GUIDE FOR CONTRACTORS AND HOMEOWNERS

What goes underneath: foundations for paths and driveways

How a path or drive should be built below the surface: survey, excavation, sub-base, concrete, mesh, joints, drainage, curing and bedding. Drawn from published UK guidance, with ranges where sources differ.

> **Every job needs specifying for its own ground and loads.** The figures here are typical ranges drawn from published guidance, not a design. Get a structural or geotechnical engineer involved where the ground is poor (soft clay, made ground, peat, a high water table), where heavier vehicles than cars will use the surface, where the work is near trees, on a steep slope or next to a retaining wall, or where a manufacturer's warranty or a building warranty provider (such as NHBC) sets its own requirements.

1. The short version

	Garden path (people only)	Car driveway (cars and light vans)
Sub-base (Type 1)	Around 100 mm, well compacted (NHBC 10.2.6.5; Marshalls' porcelain paving guide also uses 100 mm)	Depends on ground strength (CBR): **100 mm** on good ground up to **325 mm** on weak ground (NHBC Table 4). 150 mm is the figure most manufacturers quote for firm ground.
Concrete slab, if used	**At least 75 mm** (NHBC). 75 to 100 mm is common	**100 mm PAV1** for private drives used by cars (NHBC Table 3d). Many contractors build 125 to

	Garden path (people only)	Car driveway (cars and light vans)
	practice.	150 mm when reinforcing or where vans use it. **150 mm PAV2** where commercial vehicles use a shared drive now and then (NHBC Table 3c).
Mix	Frost-resistant: PAV1 is the usual designated mix	**PAV1** (house drives, no de-icing salt). **PAV2** for heavy-duty use, or reinforced paving where de-icing salt will be used.
Mesh	Often unreinforced. **A142** where used.	**A142** or **A193** are the usual domestic choices. **A252** for heavier use, where an engineer specifies it.
Joints	Movement joints at **4 m maximum** centres, at least 10 mm wide (NHBC)	Roughly 3 to 4.5 m bays unreinforced, up to about 6 m with mesh; keep bays near square (see section 8)
Falls	At least **1:80** (NHBC), and away from the house	Same, with channels or drains where water can't run off to a permeable area
Level at the house	Finished surface at least **150 mm below the DPC**	Same

2. Survey before you dig

Underground services. Get the utility records for the address before any excavation, then scan the area with a cable avoidance tool (CAT) and signal generator (Genny). Mark what you find and hand-dig trial holes near anything indicated. The HSE's guidance *HSG47: Avoiding danger from underground services* sets out the safe system of work. In older London streets, expect old gas and water pipes at shallow depth, abandoned services, and unrecorded runs to the house. Front gardens often hide the water meter, stopcock and the gas service.

Inspection chambers and covers. Find every chamber, rodding eye and gully. Plan to raise or lower covers to the new finished level rather than burying them. Covers need to suit the traffic: in common practice under BS EN 124, A15 is for pedestrian areas only and B125 suits footways and car parking. Use recessed trays where block or stone has to run through.

A chamber in the middle of a concrete slab needs boxing out with an isolation joint (section 8).

Trees. Note any tree whose roots could reach the work, including street trees and those next door. Cutting roots can kill or destabilise a tree, and roots lift paving and crack slabs. Trees in conservation areas and trees with a preservation order are protected. Work within a tree's root protection area should follow arboricultural advice in line with BS 5837. That often means a no-dig cellular confinement system rather than a full excavation, and an engineer or arboriculturist should specify it.

Levels and falls. Survey existing levels at the house, the gate and the pavement before designing. Key points: - The finished surface next to the house should be **at least 150 mm below the damp-proof course** (NHBC 10.2.6.1). On many Victorian terraces the original path already sits too high, so plan for this early. If you can't get 150 mm, you need a drainage channel against the wall and a proper solution agreed with the client, not a guess. - Don't block or bury airbricks. - Fall surfaces **away from the house**, or collect water in a channel at the house (NHBC). - NHBC asks for a minimum finished fall of **1:80** on drives and paths, and for surfaces not to be flatter than 1:40 (or to have a 1:40 camber) where there's no fall, to avoid flat spots. Manufacturers' paving guides commonly quote falls of about 1:60 to 1:80. Use the steeper end for textured natural stone and wherever puddling would be a problem. - NHBC limits the gradient of drives and paths to **1:6**. Steeper ground needs steps on paths, and transitions on drives so cars don't ground.

