Advice on Surfaces for equestrian routes

The British Horse Society

The law and management of public access rights vary widely between the four countries of the United Kingdom. Practical elements of the following advice apply in all countries but the legal requirements in Scotland and Northern Ireland may differ from those in England and Wales.

More advice is available on www.bhs.org.uk/accessadvice.

IMPORTANT This guidance is general and does not aim to cover every variation in circumstances. Where it is being relied upon, The Society recommends seeking advice specific to the site.

Inclusion of a type of surface DOES NOT necessarily infer recommendation by the BHS.

Definitions

The term multi-use path is used throughout for simplicity to include any path or track with horse access—bridleways, restricted byways, byways open to all traffic, unsurfaced unclassified roads ('green lanes'), 'carriageways' (Northern Ireland), 'core routes' (Scotland) and permissive routes—however, the term is not legally defined and horses may not have been considered where the term is used by other than the British Horse Society.

Surfaces are described in respect of the horse, whether ridden or driven (horse-drawn vehicle).

Contents

Introduction

Many multi-use paths are tracks of natural low growth vegetation and beaten earth, perhaps with some stone embedded in the consolidated surface. These unsurfaced paths are ideal for equestrian use and capable of sustaining such use if they are adequately drained and kept clear of excess vegetation (overhanging and surface).

The level of intervention or maintenance required to establish or maintain natural paths is closely related to topography, underlying geology and drainage. On many paths, regularly cutting vegetation well back and maintaining drains will avoid the need for more extensive works.

On free-draining soils, artificial surfacing is generally unnecessary as the track will usually remain useable even where farm traffic or other use causes minor erosion. Extreme erosion from heavy use may justify intervention by consolidating the existing surface or preventing material being carried away, rather than introducing artificial surfaces.

On all soils or substrates, even poorly draining ones, successful drainage is often a cheaper, easier and more sustainable way to resolve poaching, erosion or other issues than artificial surfaces. The benefits of attention to drainage cannot be over-emphasised.

Where the soil type is clay, or drainage cannot be improved and use is higher than the surface will bear without poaching, then artificial surfacing may be required for the route to remain passable for all users. If a badly poached or rutted surface dries at some times of year to resemble deeply uneven rock, this too may need attention as it is unpleasant and potentially dangerous for all users.

Successful construction and maintenance of multi-use paths will be aided by an understanding of horses, their physiology and action; the effect that horses may have on a surface, and the effect of a surface on a horse.

Facts about horses

Horses vary considerably in size and mass between breeds. A small pony (less than 1m high[1]) will weigh about 200kg; the largest draught type horses (1.9m) may be a tonne. These are extremes and the most common range for riding and driving will be 350 to 700kg (1.1 to 1.7m high).

The weight distribution of a standing horse on level ground is 30% each fore leg, 20% each rear leg.

[1] The height of horses is measured to the withers; the part of the spine in front of where a saddle sits, at the bottom of the neck/mane, which is the highest static point as the head and neck are very mobile and can rise to nearly half body height

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In walk, the peak force on a foreleg is about half the bodyweight so about 2,500N in a horse with 500kg body mass; at maximum speed, about 2.5 times bodyweight, so 12,500N, however, that peak force is momentary and quickly passes to another limb even in walk, where three limbs are in contact with the ground at any time but are not synchronous.In trot, because alternate fore and rear legs are in synchronous movement, it could be said that the peak force moment would be 8,333N (fore plus rear forces), but it is quickly passed.

Guideline values	Walk	Trot	Full gallop
X bodyweight	0.5	1	2.5
Peak force fore leg (500kg body mass)	2,500N	5,000N	12,500N
Peak force rear leg (500kg body mass)	1,666N	3,333N	8,333N

A horse's hoof varies in size from 100mm to 280mm diameter.

The hoof comprises an insensitive outer layer of horn, which surrounds and protects sensitive inner structures. Most horses in regular work are shod with metal shoes to protect the bearing surface of the hoof wall from excessive wear but unshod horses are increasingly common where the amount of roadwork they do is limited (tarmac quickly wears away the hoof). Shoes, especially when well worn, can slip on some artificial surfaces depending on the polished stone value of the surface.[2]

The sole of the hoof appears hard but is relatively thin and easily bruised (comparable with human nails). On flat, compacted surfaces it will not come into contact with the path surface because of its natural arch, but on unconsolidated stone surfaces sharp edges of stones may protrude into and bruise the sole of the foot, causing lameness. (Put pressure on your nail with a stone to feel what it may be like.) Any loose stone surface, even rounded pea gravel, may be uncomfortable for horses.

