

# The Guide to



# External works

## Pathways, Driveways and Patios

Surfaces such as pathways, driveways or patios are the external elements of the dwelling which create the aesthetic perception of the observed space. For users themselves, they represent the comfort and use of the outside areas. From the point of view of contractors, surfaces of this type require a specific approach and high accuracy of work. This guide will suggest you how to properly prepare the substrate, deal with cracks in the floor, and maintain proper fall and edges of a pathway, driveway or terrace.





# Pathways and Driveways

Pathways and driveways require a firm base, and the foundation depth or type depends on the traffic load, whether it will be used only for walking on, or whether cars or heavy cars will be driving or parking there. Drainage has to be properly done to channel water away from the surface and adjacent walls. Lastly, pathways and driveways are not only functional but also have a role

in the design of the outside space, so are often made of decorative materials.

## **Step 1. Preparing the substrate**

The surface should be cleaned of all organic material, and drainage should be considered for ground that is saturated. Existing trenches should be backfilled with the granular material

to the required level and compacted in layers no greater than 300mm. The backfilled material should have the same capacity as the adjacent ground.

## **Step 2. Substrate**

It is necessary to provide the adequate substrate that will adequately support the finished



surface. Weak mix concrete or well-graded hardcore might be suitable. For pathways minimum substrate thickness is 75mm, for driveways with light traffic 100mm should be provided, while for heavy traffic 150mm. The hardcore has to be compacted to support the pathway or drive adequately. Please note that in cases where the ground below the substrate is weak or soft, the substrate should be designed by a Structural Engineer. Compacting can be done with the vibrating plate or roller.

### Step 3. Drainage

It is necessary to provide adequate drainage to prevent staying water. It is recommended to laid pathways and driveways to fall away from the building. Rainwater should be lead to the gully or well-drained garden, not onto the main road. Please note that pathways and driveways should be laid at least 150mm below the DPC (damp proof course) of the building. Any higher then this can lead to rain getting to the DPC and causing damp.

**Establishing a Fall** - It is recommended to

establish the fall by reducing the mortar or pavers away from the building. The sufficient fall is of 25mm in 2m. Also, in the case of wooden deck boards to enhance drainage, build a fall of 1:100 away from the adjacent property. Grooved deck boards are designed to assist channelling the water, so it is recommended to lay them in the direction of the fall. It is recommended to establish the fall by reducing the mortar or pavers away from the building. The sufficient fall is of 25mm in 2m.

### Step 4. Edgings

Edgings are necessary to prevent movement or displacement of pathways or driveways, but are not required in case the substrate is the in-situ concrete or precast concrete paving slabs laid on the mortar substrate. In case of gravel pathways or slabs laid on the sand bed, the edging will prevent any movement of the surface. Edgings should be laid in line with no gaps. If slabs are bedded into mortar the edge might allow for a neat finish. Treated timber edging can be used. Concrete edging should be laid on the 200mm wide x 100mm

deep mix concrete base and haunched up the side of the edge. In case the adjacent surface is a lawn the edging should be lower than the lawn.

### Step 5. Surface

Suitable surfaces for pathways and driveways include block paving, precast concrete paving slabs, timber decking, cast in-situ concrete, rolled asphalt, macadam.

#### **Paving slabs**

Paving slabs can be placed either on bed of sharp sand or on mortar. It is recommended to allow for a 25mm bed of sharp sand or a semi-dry mortar mix (sand/ cement mix ratio 3:1). Depending on the desired finish you can lay paving slabs with joints adjacent or leaving joints no greater than 4mm for pointing. Pointing should be done with mortar, or joints should be filled with kiln-dried sand. Paving slabs can be cut with the diamond blade.

#### **Block paving**

Block paving requires a minimum of 50mm sharp sand base, and gaps between blocks should



not exceed 5mm. All joints should be filled with kiln-dried sand or similar. Block paving can be cut with a block splitter. Remember to compact the whole surface at the end.

#### **Porous block paving joints**

Where paving is designed to allow ground water to drain through the joints, the gaps between blocks and the material within the joints should meet the initial design specification. The joint material should be sufficient to prevent blocking and prevent moss growth.

#### **In-situ concrete**

In-situ concrete should be laid in areas of 20m<sup>2</sup> maximum to allow for movement. Where abutting an adjacent structure, the concrete should be isolated using a flexible jointing material. Where the sub-base is well drained, it is recommended that the concrete is cast onto a Damp Proof membrane.