Planning: the 5 m² rule. In England, if you're surfacing more than **5 m² of a front garden** (the area between the house and the road) with an impermeable material, and the water can't run to a permeable area such as a lawn, border, rain garden or soakaway, it needs **planning permission**. A permeable surface, or one that drains to a permeable area within the property, doesn't need permission for that reason. (GOV.UK, *Guidance on the permeable surfacing of front gardens*, and the Planning Portal.) This applies to houses, not flats or maisonettes, and conservation areas, Article 4 directions and listed buildings can add further controls. A new or widened dropped kerb needs separate consent from the highway authority.

3. Excavation depth: add up the layers

There's no single "right depth". Add the thickness of each layer to get the depth below finished level, then go deeper wherever you find soft spots.

Example: tiled or stone path on a concrete base (people only) - Surface (tile or stone) plus bedding: about 25 to 60 mm, depending on the unit - Concrete base: 75 to 100 mm - Type 1 sub-base: about 100 mm - **Total: roughly 200 to 260 mm** below finished level, before soft spots

Example: block-paved car driveway (flexible) - Blocks: 50 to 80 mm (NHBC Table 3d shows 50 mm for private drives used by cars; 80 mm is common where heavier vehicles are expected) - Laying course: 30 mm compacted sharp sand (Marshalls) up to 50 mm (NHBC) - Type 1 sub-base: 150 mm on firm ground, more on weak ground (NHBC Table 4) - **Total: roughly 230 to 280 mm** on good ground; deeper on weak ground

Example: reinforced concrete car driveway with a stone or tile finish - Finish plus bedding: 40 to 70 mm - Concrete: 100 to 150 mm - Type 1: 150 mm or more, depending on CBR - **Total: roughly 290 to 370 mm** on good ground

4. Formation: the ground you build on

- Strip all topsoil, roots and other vegetable matter (NHBC).
- Trim the formation to the same falls as the finished surface. NHBC asks for sub-base levels to follow the finished gradient and cross-fall.
- Compact the formation and proof-roll it with the plate or roller. Dig out any soft or springy spots, old drain backfill, rubble pockets and organic material, and replace them with compacted Type 1.
- **Clay** softens fast in rain. Don't leave the formation open overnight in wet weather if you can avoid it, and don't compact it while it's wet and plastic.
- **Ground strength (CBR).** NHBC sizes drive sub-bases on the CBR of the subgrade and says that below 2% the subgrade needs improving. On anything but obviously firm, dry ground, a simple test (for example a dynamic cone penetrometer or plate test) is cheap insurance. Where you can't test, design for the weaker end of the range.
- **Frost.** NHBC notes that frost-susceptible subgrades may need a capping layer so the build isn't affected by frost heave. Sub-base materials should be non-frost-susceptible.

5. Geotextile

A non-woven geotextile separation membrane laid on the formation stops the subgrade working up into the sub-base, and the sub-base being pushed down into soft ground. It's most useful on clay, silt and soft or wet ground, and many manufacturers' installation guides recommend it in those conditions. Lap the sheets as the membrane maker says. A geotextile is a separator, not a structural layer. NHBC notes that a reduced sub-base thickness using a **geogrid** has to be justified and designed by an engineer.

