JOHN STREET CARDIFF

PLANIT

Document Control

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3567-PLA-XX-XX-RP-L-0002 John Street Management and Maintenance Plan	IF	EL

Contents

1
INTRODUCTION

Consideration during the design stage has been given to the future maintenance requirements of the hard and softworks elements at John Street.

This management plan is a guide to enable the establishment of the hard and soft landscape, focusing on the typical first 12 months rectification period and the following five years establishment. The Landscape Management Plan is intended to be reviewed by the client/land owner at five year intervals to ensure it is performing effectively. The following maintenance schedule should be read in conjunction with the landscape design proposals and wider masterplan objectives.

The Manual must be a living document and be constantly reviewed and updated. The maintenance manual addresses specific maintenance of both hard and softworks to assure that the public realm and residents courtyard maintains a high quality appearance.

Health & Safety

A pre-tender health and safety audit is an important consideration for any area of public realm. Once chosen, the contractor will be expected to produce a risk assessment and method statement for the installation and maintenance of both the hard and softworks..

General

This Landscape Management and Maintenance Strategy has been prepared by Planit-IE Ltd.

The plans to which these management proposals relate are:

Plans

3567-PLA-XX-00-DR-L-P-0001 GA Landscape Plan

3567-PLA-XX-06-DR-L-P-0002 GA Podium Plan

3567-PLA-XX-RF-DR-L-P-0003 GA Roof Plan

3567-PLA-XX-XX-DR-L-P-1001 GA Landscape Hardworks

3567-PLA-XX-XX-DR-L-P-2001 GA Planting Plan

3567-PLA-XX-XX-DR-L-P-2002 GA Growing Medium Plan

3567-PLA-XX-00-DR-L-P-3001 GA Strategic Levels Plan

3567-PLA-XX-XX-DR-L-P-4001 GA Furniture

Details

3567-PLA-XX-XX-DR-L-6001 Typical Detail - Trees in Soft

3567-PLA-XX-XX-DR-L-6002 Typical Detail - Trees in Rain Garden

3567-PLA-XX-XX-DR-L-6003 Typical Softworks Details GF

3567-PLA-XX-XX-DR-L-6004 Typical Softworks Details Podium

Documents

3567-PLA-XX-XX-RP-L-0001 Landscape and Green Infrastructure Statement

3567-PLA-XX-XX-SP-L-0001 Soil Specification

These drawings and documents provide an overview of the landscape proposals for the proposed external environment. Given the scale of these drawings, and the level of detail provided, this management plan is intended to give an overview of the landscape and public realm treatments.

Overall Aims and Objectives

The aim of the landscape management and maintenance plan is to ensure that all landscape elements can establish and mature successfully in order that the long-term design intent can be realised.

The proposals aim to establish a landscape appropriate to the site and the context and materiality of the wider site and its environs and in keeping with the objectives of the initial Landscape Masterplan for the development.

The management plan seeks to provide a net increase in the bio diversity and landscape value of the site both throughout and at the end of the plan period.

To prescribe all necessary management and maintenance principles and management tasks to enable successful establishment and ensure the continued maturing of all landscape elements.

To ensure the continuing health of existing and proposed vegetation. To maximise the bio diversity value of native and semi native plantings.

To ensure that the management and maintenance regime is appropriate to the site.

2
MANAGEMENT PLAN

Management Brief

The brief below describes the framework:

- The Management Plan will be implemented permanently, and reviewed at 5 year intervals.
- The Management Plan must give consideration to environmentally sensitive design and management.
- The Management Plan will seek to provide a net increase in the bio diversity value of the site.

Design Objectives

The design objective is to successfully integrate the development into its surroundings by providing an interesting, durable and safe environment for visitors and residents whilst increasing its social, environmental and ecological value. This will be achieved through the following ways:

- Introduction of new seating areas to increase social interaction and enjoyment of the external environments.
- Creation of informal play areas within green sustainable drainage systems.
- Planting new trees, and a range of ornamental species, including a high percentage of native or wildlife friendly species, to contribute towards increased biodiversity and demonstrate variety in form, texture, colour and seasonal interest, for both biodiversity and occupants, and manage for long-term vigor.
- Providing a variety of shrub and herbaceous plantings to stimulate senses, encourage exploration and provide an educational resource and spaces to engage with nature.
- Ensuring that the vegetation proposed is appropriate to the site and anticipated use.

