
ST MICHAEL'S MANCHESTER

PLANIT

HARDWORKS | MAINTENANCE OPERATIONS

MAINTENANCE OPERATIONS – HARDWORKS

Surfaces need to be maintained such that they provide a safe passage for all pedestrians and highway users. It is also essential that areas, which have been subject to major investment, are protected and sustained through an effective maintenance regime. The success of any public realm project will greatly depend on the attention given to maintenance.

It is important that paved surfaces are regularly inspected so that defects can be identified and rectified. Typically, early life maintenance or aftercare of new works will be the responsibility of the Main Contractor that delivered the works. The maintenance and defects liability period will generally be 12 months. The Main Contractor should visit the site at regular intervals during the maintenance period, to inspect all paved areas, and to undertake any remedial works. At the end of the maintenance period the contractor will be required to undertake remedial works to the satisfaction of the Client.

PAVING DEFECTS - RIGID

Common defects - Paved surfaces deteriorate in a variety of ways, depending upon the type of construction and cause of distress. When deterioration presents a safety hazard then maintenance becomes essential. Timely maintenance, in some instances can prevent deterioration progressing to a state where reconstruction is required. The majority of failures tend to be confined to the surface layers of paved areas, i.e. they concern the bedding and jointing that surrounds stone elements.

Descriptions and illustrations of common defects are given below:

Punching - Vertical downward movement occurs in and around wheelpaths. Punching shear is resisted by both the joints and bedding. The lower of the two capacities, joint shear or bed bearing will control the elements resistance to punching. The defect occurs in flexible and rigid surfacing. Localised or isolated areas of punching are likely to be due to poor workmanship. More widespread punching is more likely to be due to under design.

Progressive cracking - Debonding of the jointing material from stone elements commonly leads to progressive cracking. The continuous action of heavy vehicle tyres on the elements dislodges and pulverises sufficient quantities of the jointing material to cause a breakdown of the joint matrix. Inappropriate design and poor workmanship are likely causes. Factors likely to have contributed to this type of failure are:

- poor compaction of the bedding
- inadequate moisture content in stabilized bedding
- depth of elements
- low jointing strength
- early pavement trafficking
- inappropriate laying pattern

Movement - If the homogeneity of the upper layer is broken, it is impossible to control lateral movement with joint widths $\geq 10\text{mm}$. Once the surface matrix is broken, it allows the tyre interaction of the traffic to move the setts in angular directions, thus perpetuating the breakdown of the rigid surface. Ingress of water then adds to the problems. Rutting is common and depending on the construction of the pavement the underlying layers of the structure will gradually deteriorate.

Broken or damaged elements - Apart from being unsightly, cracking and spalling can become a hazard if it creates a trip. Spalling occurs during transport and laying, but can less commonly be a fault in the material. It can result during manufacture, impact loading, abrasion and weathering. Inappropriate size or depth of element results in fracture under loading.

TREATMENT OPTIONS

Maintenance treatment will depend on the type of defect and what has caused the deterioration. For some surfacings, topping up of jointing may be all that is required, but poor surface profile may require a site investigation to provide information on the condition of the pavement at depth. Suitable strategies can then be formulated based upon informed engineering judgment.

The table on the next page summarises some common defects, resulting problems and treatments.

HARDWORKS | TREATMENTS

Defect	Problem	Treatments	
Rigid		Temporary	Long-term
Expansion and contraction joint cracks	Cracking	Monitor/method statements from bedding and jointing material supplier required	Deep water ingress can lead to structural faults.
Debonding of jointing material	Initiation of failure mechanism	Monitor / investigate	Replace jointing or reconstruct if poor design
Broken or damaged elements	-	-	Replace or reconstruct
Missing elements	Trip, water ingress	Fill holes	Replace element
Rocking elements	Hazard to users	Relay	-
Spalling of arises or surfaces	Unightly trips	-	Replace
-	Loss of stability, water ingress	Fill wide gaps if hazard	Relay elements and strengthen edge restraint if necessary
Depressions and bumps (macadam)	Hazard for users	Fill or ramp. Contact undertaker if cause is failed reinstatement	Relay
Rutting (meacadam)	Hazard for users	Monitor, warn users	Relay
Slippery surface	Hazard for users	Warn users or restore texture	Clean, restore texture or renew surfacing
Surface contamination	Hazard for users and unsightly	Clean or neutralize	Replace surfacing if necessary
Vegetation	Surface slippery	Warn users, clean	Consider increasing frequency of maintenance
Water	Surface water	Salt if freezing	Relay surfacing to correct gradients and crossfall
-	Blocked drain	Clear blockage	-

Guidance: To ensure the chosen treatment is cost effective, consideration should be given to the maintenance history of the paved surfacing, its future use and the likely failure mechanism.