Loose stones may also become wedged between the shoe and the sole, exerting painful pressure on the underlying tissues. Infection within the hoof resulting from stone punctures or bruising to the sole can cause serious problems requiring veterinary attention. A stone-free surface is therefore preferred to avoid injury to horses.

An increasing proportion of horses are not shod at all, or shod on only fore feet. Stony surfaces will therefore exclude a number of horses because walking on them is painful (think of walking barefoot on gravel or shingle). Some surfaces, especially aggregate or grit or with proportions of aggregate or grit at the surface, can be very damaging to unshod horses' feet.

The level of concussion to both the hoof and horses' legs increases with the hardness of the surface and with the speed at which the horse is moving. This is exactly comparable to humans—running on a pavement transfers a lot more stress to the bones, joints and soft tissues than running on a grass sward, with typical increased wear and risk of deterioration

[2] Common measurement of slippage but no record of it being measured for horses has been found; it generally relates to motor vehicles

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and injury—therefore, equestrians favour surfaces with some ‘give’ where possible. Even walking as a pedestrian or horse puts more stress on joints on asphalt.

The greatest risks for horses are:

- Slippery tarmac or other sealed surface
- Hard surfaces which cause concussion through joints
- Sharp stones which may bruise, puncture or damage the bottom of hooves
- Boggy ground, holes, rough ground (e.g. badly poached and dried clay or ploughed earth) or deep mud in which they may sprain or break a leg

As with humans, slopes or steps (natural or created) change the force through each footfall which may increase stress on the surface. Going up, the thrust is backwards and down with greater proportion of load through the hind legs; going down a slope, load emphasis is on the front limbs and there is a tendency to slide; down a step will cause a concentrated downward force in a small area at the base of the step.

Ideal surface

The ideal surface preferred by horses and their riders or drivers will therefore be:

- Non-slip
- Resilient, with some give (10 to 30mm at point load)
- Well-drained
- Adequate bearing capacity to avoid erosion or poaching
- Free from stones, especially if angular or sharp edged

This is most likely met by short, firm, well-drained grass sward.

Surface types

Types of path surface, in descending order of preference, are:

- Short, firm, well-drained turf, which is ideal for horses and pedestrians, and usually firm enough for cycles and horse-drawn vehicles
- Vegetated paths on a firm base such as grassed over forest roads or disused railway tracks stripped of ballast to expose consolidated ash solum, which are ideal for supporting year-round multi-use, provided they are well drained.
- Paths where the natural vegetation is protected or reinforced by some type of partial surfacing, such as embedded stone.

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- Formally constructed paths with firm, non-slip surface.

Where the existing surface is well-drained turf which is resilient to use, change to any kind of stone or hard surface is disadvantageous to horses and probably pedestrians, as well as having an impact on the natural environment.

Sealed surfaces may be considered necessary to facilitate cycle or wheelchair access, but the finished surface must not be hazardous to horses (see Bituminous Surface Treatment page 13). Where it has been decided that a hard surface is required, retention of short turf over part of the width for those users who prefer softer surfaces should be considered.

Hard surfaces

On paths where horses are legally included and may be a common user—bridleways and restricted byways—a surface more appropriate to their use than to motor traffic should be provided. If this is not practical, or other users are in the majority then a compromise, in consultation with local BHS representatives, may be reached, preferably in providing an appropriate surface for all users or parallel surfaces for different users. The BHS has found polymer-bound, rubbercrumb-grit compounds to be the most successful in providing resilient, free draining, smooth surfaces which accommodate all users well.

On paths where a hard surface is necessary for vehicles, a grass or other vegetated central or parallel strip offers a better surface for horses while providing reinforced wheel tracks and offers a good compromise solution. It is important that the unsurfaced strip has even ground and grass growth is controlled by use or cutting because if it obscures potential hazards riders are less likely to use it. It must be free from loose stones or debris that could be a trip hazard or cause injury. Care must be taken during maintenance of the hard surface that spoil or debris is not dumped on the grass strips.

On paths such as cycle tracks or permissive paths where horses are included as vulnerable road users but are not the majority user, a less than ideal equestrian surface may be acceptable where such a path gives equestrians a route free of motor vehicles.

Bound rubbercrumb-aggregate has been used very successfully to provide a bound surface that can look like tarmac, is easily used by cycles and wheelchairs but is also excellent under foot for pedestrians and horses as it has some ‘give’. This is a surface that the BHS recommends for multi-use paths where a bound surface is necessary. As this material becomes more used, its price is reducing and in 2018, it was found cheaper than tarmac at one site, in 2020 it was comparable but its lifetime, carbon footprint and guarantee are generally greater than tarmac and recycling after use similar.