Monitoring

The Management Plan’s life span has been divided into key stages of 5 yearly intervals. These will be used as the basis for developing the plan and setting reviewing targets.

Monitoring is of fundamental importance, since this is the means by which the success of the plan will be measured. It is therefore important to establish standardised survey and monitoring methods, which enable valid year on year comparisons to be made. There will be a need for flexibility during its implementation. The Management Plan must be an evolving one, able to adapt to the specific needs of the landscape and biodiversity as these change.

At the outset of the plan a suitable maintenance consultant should be appointed to monitor and provide guidance on ongoing management and maintenance issues. This consultant should undertake an annual review of the site, providing written documentation as to the development of the scheme. This report should include a condition review of all new and existing plant material, success rates of newly planted material, a survey of flora and fauna, recommendations for future management regimes and immediate management requirements.

Softworks Management

Vegetation Types

A number of separate, yet inter related, vegetation types are proposed for John Street. These include:

- Proposed tree planting
- Proposed shrub planting
- Proposed hedge planting
- Proposed ornamental and herbaceous planting
- Proposed climbing planting

The above will require varying maintenance in order to successfully achieve the design objectives. These are detailed further in this section.

Proposed **Tree Planting**

The landscape management principles for proposed individual and structure tree planting are as follows:

- To ensure satisfactory establishment and continuing health.
- To maintain the tree in a healthy condition and develop the tree structure, allowing to flower and seed/fruit at the appropriate time of year
- To ensure the successful establishment and continuity of the overall design concept.

Ensure trees in close proximity to buildings are appropriately maintained (including crown reduction if necessary) in order to facilitate cleaning of windows and maintain building façade. All works to be in accordance with BS3998:2010 Recommendations For Tree Works for good practice and BS5837:2012 Trees in relation to design, demolition and construction.

Proposed **Shrub Planting**

The landscape management principles for proposed shrub planting are as follows:

- To ensure satisfactory establishment and continuing health.
- To maintain plants in a healthy and attractive condition, allowing to flower and seed/fruit at the appropriate time of year
- To ensure the successful establishment and continuity of the overall design concept.
- To maintain the integrity of the species mix specified.
- To carry out any trimming or pruning works outside of the bird nesting season (typically March to August), unless a prior inspection confirms no active nests are present.

Proposed **Hedge Planting**

The landscape management principles for proposed hedge planting are as follows:

- To maintain plants in a healthy and attractive condition, allowing to flower and seed/ fruit at the appropriate time of year
- To create a formal and attractive visual screen
- To encourage vertical growth of the hedge and ensure the successful establishment and continuity of the overall design concept.
- To be kept in a formal manner.
- To carry out any trimming or pruning works outside of the bird nesting season (typically March to August), unless a prior inspection confirms no active nests are present.

Proposed **Ornamental and Herbaceous Planting**

The landscape management principles for proposed ornamental and herbaceous planting are as follows:

- To ensure satisfactory establishment and continuing health.
- To maintain plants in a healthy and attractive condition, allowing to flower and seed/ fruit at the appropriate time of year
- To ensure the successful establishment and continuity of the overall design concept.
- To establish a mechanism for the replacement of any failing plant or one which has reached maturity.

Proposed **Climbers**

The landscape management principles for proposed climber planting are as follows:

- To ensure satisfactory establishment and continuing health.
- To maintain plants in a healthy and attractive condition, allowing to flower and seed/ fruit at the appropriate time of year
- To ensure the successful establishment and continuity of the overall design concept.
- To establish a mechanism for the replacement of any failing plant or one which has reached maturity.
- As plants mature and overall weight increases, review of support structure to be undertaken and retension of wire ropes and addition of anchors and reinforcement elements to be introduced as necessary.

Hardworks Management

Hardworks

The following information outlines the management procedures for the hard landscape external works. Many items will need further consideration by Johmn Street Maintenance Team, some of which will form part of the development standard procedures.