HARDWORKS | MAINTENANCE

LIFTING, REPAIR AND RELAYING

Relaying elements of flexible construction should be carried out in the same way as new construction (Refer to NBS specification). Additional guidance for flags is given in BS 7533-7:2010. Removing a damaged single element prior to relaying can be difficult, particularly if it is small element, as breaking it out may disturb adjacent modules. It may be necessary to consider relaying all elements, which about the damaged area, or to relay a full line of elements back to an edge restraint. If the surface has poor profile, elements will need to be lifted over the whole of the affected area. In all cases a complete renewal of the bedding material should always take place. An experienced paver is required to execute a good reinstatement.

Joint repairs

Where elements are part of a rigid construction and degradation of the cement mortar joint has occurred, it will be necessary to refill the joint. If necessary the joint should be raked out, which is time-consuming and costly. It may be more appropriate to use a small hand-held grinder with an attachment to remove the dust and debris, in a controlled manner, into some form of hopper. Once the joints have been cleaned out they can be refilled with a mortar appropriate to the trafficking category. Care is required to confine the mixture to the joint and prevent staining of the surface. Trafficking should only be allowed once the mortar has gained the appropriate strength.

Sealing

Proprietary sealing agents are sometimes used on paved surfaces, to reduce moisture penetration of the laying course material, and minimise staining from spillages. The paving surface must be completely dry and clean before any sealer is applied with the manufacturer instructions adhered to at all times. Whilst such products may offer certain advantages, careful consideration must be given to the suitability of the sealant and any subsequent effect on the colour appearance and slip/skid resistance of the paving.

CLEANING

Generally

The following recommendations deal with vehicles and associated equipment for use on paved footways/footpaths/pedestrian areas and roads:

- The equipment should be purpose designed to sweep the particular area and surfacing product. If there is any doubt, the vehicle manufacturer should be consulted.
- Where possible, low ground pressure tyres should be fitted to reduce the risk of breaking or cracking of flags.

- Tyres should be inflated according to the manufacturer's recommendations, again to ensure minimum weight distribution per square mm.
- Polypropylene, not wire, brushes should be used.
- Sweeping brush pressures should be set to the minimum required to suit the particular task, i.e. surfaces swept regularly will require a lower setting than those swept infrequently or those covered with heavy deposits.
- When sweeping, engine revolutions should be set at the minimum required to maintain vacuum (suction) pressure.
- Operators, including reliefs, should be trained to manufacturers' recommendations and tyre and brush pressures should be regularly checked.
- Advice should be given to operators that, when equipment is stationary or left unattended, suction, brush rotation and water jetting equipment should be switched off to avoid the risk of damage to the area below the stationary equipment.
- In new or re-laid areas, agreement should be reached on a period of manual cleaning (at least four weeks) to allow the paving to settle and the joints to seal. This period may be reduced by using either a water-based bonding agent or elastomeric prepolymer sealant and by agreement with the cleansing authority on an appropriate sweeping regime.
- Following the use of mechanical cleaning operations, re-sanding of the joints in flexibly laid areas may be necessary.

The Use of Power Washing Equipment on Paved Areas

To aid in the removal of surface staining power washing equipment is often considered. Whilst such techniques offer certain benefits, particularly for larger areas, it is important that care is taken in their use to avoid damage to the structural integrity of the paving. When using any form of Power Washer the following guidelines should be strictly adhered to:

- The power washer should be used on a setting, which is sufficient to remove the dirt without causing any further distress. A low-pressure setting is recommended.
- Do not direct the power lance directly down on to the paving, as this can result in loss of jointing material.
- Ideally a spraying movement should be adopted holding the power lance at a shallow angle, not greater than 30° across the diagonal (i.e. not parallel to joints).
- Certain high-pressure jetting machines have been known to mark / damage the surface of certain types of paving material. It is therefore prudent to carry out a small test area before commencing on a larger area.
- The area should be inspected after cleaning to ensure that joints are full.

General Dirt and Detritus

To remove general dirt and detritus, regular brushing is recommended. If detritus reduces the intensity of the colour of the material then this can be reestablished by scrubbing with a mild detergent e.g. washing up liquid, and hot water.

Ensure all the detergent has been thoroughly washed from the surface on completion of the cleaning and the resulting run-off is carefully channelled to either drainage points or containers where it can be safely disposed of.

Moss, lichens and algae

Moss, lichen and algae can be prevalent on hard surfacing where the area is heavily shaded, is under trees or is not laid to an adequate fall. If such growths do occur and are considered undesirable then the area should be treated with a proprietary weed or moss killer used in accordance with the manufacturers' instructions. Such products take some days to be effective and are most effective when applied during a spell of dry weather. The washes work best if any thick growths are scraped off first and the wash is well brushed in. Some treatments leave a residue to discourage the re-growth of the moss and algae but this will only be of limited value if the surrounding conditions leave the paving damp and in shade.

Rust Stains

Initially action must be taken to eliminate the sources of staining. To remove the rust stain, the surface should first be wetted with clean water and then the affected area treated with a 7 to 10% dilution of Hydrochloric acid solution.

Guidance on the safe use of chemical treatments (Acid Washing) is given later in this document.