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Construction

Where a constructed surface is required, the three elements of a good multi-use path construction to be considered are drainage, foundation and surface. The factors influencing all three will depend on local geology, gradient, nature of the path (such as holloway, in woodland, open and windy), local materials and use.

Points of particular importance on paths for equestrian use

- Weight of horses and effect of horses' hooves must be taken into account in constructing or surfacing any paths and in ensuring drainage level will be adequate to prevent poaching.
- Where hard edged drainage grips or cut-offs have been created in the path, the space between the sides should ideally be less than 100mm or more than 300mm to prevent a horse's foot becoming stuck. They should be clearly visible.
- Brash or fascines traditionally used as floating rafts to support paths over wet ground are not usually recommended on equestrian paths because of risk of horses' hooves slipping through surfacing to penetrate branches below, leading to potential injury. However, they have been used successfully in Northumberland with geotextile to prevent the surfacing sinking into the fascines.
- Free-draining sandy or chalk soils are usually able to withstand horse use without need for surfacing.
- Clay soils are particularly prone to damage by horses. Well-used paths on such soils soon become a sticky mess impassable to walkers, cyclists or riders and may still be impassable in the driest weather if a badly poached surface hardens to jagged uneven rock. Clay paths will usually therefore need attention to drainage to avoid areas becoming wet and perhaps amelioration of the surface with other substances to reduce its overall clay content.

Drainage, foundation and surface

Drainage is crucial to the suitability and longevity of a path surface

If drainage is inadequate or inappropriate, any other work may be completely wasted. This is unfortunately too common, so the importance of getting the drainage right cannot be emphasised enough.

In many situations, attention to the drainage may be all that is required for a considerable improvement. It may be feasible to undertake drainage on a project then check how it works for a period before further work to finish the surface. The need for more drainage work may be identified which can then be undertaken without loss of a new surface (because it has not

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been laid) or it may become apparent that drainage alone has been the solution, or that less surfacing work than originally planned is required.

Drains take many forms in construction, depending on geology, space, gradient and catchment. For routes used by horses, it is important to remember:

- the much greater weight and point load of a horse compared with a pedestrian or cycle, so more drainage may be necessary for the surface to remain sound; and
- that surface drains, cut-offs or other cross slope structures to slow and divert surface water must take account of hoof size as well as potential as a trip or slip hazard.

Guidance on drainage and construction of paths is well covered in other documents, including On the Right Track: Surface Requirements for Shared Use Routes (Countryside Agency), Making the Best of Byways (Defra) and Paths for All (produced in partnership with, and available from BHS Scotland bhsscotland.org.uk). However, these publications predate the application of bound rubbercrumb-grit compounds to public tracks and this option should be considered when reading older publications.

Once a firm foundation has been prepared a bearing surface layer will be required to spread the loads imposed by horse use and to assist in protecting the foundation.

Cross drains

Cross drains are often required on sloping paths or tracks and can pose a particular problem to horses. It is important that drains are of a construction where a horse's hoof is unlikely to go into the drain and particularly not to be caught by it. Wide shallow drains are therefore safer than narrow deep ones unless the latter are slits or covered, in which case buried pipes are probably better as covers can be slippery. The sides of a cross-drain should form a concave profile, not vertical and particularly not convex as these are more likely to cause injury (figure 1)

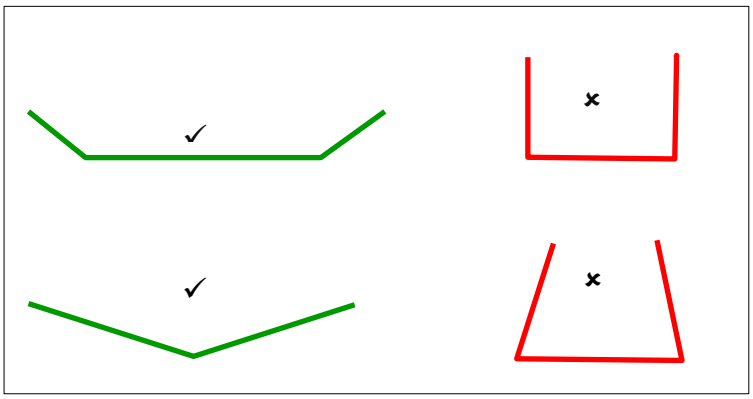

Figure 1 Good and bad profiles

Metal gratings should be avoided as they are likely to be slippery to metal-shod horses and should never extend over the full width of a track. Metal gratings covering a gully across a

tarmac road are a common engineering solution. In a case where this is deemed necessary, a 'bridge' should be made of at least 500mm so that horses can cross without touching the gratings or gratings should have a finish which is non-slip to shod and unshod horses.