6. Sub-base: Type 1, compacted in layers

- Use **Type 1 unbound granular sub-base** to the Specification for Highway Works (MCHW Volume 1, Clause 803), as NHBC specifies for drives. Recycled Type 1 is widely used. Check it's graded properly and free of contaminants such as plaster, timber and plastics.
- **Compact in layers.** NHBC sets a maximum of **225 mm** per layer for mechanical compaction. Manufacturers' installation guides usually call for thinner lifts, typically around 50 to 100 mm with a plate compactor. Match the layer to the machine: a light plate won't compact a deep layer.
- Keep the material at about its optimum moisture content. Too dry and it won't lock up; too wet and it pumps.
- Trim the finished sub-base to the falls, and check levels with a laser or string lines.
- **Blinding.** Close the surface with a thin layer of fine material or sand so the concrete or bedding sits evenly and doesn't drain into voids. NHBC's path build-up uses 25 mm of sand blinding. Some contractors lay a polythene sheet on top of the blinding under slabs to reduce friction and stop the sub-base drawing water out of the concrete. Decide on this for each job.
- **Permeable paving is different.** Permeable block paving uses an open-graded sub-base (commonly 4/20 mm crushed rock) and a clean grit bedding layer, **not** Type 1 or sharp sand, which would clog it. Follow the manufacturer's permeable paving guide.

7. The concrete slab

Choosing the mix (BS 8500)

BS 8500 lists "designated concretes" for paving. Order them from a ready-mix supplier with third-party certification (look for QSRMC or BSI Kitemark on the delivery ticket).

Designation	Typical use	Minimum strength class	Max water/cement ratio	Min cement content (20 mm aggregate)	Air entrainment
PAV1	House drives, domestic parking and external paving, **no de-icing salt**	C25/30	0.60	280 kg/m³	Yes: at least 4.5% with 20 mm aggregate
PAV2	Heavy-duty external paving used by rubber-tyred vehicles	C32/40	0.45	340 kg/m³	Yes: at least 4.5% with 20 mm aggregate

Sources: BRMCA's summary of BS 8500 amendment A1, and the Concrete Society's Fingertips on external paving and entrained air. The minimum air content rises with smaller aggregate: 5.5% for 14 mm and 6.5% for 10 mm.

Points to watch: - **Air entrainment** makes the surface resist freeze-thaw damage. Mixing on site with a cement mixer can't reliably achieve it, so for drives, order ready-mixed PAV1 or PAV2 rather than mixing your own. - **De-icing salt.** PAV1 assumes no salt. If the client is likely to salt the drive in winter, discuss PAV2. Under BS 8500, "designed" concretes for freeze-thaw with salt (exposure class XF4) start at **C28/35** with air entrainment; that's where the C28/35 figure you'll see quoted comes from. - **Reinforced slabs.** The Concrete Society notes that BS 8500 pairs PAV2 with reinforced external paving, and infers that **PAV1 is normally intended for unreinforced use**. In practice, plenty of domestic drives are built in PAV1 with light mesh. Where the slab is reinforced and salt is likely, PAV2 (or a designed

concrete specified for both freeze-thaw and chloride exposure) is the safer choice. Settle this with the supplier or an engineer for each job. - **Never add water** on site to make a mix easier to place. It weakens the concrete and the surface.

Thickness

- **Paths and patios:** NHBC says **not less than 75 mm**, with a tamped or textured finish. 75 to 100 mm is normal.
- **Private drives used by cars and light vehicles:** NHBC Table 3d shows **100 mm PAV1** on a Type 1 sub-base sized to the ground. Many contractors build 125 to 150 mm when the slab is reinforced, carries a heavy stone finish, or will see vans and delivery vehicles.
- **Shared drives used now and then by commercial vehicles:** NHBC Table 3c shows **150 mm PAV2**.
- **Anything heavier** (skip lorries, motorhomes, regular delivery vehicles, cranes or plant): get it designed by an engineer.

8. Mesh reinforcement (BS 4483)

Mesh	Wire size and spacing	Area of steel	Weight	Stock sheet
A142	6 mm at 200 mm centres both ways	142 mm^2 per metre	2.22 kg/m^2	4.8 × 2.4 m (about 25.6 kg)
A193	7 mm at 200 mm	193 mm^2/m	3.02 kg/m^2	4.8 × 2.4 m (about 34.8 kg)
A252	8 mm at 200 mm	252 mm^2/m	3.95 kg/m^2	4.8 × 2.4 m (about 45.5 kg)

Source: BS 4483 table as published by CARES (2025) and reinforcement suppliers. Smaller "merchant" sheets (3.6 × 2.0 m) are also sold.