Typically these could include:

- Specification and methods for maintenance, watering and replacements of trees
- Specification and Requirements for work by Public Utilities and general surface reinstatement
- Procedures for non-attributable damage reinstatement
- Specification and sources of materials for repair/reinstatement
- Street and amenity lighting requirements
- Winter Maintenance procedures
- Procedures for refuse collection and use of litter bins
- Procedures for street cleaning
- Procedures for the maintenance of Street Furniture

Hard Landscape Types

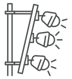
A number of separate, yet inter related, hard landscape types are proposed for John Street. These include:

- Proposed concrete paving
- Proposed natural stone paving and steps
- Existing and proposed concrete kerbs
- Proposed steel edges
- Proposed stainless steel corduroy tactiles
- Proposed self-binding gravel
- The above will require varying maintenance in order to successfully achieve the design objectives.

Proposed **Paving**

The landscape management principles for proposed hard paved areas are as follows:

- Procedures for regular inspections of all paved areas.
- Procedures for non-attributable damage reinstatement.
- Procedures for cleaning.



Proposed **Furniture and Lighting**

The landscape management principles for proposed furniture and lighting are as follows:

- Procedures for the regular inspections of street furniture, raised seating, railing, gates and bike racks.
- Procedures for reinstatement of damaged street furniture and lighting.

3
MAINTENANCE PLAN

Softworks Maintenance Operations

Set out in the following tables are the maintenance operations that should be carried out over the next 15 years in order to achieve the design objectives. They have been set out in a format that can be easily followed by all parties, ensuring that the Management Plan exists and a working document and not an archived report. The management prescriptions are flexible such that each section can be changed and updated on an annual basis, allowing targets to be set, progress monitored and accurate reporting made.

Maintenance Tasks and the Use of Chemicals

Chemicals generally should not be used within the grounds unless specifically instructed to do so. All chemicals, herbicides, pesticides and fertilisers, should be approved by Natural England and should be used, stored and disposed of in accordance with EN guidelines and COSHH Regulations 1988.

Maintenance Operation *Tree Work Generally*

Tree Planting

Tree planting to be undertaken only following approval of planting soils in accordance with the Soils and Development TGN and approval of tree stock in accordance with BS 8545:2014.

Identification

Before starting work identify species and agree which trees are to be removed or pruned.

Highways

Maintenance works associated with works adjacent to highways will need to be considered as part of the general management and maintenance procedures

Standards

To BS 3998 and Health & Safety Executive (HSE) 'Forestry and arboriculture safety leaflets'.

Removing branches

Cut as shown in Arboricultural Association Leaflet No 8 'Mature tree maintenance'. Cut vertical branches similarly, with no more slope on the cut surface than is necessary to shed rainwater. Leave trees with a well balanced natural appearance.

Chain saw work

Operatives must hold a Certificate of Competence.

Tree work

To be carried out by an approved member of the Arboricultural Association.

Additional Work

Defective, diseased, unsafe or weak parts of trees additional to those scheduled for attention: Give notice if detected.

Chemicals

Chemicals generally should be restricted in use. All chemicals, herbicides, pesticides and fertilisers, should be approved by English Nature and should be used, stored and disposed of in accordance with EN guidelines and COSHH Regulations 2002.

Prevention of Wound Bleeding

Standard: To BS 3998, clause 8.

Prevention of Disease Transmission

Standard: To BS 3998, clause 9 and Appendix B.

Water Restrictions

General: If water supply is, or is likely to be, restricted by emergency legislation, submit proposals for an alternative suitable source of water. Obtain instructions before proceeding.

Reporting to LPA

A site monitoring programme for tree planting and aftercare shall be agreed by the project Arboriculturist or Landscape Architect. This programme should be prepared during the pre-construction phase, once the planting design and specifications are confirmed. It will include reporting to the Local Planning Authority (LPA) upon successful completion of each stage. The programme must ensure: a) monitoring of the first tree(s) planted to confirm compliance with the agreed specification; confirmation that all stakes and ties are checked, adjusted as needed, and fully removed within three growing seasons following planting; b) confirmation that irrigation has been undertaken in accordance with the irrigation plan; c) confirmation that mulch beds have been maintained as necessary; d) confirmation, within five years post-planting, that formative pruning has been carried out as necessary; e) where failures occur within 5 years post-planting, the reasons for failure should be investigated and a programme of replacement proposed, including amendments to the specification as necessary. (Ref: Trees and Development – Technical Guidance Note, Nov 2017)