The wide variety of weather conditions and run-off rates in most areas means that drains will have to be constructed dependent on the requirements of any individual site. A width between 70 and 200 mm should be avoided as a potential 'hoof trap' unless the drain is constructed with a shallow V profile.

Surfacing options

NOTE: Inclusion here does not constitute 'recommendation' by the Society; the following is consideration of common options available. What is appropriate will always vary depending on site conditions and normal use and must be judged on an individual site basis.

Grass paths should always be the first choice for multi-use, but sustainability depends on drainage and soil type. Regular use will help maintain a short sward suitable for all users, and provided trampling from use does not exceed plant growth, virtually no maintenance will be required.

Some mixes of grass species are more resistant to wear than others. Annual meadow grass is one of the most resistant species and can be introduced to or the proportion increased in most swards to improve wear resistance (subject to conservation controls). Usual treatments for grass sward—aerating, scarifying, fertilising, rolling and mowing—can make the sward stronger and denser.

Where use is high and vegetation is unable to keep up with wear resulting in deterioration of the sward despite attention to drainage and the sward quality, artificial surfacing may be required.

Well-drained short grass can provide a suitable year-round alternative parallel to a surfaced path, but it will be avoided if boggy or litter-strewn or where hidden hazards may be concealed by long vegetation. Equestrians will avoid vegetation that may obscure holes, drainage channels or debris because of risk of injury to the horse. Mowing may be necessary where use is insufficient to restrict grass growth.

On vehicular tracks a grass or other vegetated central or parallel strip offers a better surface for horses while providing reinforced wheel tracks. If the grass growth is not controlled by use or cutting, equestrians may avoid it in case of obscured hazards.

Rough, tussocky moorland grass is unsuitable for most horses.

Grassed gravel paths can offer a turf path ideal for all users with increased resilience to wear as the turf is reinforced by gravel embedded in the earth. The construction is as for an aggregate path with the top 200mm mixed with top soil and seeded with a wear resistant grass

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species. The key is establishing a sward before the soil is washed into the aggregate below. A geotextile below the earth-gravel-seed mix will probably be required and aftercare (especially watering, depending on time of year and possibly restriction of use). It is important that any aggregate/gravel is well bedded in the sward.

Reinforced grass paths are where cellular grids of plastic or concrete (geocell) are filled with earth or aggregate. If planted or seeded, the resultant turf may be protected from excess wear, especially by vehicles, because the grid takes most of the contact. The grass can be mown and treated the same as with no reinforcement and the grid can be almost undetectable. Its success depends on the drainage quality of the subsurface and earth, the degree of wear and quality of turf.

Geocell may also be used simply to confine aggregate on a difficult surface or to provide a temporary route for construction traffic without intention of it being vegetated.

If considered for use where there is horse access, care must be taken to identify grids which are not slippery—some are dangerous in providing no grip at all to shod horses. The cell size must be smaller than a horse's foot so that if the earth content erodes the cell will not form a hole which could trap a horse's foot.

If use of geocell is essential, the cell contents should be frequently checked and topped up if necessary to ensure it is as high as the grid to provide a safe path for horses.

Woodchips may be popular with riders but are unsuitable for wheelchairs and cyclists. They are difficult to contain to the path and rot relatively quickly, requiring regular top up. They are not recommended except on a horse-only route with maintenance commitment. Similarly, **recycled materials such as shredded tyres, chopped plastic cable casing**, and synthetic fabric scraps incorporated with sand, each on a well-draining substrate, can provide an excellent surface for horses (rarely other users). A border may be needed to contain the material within the path width as it is unbound. Like woodchips, such materials are unsuitable for non-equestrian users but can be a good solution on the horse section of multi-use paths with separate tracks for different user types.

Care must be taken to ensure there are no metal or other foreign parts included in the material.

Some rubber crumb or shred materials can be bound with resin to form an excellent firm surface that is ideal for horses.

Bound rubbercrumb-grit has been used very successfully on routes used with horses, even on a 1:4 gradient, with a lot of horse use where erosion was previously a problem. It provides a firm, bound surface that can look like tarmac, is easily used with cycles and wheelchairs but is also excellent under foot for pedestrians and horses. This is a surface that the BHS has found optimal for all users on shared use paths where a natural sward surface is not sustainable.