What mesh does and doesn't do. In a thin domestic slab, light mesh mainly **controls the width of shrinkage cracks** and holds cracked pieces together. It does **not** stop cracking, and it won't save a slab laid on a poor sub-base. A good sub-base and well-placed joints matter more than heavier steel.

Where each fits (common practice, not a design rule): - **A142:** paths, patios, light domestic slabs, crack control in bases for tiles or stone. - **A193:** the usual choice for domestic car drives. - **A252:** heavier domestic use or larger bays, normally where an engineer has specified it.

Position and cover. Sources and site practice differ on how high to set the mesh: - Some guidance places it **in the upper part of the slab**, since its main job is controlling surface shrinkage cracks. Overseas driveway guidance, for example, puts it in the top half with at least 30 mm of cover. - Many UK suppliers and contractors instead put it on chairs **around a third of the depth up** from the bottom, with at least 40 to 50 mm of concrete all round. - In a 100 mm slab, both approaches end up close to mid-depth, so the practical rule is: support the mesh on proper chairs or spacers so it ends up **near mid-depth with at least 40 to 50 mm of cover to the top surface and to the edges**. Never lay it on the sub-base and try to pull it up during the pour; it ends up at the bottom, where it does nothing. - Where de-icing salt is likely, more cover is needed to protect the steel, which is hard to achieve in thin slabs. That's another reason to think about PAV2 or a thicker slab.

Chairs. Use plastic or concrete chairs at regular centres, commonly around 600 to 800 mm, so the mesh can't sag when walked on.

Laps. Lap sheets and tie them with wire. Recommendations vary: some merchant guides quote one mesh pitch (200 mm) as a minimum, others 300 to 400 mm. For engineered work, the lap length comes from the design. Where there's no engineer, use the more generous end of the range.

Edges. Stop the mesh about **50 mm** short of the slab edges and formwork so the steel isn't exposed.

At joints. Sawn contraction joints only work if the slab can move there. Common practice is to stop the mesh at the joint, or cut alternate wires through it, unless the design calls for continuity. Follow the design where there is one.

9. Joints

Concrete shrinks as it dries and moves with temperature. Joints decide where it cracks.

Types - **Contraction (control) joints:** a weakened line, sawn or formed, usually a quarter to a third of the slab depth, so the crack forms neatly in the joint. Saw as early as the concrete allows without ravelling the edges. - **Isolation joints:** a full-depth compressible filler where the slab meets something it shouldn't be tied to, such as the house wall, steps, inspection chambers, posts, kerbs or another slab. NHBC notes that an isolation joint against a wall isn't needed unless the opposite edge of the concrete is also restrained. - **Expansion joints:** full-depth joints with a compressible filler that allow the slab to expand. Use them on long runs, where the shape changes and where slabs meet. The Concrete Society's TR66 (*External in-situ concrete paving*) gives detailed spacing and detailing for different amounts of reinforcement.

Spacing (sources differ, so treat these as ranges): - **Paths:** NHBC calls for movement joints **at least 10 mm wide across the full width at not more than 4 m centres**. - **Unreinforced slabs:** the Concrete Society notes that about **4.5 m** has typically been the maximum in the UK, with rules of thumb ranging from **24 to 40 times the slab thickness** (2.4 to 4 m for a 100 mm slab). - **Lightly reinforced slabs:** bays up to about **6 m** are used, with a greater risk of mid-bay cracking as bays get longer. - **Shape:** keep bays as near square as possible. A length-to-width ratio of **up to 1.5:1** is typically acceptable (Concrete Society). - Put joints at **re-entrant corners**, around chambers and at changes of width. Odd-shaped bays crack from their corners.