HARDWORKS | MAINTENANCE

Oil Stains

Oil can penetrate readily into hard surfacing materials, but it should not stain if any spillages are removed promptly with an absorbent material e.g. paper towels, cloth or absorbing granules. Do not attempt to wipe the stain as this will drive the oil into the surface of the units and spread it over a wider area.

If the stain persists then an emulsifying degreaser should be employed. Brush the cleaner onto the affected area, leave for a period of time according to the manufacturers instructions and then wash the emulsified oil away with plenty of clean water.

Alternatively the surface can be scrubbed with a detergent and hot water taking care to ensure that the strength of the detergent is not detrimental to the appearance of the paving. However, for persistent oil staining, steam cleaning may have to be considered.

Bitumen Stains

Fresh bitumen should be allowed to cool down before removing it with a paint scraper or similar. If it is particularly resistant, the use of ice to make the bitumen brittle may be required prior to scraping it from the paving. Any residue should be removed with an abrasive powder and finally the whole area rinsed with clean water. Certain proprietary cleaning agents are available to remove bitumen but these should be tested on an inconspicuous area of paving first.

Graffiti and Paint Stains

Both paint and graffiti are difficult to remove from most hard surfacing materials. Fresh wet paint should be soaked up with an absorbent material without wiping the paint, as this will spread the stain. It should then be treated with a suitable solvent such as white spirit and then the area washed with a de-greasing agent taking care in the disposal of the run-off material.

Dried paint should be scraped off as far as possible and then an appropriate paint remover applied.

Paint manufacturers may often be able to give more detailed advice on the removal of paint and graffiti. Therefore they should be consulted directly for specific recommendations.

Epoxy and Polyester Stains

Areas of solidified epoxy or polyester resin can be removed by carefully burning off the area with a blowtorch. Care must be taken not to inhale any fumes given off.

If, after burning, a black stain remains, this can be removed by scrubbing with detergent and hot water. For larger areas grit blasting may have to be considered, however the effect of such treatment on the micro texture of the surface should be carefully considered. Again it is advised that a small area be tested before any large-scale operations are undertaken.

Smoke, Fire and Tobacco Stains

Normally such stains can be removed by scrubbing with detergent and hot water. Where the stains persist, a mixture of scouring powder and household bleach can be used. It is important the bleach is washed from the area with clean water once cleaning is completed and the run-off carefully disposed of.

Beverage Stains

These can normally be removed by scrubbing the stain with detergent and hot water. If the stain is persistent, apply a household bleach solution and then rinse the area with clean water taking care to dispose of the run-off safely.

Chewing Gum

Chewing gum is a particularly difficult substance to remove from hard surfaces.

Newly discarded gum can be scraped off by using a mechanical scraper but hardened gum can only be removed by both freezing the gum and chiseling it from the surface of the paving or utilising a hot water/steam cleaner.

For specific advice on chewing gum removal it is recommended that specialist contract cleaning companies be contacted directly for further details.

Scuff Marks from Vehicle Tyres

These can normally be removed by steam cleaning, or by scrubbing the area with detergent and hot water.

It is important that prior to any acid cleaning being undertaken, the paving is checked to ensure that any signs of vanadium staining have thoroughly weathered away before acid cleaners are applied.

If some form of chemical treatment is required to remove more stubborn vanadium staining, then this should be undertaken using an organic acid that will not have the aforementioned effect of "fixing" the stain to the paving.

Acid Washing

Stubborn and persistent stains that will not generally weather away naturally will require the application of a specific acid cleaning treatment to remove them.

Prior to any acid cleaner being applied, the surface must be thoroughly wetted with clean water to prevent the acid being absorbed directly into the paving. A dilution of 7 to 10% of hydrochloric acid should then be prepared and applied to the affected area.

As the staining begins to dissolve, some frothing may be apparent, which should be followed by agitation of the surface using a stiff bristle brush to completely remove all trace of the stain.

Once this process is complete the whole surface should be rinsed thoroughly with clean water, taking care to dispose of the run off safely. In the vast majority of cases, one

treatment will be sufficient; however, in some cases re-treatment may be required.

When using any form of chemical treatment the following guidelines should be strictly adhered to:

- With deeper stains, the degree of acid treatment may result in an acid etched appearance.
- Protective clothing (gloves, boots, goggles etc.) should be worn at all times when using chemicals and the appropriate first aid measures must be available on-site.
- Take care to ensure that surrounding materials and landscaping are protected. Soft landscaping and exposed metals can be severely affected by chemical treatments.
- It is better to treat several times with the correct dilution than to use concentrated acid, which may damage the surface of the unit.
- When diluting acids, always add acid to water and not water to acid.

General Cleaning

An annual detergent wash is also recommended.

Drainage Channel

An annual detergent wash is also recommended.

We design for the living world.
For today, tomorrow and
the next 200 years.



PLANIT



planit-ie.com

Manchester | Leeds | Liverpool | London | Standish

Leeds

+44 (0)113 824 6413

Liverpool

+44 (0)151 363 1230

London

+44 (0)207 253 5678

Manchester

+44 (0)161 928 9281

Standish

+44 (0)1453 607080