3.1.1 Maintenance Operation Number

Maintenance Operation
Tree Planting

Maintenance during defects liability period or 5 years after planting whichever is the greater, and on going maintenance thereafter. Operations to include:

Prescription	Year (s)	Season	Frequency (per year)
Tree Planting			
Maintenance during defects liability period or 5 years after planting whichever is the greater, and on going maintenance thereafter	Ongoing	March - September	2
To establish new planting, maintain a 1m diameter weed free area around all trees within self bound gravel or mulch	1-5	As required	2
General			
Inspection / maintenance times: Quarterly and after strong winds Operations: Replace or re-secure loose or missing guy wire Adjust to suit stem growth and to provide correct and uniform tension	Ongoing	Spring	2
Apply granular fertiliser according to manufacturer's recommendations	Ongoing	Spring - Autumn	2
Ensure trees remain firmly bedded after disturbance and re-firm as necessary	Ongoing	As required	As required
Control all pests and diseases as necessary	Ongoing		To be determined
Prune in accordance with good horticultural practice, thin, trim and shape as appropriate. Eg. Removing branches: Do not damage or tear the stem. Wounds: Keep as small as possible and cut cleanly back to sound wood. Cutting: Make cuts above and sloping away from an outward facing healthy, angled so that water will not collect on cut area. Larger branches: Prune neither flush nor leaving a stub, but using the branch bark ridge or branch collar as a pruning guide. Tools: Use clean sharp secateurs, handsaws or other approved tools. Disease or infection: Give notice if detected. Growth retardants, fungicide or pruning sealant: Do not use chainsaws and mechanical pruning unless instructed. Prune multi-stem trees to maintain required uniform shape dimensions	Ongoing	Autumn - early Winter	1-2 min, further as required
Watering – Regular checks using a moisture probe testing during the first two years after planting on a monthly cycle during the summer months of May-September	Ongoing	As required	12
Water as necessary to ensure healthy growth in accordance with the recommendations in sections 11.3, F.1.6 and G.2 of BS 8545:2014	Ongoing	Spring - Autumn	12 min
Replace dead or damaged trees to original specification. Remove within 1 month or as soon as possible and replace within the next available planting season	Ongoing	As required	6
Top up mulch planting to original specification at the end of year three	Ongoing	As required	1
Autumn Leaf Removal			
Collect accumulations of drifted leaves from the vicinity and from paved lawn area	Ongoing	Autumn - Spring	As required
Arisings: Remove			6

3.1.2 Maintenance Operation Number

Maintenance Operation
Ornamental Shrub and Climber Planting

Maintenance during defects liability period or 5 years after planting whichever is the greater, and on going maintenance thereafter. Operations to include:

Prescription	Year (s)	Season	Frequency (per year)
Ornamental Shrub Planting			
Maintain weed free area to the surface of all planting areas	Ongoing	March - October	8
Fertiliser application	Ongoing	Spring	1
Re-firm all shrubs as necessary	Ongoing	Spring - Autumn	8
Prune as necessary to encourage healthy growth and boxed form as illustrated on the drawings	Ongoing	Spring - Autumn	2
Control all pests and diseases as necessary	Ongoing	As required	As required
Remove all dead or damaged material	Ongoing	March - October	8
Watering – Regular checks using a moisture probe testing during the first year after planting on a monthly cycle during the summer months of May-September.	1	May - Sept Autumn	6
Water as necessary to ensure healthy growth	Ongoing	Spring-Autumn	12 min
Replace dead or damaged material to original specification	Ongoing	Autumn	As required
Maintain mulch to a minimum of 50mm depth	Ongoing	Autumn	As required

Note: In the longer term, as the planting matures, thinning of species will become necessary, probably initially 5-10 years after planting. The amount of initial thinning and the timing of subsequent thinnings will be dependent on the extent of growth at the time and will need to be determined by the maintenance manager at the time.

Weed control

Keep planting beds clear of weeds by hand picking.

Watering

As necessary to ensure establishment of planting

Soil condition

Fork over beds to keep soil loose, with gentle cambers and no hollows. Do not reduce depth or effect of mulch.