#### **Macadam and asphalt**

Ensure that sub-bases are dried and primed and that the surface is appropriately rolled with a vibratory roller to the required finish.

#### **Timber decking**

Only timber naturally resistant to decay, or which can be treated by an industrial process to give long-term protection from decay, shall be used.

#### **Hardwoods**

Only use species rated as durable or moderately durable.

#### **Softwoods**

Only use species/components with natural durability or which have been treated in accordance with bS EN 335 to a 'Use class' standard appropriate to their use, i.e. 'Use class 4' treatment for posts and other structural components in direct ground or freshwater contact, or 'Use class 3' treatment for all components out of direct ground contact subject to frequent wetting.

#### **Timber grade (strength class): C16 minimum**

Softwood with a strength class rating of c16 is considered the minimum standard for decks above 600mm in height, and is a requirement of building Regulations for such raised-level structures. The higher strength classes, typically c18 and c24, should be specified where smaller component sections, longer spans or commercial deck performance design considerations are required. For decks below 600mm in height, the use of c16 timber is also recommended.

Posts can be made from laminated sections, solid timber or round poles, and should have a load-bearing capability/size/spacing appropriate to the scale and end use of the structure. For extended life, the surface mounting of posts on precast piers or metal shoes is recommended.

When laying timber decking boards:

- Allow for a 5mm minimum to 8mm maximum gap between board lengths.
- where the board abuts a post, allow a 5mm gap.
- where board ends meet, allow a 3mm gap.

#### **Metal fixings**

All metal fixings shall be made from corrosion-resistant materials, such as stainless steel, hot dipped, galvanised or other specialist coating. Screws should be at least two-and-a-half times the thickness of the board being fixed. Ideally, choose screws that are self-countersinking.

Pre-drilling pilot holes will help prevent splitting, and always drill pilot holes 2mm oversize when fixing hardwoods.

At all joist crossing points, secure boards with two fixings positioned at the outer quarter points of the deck board, i.e. 25% in from either edge. On grooved boards, fixings should always be at the bottom of grooves. Take care using high-pressure nail guns as they can damage timber.

#### **Manhole cover**

Never seal the manhole covers or other access points to underground services. Use the removable cover or engineering bricks to build up the manhole.

(Source: LABC warranty, Technical Manual V7: TS-011a-7.00-180814, Chapter 11: External works, p.299-301)





# Patios

Patios not only provide the place for relaxation and add to the overall design of the property but also enhance its value. There are various options to create a beautiful area at the rear of the building. Amongst others, there is aggregate flag range, stone, paving slabs, tiles.

***In the first part of this guide, we will describe how to lay a paving slab patio.***

Laying paving slabs requires some setting out. It is recommended to include in the calculations of exact patio area the pavement design and how to minimise cut slabs. The decision whether the paving slabs should be laid on the sand or mortar, with pointing or directly next to each other is also relevant. Remember to include the space for edging.



### Step 1. Setting out and excavating

Knock pegs into the ground and tie strings to establish the patio area. Once the patio area is marked out, dig down to the required depth. Include slab depth, hardcore and the mortar in calculations. Remove any turf, plants or paving and dig down to a depth of about 150mm to allow for the foundations.

### Step 2. Edging

Cut timber edging to the same depth as the excavations, adjust it so that the patio surface slopes away from the building, using a gradient level. It is necessary to preserve a fall of 1.5-2% to enable water channelling away from the building.

### Step 3. Laying the hardcore base

Evenly lay the hardcore base (also you can use or add additional layer of granular MOT type 1) across the floor of the excavation to an approximate depth of 100mm. Compact the hardcore using the plate compactor or roller. Check the level of the compacted hardcore across the site. Ensure the compacted surface slope away from the house. If required add a layer of bedding mortar over the compacted hardcore.

**What is type 1 MOT?** It is a granular sub-base material, widely used in the construction industry. It has excellent load bearing qualities and is often used for heavy traffic areas like highways, car parks, footpaths, driveways, hardstandings and building bases. Any application where a firm sub-base is required needs type 1. MOT classed as 'Type 1' must comply with the Department of Transport Specification for Highway Works, clause 803 (SHW 803). MOT Type 1 is made from Granite, Limestone or clean Crushed Concrete. The product is crushed to 40mm down to dust creating an aggregate containing a range of particle sizes that is easy to compact.