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Rubber mats, blocks and pavers or hot spray application have been successful in many equestrian applications around racetracks and training yards. It is expensive but may be a solution for short stretches such as a bridge or ramp. On inclined surfaces, consideration must be given to the force of hooves which will be much greater than on the flat. Applications will need to be secure so that they do not tear away from anchor points (mats) or separate from the sub surface (spray applications).

Boardwalk is not always appropriate for horse use but some situations have no other solution, although a form of Irish ford (adjacent pipes laid laterally across the path width, with surface on top so water can pass through, or causeways have been used successfully where a boardwalk was suggested.

As with a bridge, solidity and anti-slip finish are important with good landings at the ends, clear sightlines so that any users can choose to wait rather than share the boardwalk and be of adequate width. 2m is recommended but BHS representatives may agree a lesser width in local circumstances where it is practical. Passing places may be required on long lengths.

Wire mesh must not be used to attempt a non-slip surface as it may catch the nails used in horse shoes. There are grit products which can be applied to boards which are successful for all users, particularly if used from new. A kickboard along edges may increase safety.

Rather than wood, which can be slippery for all users, recycled rubber or plastic compounds (possibly reinforced) have been used successfully and had far longer lifespan.

Stone flags have been used commonly historically to provide safe paths across boggy uplands, in particular, and modern flags have been used successfully on such as the Pennine Bridleway. There is a danger where such paths are narrow if the ground immediately next to the path is boggy and a horse could step off the path when attempting to pass others. Additional flags or other hard surfacing should be used to create passing places wide enough for users to comfortably pass each other or for a horse to turn if necessary on long sections or where the full length cannot be seen. Ideally users should be able to see before setting foot on the flags whether the next section of the path is clear.

Soil reversal uses a digger to invert the soil, burying the top soil, with sub soil on the surface which is then profiled to provide drainage and base for a new surface, sometimes stone or stone on geotextile, or left as a natural surface to vegetate. It has been used successfully on many bridleways over poorly drained ground in northern England.

Sand is popular with riders, provided it is not too deep (recommended 75mm on 150mm depth of free-draining base) but it is usually difficult to contain on a path. It can be good on horse-only sections.

Stone pitching is not ideal for horses but may be necessary to provide a firm entry/exit to a ford, and may be the only option on some heavily used steep hill paths. Smaller random (rather than dressed) stones laid to provide a slightly irregular finished surface will allow more grip than large, flat stone faces, but only if the horse's hoof can be placed flat on their top

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surface. Stones should be pitched vertically with the longest face into the slope. Adjoining stones should be pitched to provide a foothold of minimum 200mm width. Downhill gradient of foothold should be less than five degrees. Stone which may become polished and slippery through wear (such as limestone) must be avoided.

Steps, as for pedestrians, are to be avoided as discriminating against some users. Steps can be used by horses if the tread is long enough but must only be used where a ramp, which is better for most users, including those with impaired mobility and cyclists, is not possible. Where steps are the only option, please see BHS Advice on Bridges, Gradients and Steps.

Quarried aggregate without a consolidated dust wearing course is completely inappropriate for multi-use paths because angular stones will damage horses' feet and may result in serious lameness. Where it is used as a substrate or structural layer, the surface must be finished with 75-100mm depth compacted MOT type 1 (40mm-dust) dressed with dust to fill the spaces between the stones and consolidated to withstand rainfall.

Aggregate surfaces may occur naturally or where erosion has removed an upper surface layer. Such a surface is 'out of repair' as it limits use by natural and legitimate users (horse riders) and should be topped off with a consolidated dust layer.

A specification for an aggregate surface should always include clauses for topping-off as required to a uniform consolidated dust finish and checking after so many months with subsequent top-off as appropriate. This is because aggregate quality is variable; it may settle in transit to give inconsistent levels of fines throughout the laid length of track or may wash through if there is heavy rain before consolidation.

Any new construction or path restoration project should always provide a finished surface to this standard. It is not acceptable to leave an unconsolidated surface of stones following work. Any stony tracks may need improvement by topping-off with consolidated dust to avoid injury to horses.

Rubble or similar recycled material may be used as a substrate but must be finished with a wearing surface as for aggregate. It is very important that it is 'clean', i.e. not contaminated by material such as wire, glass or nails that could work to the surface and cause puncture wounds or trip hazards. Specifications should state non-recycled MOT type 1 or clean rubble as a requirement.

Self-binding gravel is a specific type of aggregate which is considered self-binding because it has a complex mixture of minerals and particle-size which, when consolidated in a surface tends to hold its form. Self-binding gravels can be successful for horse use, providing a surface with more give than a sealed surface and is preferred over asphalt when a grass sward or more natural surface is not sustainable.