3.1.3 Maintenance Operation Number

Maintenance Operation
Hedge Planting

Maintenance during defects liability period or 5 years after planting whichever is the greater, and on going maintenance thereafter. Operations to include:

Prescription	Year (s)	Season	Frequency (per year)
Hedge Planting			
Maintain a 1m wide weed free strip to the line of new hedge planting by hand weeding operations	1-5	As required	As required
Areas of new planting should also be mulched initially and re-mulched at least once a year to help maintain a weed free zone	1-5	As required	As required
Check any support fencing for defects and replace repair where required	1-5	As required	Every 12 months
Application of granular fertiliser (15:15:15).	1-5	Spring	As required
Water as necessary to ensure establishment and continuing health	1-5	As required	As required
Ensure hedging plants remain firmly bedded after disturbance and re-firm as necessary	1-5	As required	As required
Control all pests and diseases as necessary	1-5	As required	As required
Replace any dead or dying hedging plants implemented in year 1.	1	Autumn	As required
Trim to a gentle ‘A’ form to allow light to reach lower areas. Do not prune out leaders until final height has been reached.	1-5	Mid Summer	1

Post 5 years maintain as above, plus:

Maintain the hedge at a final height of 1.5m. Trimming to a gentle ‘A’ form as above.	6-15	Early Autumn	1
Replace any dead/ under performing plants. Where planting continually fails to establish, undertake investigations to ascertain any underlying cause.	6-15	Autumn	As required
Control all pests and diseases as necessary	6-15	As required	As required

3.1.4 Maintenance Operation Number

Maintenance Operation
Herbaceous Planting

Maintenance during defects liability period or 5 years after planting whichever is the greater, and on going maintenance thereafter. Operations to include:

Prescription	Year (s)	Season	Frequency (per year)
Herbaceous Planting			
Maintain weed free area to the surface of all planting areas	1-5	March - October	8
Fertiliser application	1-5	Spring	1
Re-firm all shrubs as necessary	1-5	Spring - Autumn	8
Control all pests and diseases as necessary	1-5	As required	As required
Water as necessary to ensure establishment and continuing health	1-5	As required	As required
Maintain mulch to minimum 50mm depth	1	Spring	As required
Prune early flowering shrubs after flowering	1-5	Early Summer	1
Prune late flowering shrubs before new growth	1	Early Spring	1
Prune evergreen shrubs	1	Mid Spring	1
Prune herbaceous perennials as required to maintain form and supply supports as needed	1-5	Early Summer	1
Replace any dead or dying plants implemented in year 1 to original specification	1	Autumn	As required

Post 5 years maintain as above, plus:

Replace any dead/ under performing plants. Where planting continually fails to establish, undertake investigations to ascertain any underlying cause.	6-15	Autumn	As required
Control all pests and diseases as necessary	6-15	As required	As required

Note: In the longer term, as the planting matures, thinning of species will become necessary, probably initially 5-10 years after planting. The amount of initial thinning and the timing of subsequent thinnings will be dependent on the extent of growth at the time and will need to be determined by the maintenance manager at the time.

Weed control

Keep planting beds clear of weeds by hand picking.

Watering

As necessary to ensure establishment of planting

Soil condition

Fork over beds to keep soil loose, with gentle cambers and no hollows. Do not reduce depth or effect of mulch.

Hard Landscaping and Furniture

Hardworks Maintenance Operations

Stone surfaces need to be maintained such that they provide a safe passage for all footpaths 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 streetscape project will depend strongly 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 Contractor. The rectification period will be 12 months post practical completion, and the maintenance period will commence directly after this. Contractors should visit the site at regular intervals to inspect all paved areas regularly during the maintenance period, 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.

Replacement Materials

Effort is required to ensure surfaces are maintained as they were originally constructed. The need for replacement of high quality materials is required for all streetscape projects at some time. Delivery periods for many materials will be 2 to 3 months if not more, and in order to achieve early reinstatement, a stock of replacement materials should be provided out of the initial project budget. An allowance at the tender stage for the procurement and storage of surplus material, typically 3%, should be made. If carefully and securely stored this should allow quick replacement and give time for ordering of appropriate materials to replenish the store. The quantity of extra materials put in store will vary depending on the size and nature of the site. Paving materials and street furniture should also be considered.

Guidance:

An allowance of 3% for the procurement and storage of natural stone materials should be made at the tender stage.