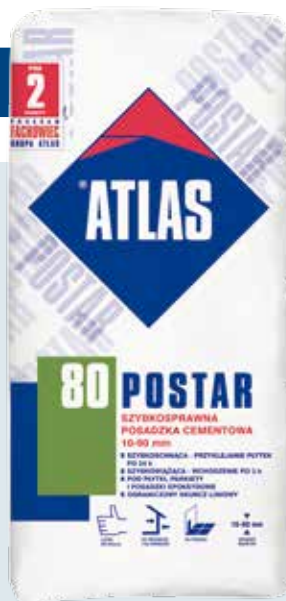
### Step 4. Laying the mortar

The surface of patio must be at least 150mm below the DPC of the house, so rain doesn't get there.

At this stage, it is recommended to lay a concrete slab. Pour the foundation concrete onto the hardcore base. Compact it with the batten and level the surface with the float. For larger surfaces consider laying the self-levelling compound on top.

#### Mortar application

The compound should be laid the wet contact layer, using method 'wet-on-wet'. Prior to applying the main layer of screed you should execute the



#### ATLAS POSTAR 80

It is recommended for quick repairs. It may be used as the floor finish or screed beneath the top finishes like: ceramic and stone tiles, epoxy floors and coatings, PVC and carpet floorings\*, parquet and floor panels.

##### Main properties:

- further works just after 24 hours,
- foot traffic after 3 hours, limited linear shrinkage, high cohesion,
- thick plasticity.

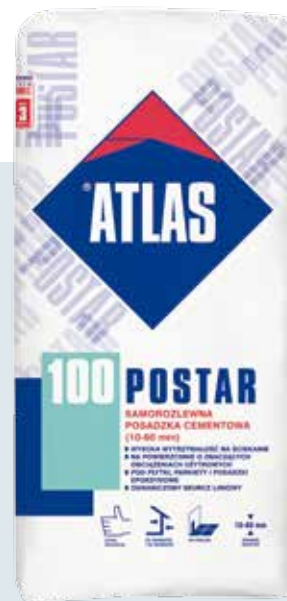
##### Main parameters:

- consumption: 20 kg/1 m<sup>2</sup>/1 cm layer
- thickness: 10-80 mm
- high compressive strength:  $\geq 40$  N/mm<sup>2</sup>

\* Before the application one should execute a smoothing layer with the use of ATLAS SMS 15 or ATLAS SMS 30.

second contact layer after first has dried. All works should be carried out in accordance with the flooring work techniques. It is helpful to use levels to ensure that the resulting surface is even. The guides should be attached so that the screed thickness is as designed and in all places no less than the minimum thickness for a given design (bonded to the substrate, on a separating layer, floating). In order to compact the material or spread it more evenly, it can be vibrated with a screed or compacted with a trowel. Rake up the excess mix along the guides with zigzag moves. The assumed technological pad should be filled and levelled within ca. 30 minutes. The surface should be floated and evened with floats after ca. 3 hours.

The freshly applied screed should be protected against excessive drying, direct sunlight, low air humidity and draughts. In order to ensure



#### ATLAS POSTAR 100

It forms the floor finish layer of high strength – it is used on loading ramps, driveways, underground garages, parking lots, terraces, balconies, warehouses, production halls, etc. It may be used as the floor finish or screed beneath the top finishes like: ceramic and stone tiles, epoxy floors and coatings, PVC and carpet floorings, parquet and floor panels.

##### Main properties:

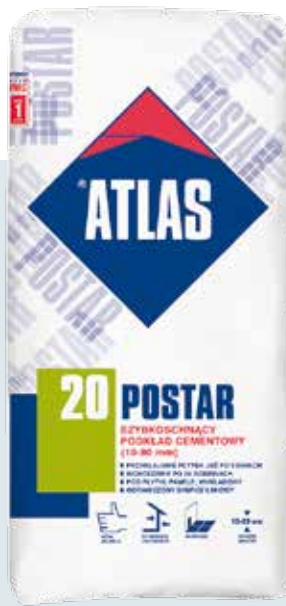
- limited linear shrinkage,
- easy application,
- applied manually or mechanically.

