be about 2.5 times the thickness of the floor board.

The floor joists supporting the decking should all be preservative treated and of a size that will transmit the floor loads to the foundations.

2. Shed floor plan

If you are building a floor for a shed it's surprising how strong you need to make it. For a domestic house the British Standard for floor loadings (BS6399) recommends 150kg/metre square, for a work shop or office floor the floor loading goes up to 250kg/metre square. An average person weighs between 70 and 80 kg, so that gives you an idea of what the floor has to support.

When designing the floor arrangement remember **water is the enemy of shed floors**. Anything you can do during planning to stop water getting in to the shed floor from the ground below or from rain coming down from above the better.

Tips to keep the shed floor dry:

- A polythene vapour barrier weighted down with stone or concrete beneath the shed will provide a barrier to moisture and also prevent plant growth beneath the shed.
- Good ventilation beneath the shed will help any damp air disperse and keep the timbers dry. What is good ventilation? Most often for sheds the underside can be left completely open to the atmosphere so damp air cannot accumulate. For house floors it is recommended that there is a minimum of 150 mm between the underside of floor joists and the ground, also that air can flow from one side of the shed to the other, letting humid air escape. For timber frame houses there is a recommendation that that a minimum of 1500 square mm per linear m of floor ventilation is provided.

- Another tip to protect the floor joists is to put some Damp Proof Membrane, beneath the supports of the floor joists. This provides yet another barrier to moisture wicking its way up from the ground into the floor.
- Stop moisture getting in from above by using large eaves and gutters and making the walls drain down on to the ground.

Garden tool sheds or storage sheds do not need an insulated floor, however insulation is essential if you are going to make your structure a garden office or hobby room. Insulation is easily installed between the floor joists. To make the as draught free as possible pay particular attention around the floor edges as this is often the main source of air leaks.

3. Workmanship.

Building a storage shed floor? These tips will get the project off to a good start:

- Work off a square and level foundation. This the most important of all by starting of right the job will go smoothly. If the starting point is badly set up you will be forever making time-consuming adjustments to compensate.
- Use material modules to prevent excessive cutting. Plywood and OSB sheet flooring comes in 1.2x2.4m sheets- making the floor a multiple of this size will minimize the number of cuts you need to make. Don't worry if you can't follow this one though, best to get a shed the size you want than to save on a tiny bit of labour.
- Use a nail punch to get the head of the nail below floor level, so you don't make a hole in your welly when you come in to get the garden fork!