Joints and the finish on top. If the slab carries a bonded finish (stone, porcelain or tiles in mortar), **carry every movement joint in the base up through the bedding and the finish**. Otherwise the joint will crack through the tiles or stone.

10. Falls, drainage and SuDS

- Lay to the falls in section 2, away from the house.
- Where a drive or path falls towards the house or garage, fit a **linear channel drain** (ACO-type or similar) across the threshold, with a grating rated for the traffic (A15 for pedestrian areas; B125 for domestic car traffic is the usual choice for drives, under BS EN 1433 and BS EN 124).
- Send surface water to a **soakaway, rain garden or permeable area** wherever possible. Using the public sewer should be the last option and needs the water company's agreement; never connect surface water to a foul drain. Building Regulations Approved

Document H recommends that soakaways are **at least 5 m from a building**, and they need percolation testing on site.

- **Sustainable drainage (SuDS)** options that also help with the 5 m^2 planning rule:
- permeable block paving on an open-graded sub-base
- gravel, ideally stabilised with a cellular grid on drives
- an impermeable surface draining to a planted border or rain garden
- a combination of these
- On clay, soakage can be poor, and the GOV.UK guidance notes that an overflow to a drain may be needed.

11. Placing and finishing

- Fix formwork to line and level, oil it, and check falls before the lorry arrives.
- Have enough people and tools on site for the volume. Plan access for the ready-mix lorry or a pump. On terraced streets this often means a parking bay suspension.
- Place and compact the concrete with a tamping beam or poker so there are no voids around the mesh.
- Strike off, then give it a **tamped, brushed or textured finish** for grip (NHBC asks for tamped or textured on paths). Don't overwork the surface or sprinkle water or dry cement on it.
- Form or saw the contraction joints at the planned positions.

12. Curing and protection

- **Cure from the moment finishing is done.** Cover with polythene held clear of the surface, wet hessian kept damp, or a sprayed curing compound. The Concrete Society says curing typically runs for **about 4 to 6 days**, depending on cement type and weather (guidance is in BS EN 13670).
- **Cold weather.** Under BS EN 13670 (as summarised by the Concrete Society), concrete must not fall **below 5°C until it reaches 5 MPa**. Surfaces it's placed onto should be a couple of degrees above freezing. Never pour onto frozen ground or onto mesh covered

in ice or snow. Ready-mix should be at least 5°C on delivery (BS EN 206). Cover fresh slabs with insulating blankets under a waterproof sheet when frost is forecast, and expect strength to develop more slowly, especially with GGBS or fly-ash mixes.

- **Hot, dry or windy weather.** Protect against rapid drying, which causes plastic shrinkage cracking. Cover early.
- Keep de-icing salt off new concrete during its first winter if you can, and tell the client.

When can it be used? There's no single figure; it depends on the mix, the temperature and the load. Commonly quoted industry guidance: - light foot traffic after about **24 to 48 hours**, with care - **cars after about 7 days** in mild weather - heavier vehicles not until the concrete is closer to its 28-day strength

Extend all of these in cold weather, and follow the supplier's or engineer's advice where it differs.

13. What goes on top: bedding the surface

Choose the bedding to match the surface, and don't mix systems without thinking it through.

Flexible (unbound) construction: concrete block and clay pavers. - Blocks on a compacted sharp sand laying course over Type 1, with **firm edge restraints** (kerbs or edgings set in concrete) all round. BS 7533-3 covers the laying course and laying. - Laying course thickness varies by source and product: Marshalls' block paving guide uses **30 mm compacted**; NHBC's drive tables show **50 mm**. - Vibrate the blocks in, then sweep in jointing sand. - Permeable block paving uses its own open-graded bedding and sub-base (section 6).