##### Main parameters:

- consumption: 20 kg/1 m<sup>2</sup>/1 cm
- layer thickness: 10-80 mm
- high compressive strength:  $\geq 50$  N/mm<sup>2</sup>

the optimal setting conditions for the screed, the fresh screed surface should be sprinkled with water or covered with plastic foil. Appropriate maintenance leads to an increase in the strength of the product, but it also extends the drying time. The screed drying time depends on the layer thickness and the ambient temperature and humidity. Foot traffic on the screed is allowed after ca. 24 hours, and full load can be applied after ca. 14 days.

Depending on the conditions of curing, humidity and the type and permeability of the flooring, application of top flooring can be commenced after an average of 5-6 days for tiles, PVC flooring can be applied when the screed has dried completely. Before application of flooring the surface should be primed with UNI-GRUNT or AVAL KT17 primers.



### ATLAS POSTAR 20

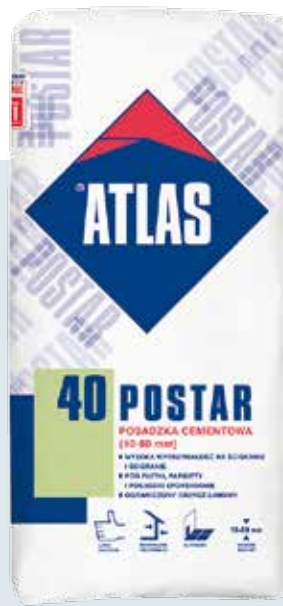
Creates subfloor of thickness 10 - 80 mm - the layer thickness depends on the structural arrangement (table below). Recommended for use in residential and public access buildings.

#### The main characteristics:

- fast-drying - work can be continued after 5 days
- foot traffic after 24 hours
- limited linear shrinkage
- high compressive strength:  $>20 \text{ N/mm}^2$
- for places exposed to permanent dampness

#### The main parameters:

- consumption:  $20 \text{ kg/1 m}^2 / 10 \text{ mm}$  of thickness
- layer thickness: 10 - 80 mm
- compressive strength: min  $20 \text{ N/mm}^2$



### ATLAS POSTAR 40

Forms subfloor or floor of thickness 10 - 80 mm - the layer thickness depends on the structural arrangement. Recommended for execution of subfloors and floors in residential buildings, warehouses, industrial premises, as well as on driveways and terraces. etc.

#### The main characteristics:

- high compressive strength  $\geq 30.0 \text{ N/mm}^2$
- for warehouses, driveways
- as substrate for tiles, epoxy screed
- for places exposed to permanent dampness
- on separation layer or floating

#### The main parameters

- consumption:  $20 \text{ kg} / 1 \text{ m}^2 / 10 \text{ mm}$  of layer thickness
- compressive strength:  $\geq 30.0 \text{ N/mm}^2$
- layer thickness: 10 - 80 mm

## Step 6. Pointing

Avoid foot traffic for 24 hours to allow the mortar to set. Cover the area with the protective sheets. When the mortar sets, finish off the pointing. Pointing mortar should be a semi-dry mixture of sand and cement in 4:1 proportions. Too wet or too dry mortar may cause shrinkage. To prevent water seepage you might consider using a sealant, but bear in mind that sealants might cause discolouration. We advise following manufacturer's manual.

*For the purpose of the second part of this guide, as an example, for the subsequent steps we will use a ground patio, on a compact, concrete slab carrier substrate. It can be finished with any decorative materials, for instance tiles.*

## Step 1. Preparing the substrate

Preparatory work must begin with an accurate inspection of the substrate. It is necessary to preserve a fall of 1.5-2%, which will enable an efficient flow of water out of the contour of the terrace. Should the fall be smaller, it will be essential to add an additional layer of concrete floor in a separate stage of work.

Using a level, check that the surface is even. Any inequalities need to be removed with a hammer and chisel. Next, measure the height available for the performance of works. As part of the estimations, take into account the possible need to add fall (the thickness of the additional downward layer), the height of the sealing layers and adhesive, as well as the thickness of the planned ceramic tiles.

External surfaces, such as terraces or balconies, absolutely require appropriate carrier substrate, which will allow for proper load distribution. They must be clean, dry and free of cracks and any non-load bearing layers, which reduce the adhesion of subsequent layers. This means cement residue and any loose dirt. Any possible cracks must first be made good, before moving on to the next stages.