Such aggregates tend to improve with weathering, which assists the consolidation process. Care may be required in their first year of use in gateways or inclines where horses' hooves may loosen the surface because of the nature of their movement manoeuvring for a gate or up

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or down a slope. Periodic compaction over the first year may be required to ensure the surface does not loosen and start to scatter or degrade.

Most common examples are Breedon gravel, Hoggin and Coxwell gravel but the closure of quarries means it is less available and is in high demand. Hydraulically Bound Material (HBM) which is aggregate and water with a binder, mimicing the composition of self-binding gravel, has been used with some success.

Road planings (skimmed road tarmac arisings) have sometimes been used successfully to form a base course — N.B. not a top wearing course as the fragments can be very sharp and injurious for horses' hooves, especially barefoot horses — however, results are very variable and there are as many failures as successes.

Planings are often seen as a cheaper option than new aggregate, but must be screened to ensure there are no metal, glass, wire or other foreign bodies included in the material. A wearing course on top of the planings as base is still required, as with any aggregate.

Planings used as a base (on geotextile if the subsurface is wet) should be rolled and consolidated then — importantly — topped with whinstone 3mm to dust (or similar local stone) to form a wearing surface.

Where the wearing course is loose enough to encourage light vegetatation, it can be a reasonable solution for all users and is popular for railway trails as it provides some give for horse and pedestrian use but is still smooth enough for cycling or mobility vehicles. In some conditions, relying on leaf mould and nature to soften the surface can take too long so must be assisted by spreading a soil-seed mix in temperate conditions to encourage vegetation.

Planings can be consolidated, whether by laying in hot weather or with heat treatment or added bitumen, to form a sealed surface, but the Society advises against this because it generally forms a slippery surface for horses, like tarmac, which is is very poor for horse use.

Concrete gives highly variable results depending on its composition and it can become very dangerously slippery. Consequently, the Society would recommend against it as a new surface unless approved in specific circumstances. Only the specification of concrete that is most likely to be safe (see below) should be used in those circumstances. Remedial action will be required if the surface should become dangerous, which could be more costly than using the specified mix.

The concrete mix most likely to give a safe surface is RC 35/45 CEM1, without added water, as it is least likely to polish and become slippery. The final tamped and highly roughened surface should be covered to cure slowly and completely. A lower quality concrete may either become polished mortar or, if the aggregate becomes exposed, the aggregate may polish to become slippery. Some gravel aggregates are more likely to become smooth with wear. Crusher run carboniferous limestone or granite is more likely to remain rough even if partially exposed. Aggregate of high Polished Stone Value (gritty when worn) should be used if there is risk of the mortar wearing.

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Concrete which has become slippery can be treated with machinery to roughen the surface by cutting grooves, sometimes in a set pattern of squares. This is commonly undertaken by contractors on dairy farms where slurry degrades the concrete and it has been successful even on slopes.

If concrete is required for vehicular access, a safe surface in between concrete wheel tracks or alongside a concrete track may be a solution.

If use of concrete is unavoidable for short distances, such as a bridge or its transition ramps, then care must be taken to ensure the surface is well roughened and ridged across the width by hard tamping (raising and lowering the compacting beam). Brushing does not usually give a durable rough finish.

Concrete blocks, paviours, setts or bricks may be slippery for horses unless the blocks have been specifically made with high Polished Stone Value (PSV: a high PSV is gritty when worn, a low PSV is very smooth and potentially slippery). The quality of cement used in manufacture can also affect slip hazard, as in concrete slab above. It is important to check with manufacturers that blocks sold as non-slip include being non-slip to shod and unshod horses, not only to vehicles and pedestrians.

Asphalt or Bituminous Mastic ('Tarmac' or 'Bitmac')

Bituminous mastic is a standard surface in the UK for roads and footways. It is less appropriate on multi-use paths because it is designed to provide grip for motor vehicle tyres, not for shod or unshod horses and causes excessive wear on barefoot horses' feet. It is often dangerously slippery for horses, particularly stone mastic asphalt, which may increase or decrease as a problem with wear depending on the exact compound in use and its final surface treatment. In addition, its hardness is very uncomfortable for pedestrians and horses and can cause injury through concussive impact, as well as holding heat, water and ice to be an unpleasant environment for those in direct contact.

Asphalt surfaces consist of a wearing layer of aggregate bound with bitumen. Aggregate and bitumen compounds vary depending on specifications and area. The bitumen forms a film over the stone which is gradually removed by wear.