Rigid (bound) construction: natural stone, porcelain, and Victorian-style geometric and encaustic tiles. - Lay on a **full mortar bed**, never on five spots of mortar, which leave voids that crack slabs and let water and frost in. - NHBC's path build-up shows slabs **fully bedded in 25 mm of 1:4 cement:sand mortar**. Bound paving guidance aligned with **BS 7533-101** typically uses around **40 mm** of bedding mortar, laid wet-on-wet. - **Prime the back** of natural stone and porcelain with a bonding slurry or primer immediately before laying. Porcelain in particular won't bond without one. - **Geometric and encaustic tiles** are thin and brittle, and they crack over any movement. They need a **rigid, stable base**: usually a

concrete base, or a properly prepared screed, with a frost-resistant exterior bedding mortar or adhesive. Use tiles rated for external, frost-exposed use, and bring the base's movement joints through to the surface. - **Bound jointing** (mortar or proprietary jointing compounds) suits a rigid base. A bound surface on an unbound sub-base without a concrete base is a common cause of cracked joints on drives, so only do it where the manufacturer's system allows.

Efflorescence. White salt deposits are common on new concrete products and mortar beds, and usually fade with weathering. Warn clients before they see it.

14. Pre-pour checklist

- Services located, marked and protected; covers set to new levels
- Trees checked; arboricultural advice taken where roots are affected
- DPC clearance of 150 mm and falls away from the house confirmed
- Planning position checked (5 m^2 rule, conservation area, Article 4, listed building, dropped kerb)
- Formation stripped, proof-rolled, soft spots replaced
- Geotextile laid where needed
- Type 1 laid in layers, compacted and checked to level and falls; blinded
- Mix ordered (PAV1 or PAV2), ticket checked on delivery
- Mesh on chairs, laps tied, cover to top and edges checked
- Joint layout marked; isolation joints around chambers and walls in place
- Curing materials and frost protection on site; weather forecast checked
- Access, parking suspension and pump or barrow route arranged

Sources

- NHBC Standards 2026, Chapter 10.2 *Drives, paths and landscaping*: 10.2.6.1 (150 mm below DPC, falls, layers ≤225 mm), 10.2.6.2 (falls 1:80 and 1:40), Tables 3c and 3d (PAV2 150 mm, PAV1 100 mm), Table 4 (sub-base thickness by CBR), 10.2.6.5 (paths: 100 mm sub-base, 25 mm sand blinding, 75 mm concrete, joints ≤4 m, 1:4 mortar bed).

- BS 8500-1 and -2: designated concretes PAV1 and PAV2. Summarised in BRMCA, *New standards for pavement concrete* (2013) and *Concretes for housing* (2015); Concrete Society Fingertips, *External paving: BS 8500 requirements* and *Entrained air: BS 8500 requirements* (2025); The Concrete Centre, *BS 8500 for building and civil structures* (2024).
- BS 4483 (2025): steel fabric for the reinforcement of concrete. Mesh table as published by CARES, *Guide to product certification, Part 7: welded fabric* (2025).
- Concrete Society Fingertips: *Joint spacing for unreinforced concrete*, *Joints in external paving* (refers to Technical Report 66, *External in-situ concrete paving*), *Curing concrete*, *Cold weather concreting* (BS EN 13670, BS EN 206).
- BS 7533-101 (design of pavements with clay, concrete or natural stone units) and BS 7533-3 (laying course for flexible pavements).
- Marshalls installation guides for concrete block paving, permeable block paving and porcelain paving (sub-base and laying-course thicknesses).
- GOV.UK, *Guidance on the permeable surfacing of front gardens* (published 2009, rules in force from 1 October 2008), and the Planning Portal, *Paving your front garden*.
- HSE, *HSG47: Avoiding danger from underground services*.
- BS 5837, *Trees in relation to design, demolition and construction*.
- Building Regulations Approved Document H (drainage and soakaways).
- BS EN 124 and BS EN 1433 (load classes for covers and channels).
- BRANZ (New Zealand), *Bulletin 412: Concrete driveways* (2001). Overseas guidance, cited only for its mesh position, edge distance and bay ratios.
- Commonly quoted industry guidance on trafficking times, from ready-mix and contractor sources. These vary, so follow the supplier's advice for the mix used.

This guidance is general and doesn't replace a site-specific design, the manufacturer's instructions for the products used, or an engineer's advice.