## Step 2. Fix cracks in the floor

Cracks and grooves and the width of cuts in the floor must be visibly marked. Cracks should be widened using braces, to facilitate effective and durable resin fill-in and reinforced. While performing injections, be careful of their depth, so as not to weaken the substrate. After making a cut, get rid of dust and loose fragments, insert braces into the prepared cracks, and fill with the appropriate resin.



## Step 5. Laying the paving slabs

Firstly ensure there is a bed of mortar for the first slab, approximately 2-3cm deep. Insert spacers between the paving slab and edging to keep pointing the same. Continue laying slabs according

to the required design. Use a spirit level to ensure the fall is maintained away from the building. Adjust the amount of mortar where necessary. Allow 10mm-30mm gaps between slabs of natural stone, 10mm-15mm for straight edge slabs.



### Step 3. Priming the substrate

UNIGRUNT or AVAL KT17 might be used to prime the substrate. Priming will reduce the absorption, bind loose, fine residue and simultaneously increase the adhesion of subsequent layers.

### Step 4. Create the required fall

Substrate falls of 1.5-2% are necessary for smooth removal of water from the patio surface. If the existing fall is insufficient (a common issue) or non-existent (even more frequently), it needs to be added. There are two options to choose from: make a pitched screed or a smoothed screed. Regardless of the method, the fall always must be shaped on the construction substrate, that is, before laying the seal layer.

#### *Example of calculation of the required pitch*

Patio overhang (distance from the wall of the building to the outer edge with water drainage) is 4 m. Within this section, the pitch must change by at least 1.5 cm on each subsequent meter (i.e. 1.5%, preferably about 2%). This means that the difference in height between the wall of the building, and the outer edge of the drainage must be at least 6 cm (preferably 8 cm).

#### *Variant 1. Pitched screed*

First, make the necessary measurements at the walls. Make the screed using the "wet on wet" method, firstly wetting the substrate with water and then applying a quick-setting mortar (Atlas Postar 20, 40, 80, 100), which will serve as a bridge for the screed cement and drainage mortars. Pour the mortar into a measured amount of

water and mix mechanically to achieve a uniform, lump-free consistency. Pause mixing, due to the time required for maturation, and then mix again. Start applying the mix from building walls, taking care not to cover a too large surface area, because the mortar screed will also have to be applied by the "wet on wet" method.

To perform the screed, you will need a fairly thick pitched layer, due to a usually wide patio outreach. The mortar is then distributed by means of a shovel, to the height indicated earlier and thickened, by initially tamping down. Thus, distributed mortar is then thickened again, with a float or a trowel, and then levelled. The surface is then checked and swiped down with a long floating rule with a level, which will facilitate to control the executed fall. After 12 hours, we can clean the edges to allow the installation of flashings and sealing coatings, then cut off the excess string level.

#### *Variant 2. smoothed screed*

In case where the substrate requires only smoothing to make a fall, the work also starts with applying string level onto the substrate, and then marking the height to which we will apply the cement mortar. In the case where we can use a thinner layer, apply the self-levelling mortar, which is applied in layers with a thickness of 3 mm to 30 mm. Measure out the right amount of water and pour the mortar powder in. Information on the ratio of water to the amount of mortar can be found on the bag. Mixing should be paused for 3-5 minutes, to observe the required curing time, then continued until obtaining a homogenous consistency without lumps. Thus prepared mortar is then applied to the surface.

The application of the mortar should start from the highest designated point, all the time checking the appropriate thickness. The whole layer needs to be sharply evened with a float, regularly observing the beforehand marked maximum height of mortar. Starting from the highest point, even out the mortar layer with a float, regulating level and fall of the surface.

The outer edges need to be then cleaned with a wet brush to prevent subsequent sharp edges, improper for the placement of tile sealing layers. Cut off the excess string level, and then check the fall and level of the surface with a long level. Any lumps should be removed and any hollows evened-out with a spatula.

### Step 5. Edging

Equally important to the appropriate surface preparation of the patio is to ensure accurate treatment of its leading edge. Vertical should effectively drain water outside the entire frame of the patio, and at the same be protected against the ingress of moisture and water from soil.

Preparing the leading edge of the patio begins with proper surface preparation. These surfaces must be even and free of dust or loose particles and properly primed. Any inequality in the patio front part, including the contact area of the construction plate with the newly laid self-levelling layer must be made good using the mortar.

After curing the mortar, the edges are ready for further flashing and application of seals. The finish of the outer edges of the patio can be performed in various ways.