Horses are commonly ridden or driven on asphalt because most equestrians have to use roads to reach any unsurfaced routes. Where a route is proposed which will create **new additional access** for equestrians, such as a part of a carriageway set aside for non-motorised users, the need for an asphalt surface for other users is not a valid reason to exclude horses. However, non-slip options should be used, which need not increase expenditure or affect other users.

The Society's acceptance of asphalt for **new access which includes horses**, where asphalt is appropriate for the majority user, **does not confer acceptance of asphalt** for bridleways and byways which have historically had an unsealed surface.

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All asphalt surfaces have the potential to be initially slippery unless appropriate preventative action is taken and this applies even more to horses than to vehicles as the surface treatments are designed for motor vehicles. The result is a surface which results in horses having to proceed unnaturally slowly and carefully, much as a car in icy conditions, which is unreasonable.

For motor vehicles, the increased skid potential of the unworn film may be reduced in key areas (e.g. junction approaches) by mechanically removal using grit brushing. This can be helpful on parts of the surface which are less used by vehicles but more used by horses such as close to the edge of the road.

The high skid risk can last for an unpredictable length of time depending on the variables of volume and type of traffic, construction method, stone and bitumen types and surface treatments. Vehicular wear can bring about an improvement quite effectively but only in the wheel tracks.

Horses may take different paths which remain slippery for longer periods particularly as horses are likely to keep close to the edge on busy roads where there is little vehicular wear so the slip hazard may remain for a long time. Top dressing with grit on routes used by horses is strongly recommended with attention to the usual path of the horses (i.e. road edge on a busy route).

Provided that the aggregates used within the mixes have a high resistance to polishing (high Polished Stone Value (PSV) means that the stone retains a surface grittiness even when worn) and once the bituminous film has been suitably worn by vehicular traffic may produce an acceptable surface, but not necessarily as wear by wheeled traffic can result in an embedded surface that is more slippery to horses. Embedment due to high surface pressure is a common cause of failure of surface dressing therefore any surface of this type must be laid on a high quality base layer.

Where asphalt has been judged to be appropriate, the Society has found the following specification less likely to be slippery, although the many other hazards of asphalt for not motorised users remain.:

- PSV above 65, the higher the better to reduce smoothing
- Aggregate size around 14mm; larger or smaller grades have been found more likely to polish with vehicular use and be more slippery to horses

Horses are commonly ridden or driven on asphalt because most equestrians have to use roads to reach any unsurfaced routes. Where a route is proposed which will create **new additional** access for equestrians, such as a part of a carriageway set aside for non-motorised users, the need for an asphalt surface for other users is not a valid reason to exclude horses. However, non-slip options should be used, which need not increase expenditure or affect other users.

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The Society's acceptance of asphalt for new access which includes horses, where asphalt is appropriate for the majority user, does not confer acceptance of asphalt for bridleways and byways which have historically had an unsealed surface.

Stone mastic asphalt is such a problem that the BHS worked with a task group of highway engineers (CSS, now ADEPT) to produce a report 'Horses and Highway Surfacing – A guidance note for highway authorities'. Reported incidents of horses slipping on asphalt have increased since the guidance was published in 2005, indicating that it is a continuing and increasing problem. The report recommends grit during construction (e.g. 3mm quartzite at 1kg/m^2) or post application of dry uncoated grit spread at 1kg/m^2 and rolled with a steel roller to abrade the bituminous film. It is important that the specification to contractors includes such measures as appropriate during construction to minimise the slip or skid incidences.

Hot rolled asphalt is usually better than stone mastic asphalt in terms of slip hazard for horses.

Remedial top dressing Where a tarmac surface is unavoidable, a top dressing of grit or spray and grit is recommended.

Calcined bauxite was used by North Yorkshire County Council (Lousy Hill, Littlebeck) on a steep minor road and was very successful. It is now thought to be at least fifteen years old and still good though worn. .It is likely that such treatments need repeating periodically depending on level of wear.

A treatment of 10mm close graded wearing course of dry steel slag aggregate applied while the surface was still hot (Middleham, North Yorkshire) was not successful after a few months.

In Dorset, a surface dressing of Colas Cationic Bitumen Emulsion was applied at 1 litre/m^2 with Trent Pea 3-6mm Long Rake Spar aggregate (New Milton Sand & Ballast, Hurn). Method: Spray hot bitumen emulsion over tarmac (asphalt or concrete) surface and evenly spread 6mm aggregate over it; spray a further layer of tar and a layer of 3mm aggregate; roll. With hindsight, it would have been worth increasing the emulsion to 2 litres/metre^2 to increase adhesion.

In Ripley, North Yorkshire, quartzite grit was applied at 1 kg/m^2 to day-old asphalt and rolled with good result at less than £2/m^2.

Additional effects of asphalt

Asphalt surfaces are generally non-porous so are profiled to disperse surface water to the sides. Without drainage provision, this can make verges too wet, encourage rank vegetation, and render them impassable for horses whose riders would prefer not to use the tarmac, whether to avoid the slip hazard, avoid other users, or to pass dung off the main track.

Wet ground may dry unevenly, potentially causing injury, especially where ruts and holes are hidden by vegetation, therefore riders will naturally avoid such areas.

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Where a shared use track has been surfaced with asphalt with the expectation that riders will use the verge, not the asphalt, but the verge is unusable, riders may then be criticised or abused for being on the tarmac, causing needless conflict.

The lack of porosity means there is higher risk of ice as well as the inherent slip hazard, which may result in the need for road salt, which affects biodiversity.

Considerations for shared use or cycle tracks

Bituminous surfaces consist of a wearing layer of aggregate bound with bitumen. Aggregate and bitumen compounds vary depending on specifications and area. The bitumen forms a film over the stone which is gradually removed by wear. Softer surfaces are more ideal for horses than any hard sealed surface, although where a horse-friendly surface is considered impossible because the majority use is cycling there are ways in which horses can be accommodated so that off-road routes are available to all vulnerable non-motorised users.

Increasingly:

- Off-road routes are being provided for cycling which could benefit equestrians who are also vulnerable road users; and
- Surfaces of routes with rights for riders or carriage drivers are being changed to facilitate cycling but to the detriment of equestrian access.

This is particularly influenced by current funding initiatives making provision for cycling. However, with more awareness in the planning stages, it is obvious that all non-motorised vulnerable road users can benefit from all off-road tracks and none need be excluded. Importantly, it is sensible and cost-effective to include all who wish to exercise and transport themselves in safety away from the danger and pollution of motor traffic and with care for the environment, rather than only accommodating one section of society.

Bound rubbercrumb-grit mixes have been found to be appropriate for all users and very acceptable for horses on multi-user paths. Although the initial cost may be higher than for tarmac, it has many advantages in construction, particularly on sites with limited access, and in not requiring edging (unlike tarmac) as well as providing a more beneficial surface for pedestrian and equestrian users without detriment to use with cycles, pushchairs or mobility scooters. Its porosity means it is safer for all users in icy conditions, there will no puddles and dung will quickly wash through. It has a very much longer life guarantee than asphalt.

Where equestrian rights exist, natural surfaces are best managed by drainage, strengthening and unsealed surfacing as appropriate to the local conditions rather than seeking a sealed surface. On shared use routes where this has failed or is judged insufficient, the following approach is recommended:

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If a sealed surface is judged to be essential (by the highway authority's rights of way officer), the first choice should be two metres of surface suitable for horses alongside the sealed surface, by dedicating additional width as multi-use path if appropriate.

If it is not possible to have different surfaces alongside one another, then the options should be, in order of preference:

1. Two sealed strips for wheels either side of a central softer strip for horses. This is particularly important where there is tall side vegetation[3], as is often the case with old railways, as it allows the tallest users—the horse riders whose head height is often over three metres—to be in the centre away from the overhanging vegetation. The two sealed strips can also act as wheel tracks for maintenance vehicles and encourage 'keep to the left' use by cyclists. Signs should be used to encourage user separation.
2. Divide the surface along the length down the middle with one side sealed, the other half softer.[4] This would be acceptable if one or both sides of the track did not have overhanging vegetation.

Bound rubber crumb is preferred where a bound surface is required. Where a sealed surface has to be created, care should be taken to make it non-slip for horses by top dressing with quartzite grit or other treatments..

N.B. Putting a tarmac strip down the middle and leaving two narrow verges, too narrow for horses, is a common bad practice. It forces all users onto the tarmac strip when they would be better served by a choice of surfaces, each of appropriate width. It may cause congestion or conflict between users and excessive wear of one part of the width. It is much better to put the tarmac strip as far to one side as possible.

In circumstances where equestrians have no access currently, a single surface may be appropriate where a split surface or bound rubber-crumb is not feasible, because an off-road route for all non-motorised users is better and safer than excluding horses, leaving equestrians no choice but to use roads with motor traffic.

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[3] Where trees or bushes overhang the track for more than half its width in total, or have reduced the width, clearing these back to provide the maximum width will let sun and wind into the track to assist in keeping the surface firm and dry, and improve the available width for all users.

[4] 'Soft' does not necessarily mean 'unstrengthened'. For instance, an old railway line has a certain amount of inherent strength that might only need attention at certain spots.

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