Materials include:

Concrete block paving and kerbs

Furniture adn

All furniture, fencing, and fixtures must be maintained in accordance with the supplier’s or manufacturer’s guidance. Once a supplier is appointed, their maintenance recommendations will be reviewed and incorporated into the overall Management and Maintenance Schedule. This approach ensures the longevity, safety, and aesthetic integrity of all installed elements, while supporting compliance with warranty and performance requirements.

Paving Defects – Rigid and Flexible

Common defects - Paved roads 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 roads, 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 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
- incorrect laying pattern

Flexible Movement

During the very early life of flexibly laid pavements, the joints between the units will be relatively porous. The ingress of water can consolidate jointing sand and it is important that the joints are regularly 'topped up' to replace the sand consolidated by rainwater or removed by other factors.

The joints will soon become semi-impervious as the build up of surface detritus seals the joints. Until this has occurred the paving should only be brushed by hand. Mechanical sweepers, and in particular sweepers with high suction forces, should not be used as there is a real risk of further loss of jointing sand.

When high traction forces exist such as with braking, accelerating and cornering. The surface profile and element orientation can be lost with flexible construction. The ability of the surface elements to move and the surface to deform without, necessarily, a loss of stability defines the layer as being a 'flexible' layer.

Loss of jointing material

Mechanical breakdown or loss of jointing material in large elements allows the ingress of water. Load spreading ability will reduce if the bedding layer is broken down by the action of water, freezing effects, lateral movement etc.

Rocking of large elements

A stone element that is not evenly supported will rock when loaded. The problem is compounded as rocking pumps water and fines out from under the element, reducing the support further. Rocking or loose elements result in higher stresses being imposed on surrounding elements due to dynamic effects.

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.

This table summarises some common defects, resulting problems and treatments.

Defect		Problem	Treatments	
Flexible	Rigid		Temporary	Long-term
Loss of jointing material	-	Loss of stability	Replace jointing material	-
	Debonding of jointing material	Initiation of failure mechanism	Monitor / investigate	Replace jointing or reconstruct if poor design
Broken or damaged elements	Broken or damaged elements	Unsightly water ingress	-	Replace or reconstruct
Missing elements	Missing elements	Trip, water ingress	Fill holes	Replace element
Rocking elements	Rocking elements	Hazard to users	Relay	-
Spalling of arises or surfaces	Spalling of arises or surfaces	Unsightly trips	-	Replace
Widening of joints	-	Loss of stability, water ingress	Fill wide gaps if hazard	Relay elements and strengthen edge restraint if necessary
Depressions and bumps		Hazard for users	Fill or ramp. Contact undertaker if cause is failed reinstatement	Relay
Rutting		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.

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 6677. 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 abut 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.

Retexturing

Re-texturing of stone/clay surfaces which have become slippery due to vehicular or heavy pedestrian traffic can be undertaken by various methods including scabbling, sand or shot blasting, high pressure water jetting or application of a weak acid. Composite decking can be cleaned by high pressure water jetting.

Scabbling is slow but can be used successfully on flags, especially where there is some form of surface growth. Sand blasting can be successful but results in a lot of fine particles and debris, which have to be removed separately. Shot blasting with steel shot involves the use of specialised machinery, which sucks up the debris and shot by vacuum. The steel shot is separated magnetically in the return loop for continuous re-use. This is a very successful process that tends to form a lightly-exposed aggregate surface on flags, giving a pleasing appearance. However, regular use of this technique can sometimes cause problems and retexturing areas around street furniture is difficult. Flexible Joints may need resealing with sand after any high pressure method has been used.

Guidance: Stone surfacings will become slippery and an appropriate re-texturing technique should be used to restore skid resistance.

Sealing

Proprietary sealing agents are commonly 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 Operations

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 300 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 is given in Section 7.0 (Acid Washing) of this document.

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.

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.

Cement and Lime staining

Both types of staining can occur on paved surfaces, usually as a result of contamination from other sources, such as concrete street furniture or the use of onsite mortars and concrete.

Cement and lime deposits are generally insoluble and therefore require treatment by a suitable acid cleaner to fully remove them.

Guidance on the safe use of chemical treatments is given in section 7.0 (Acid Washing) of this document.

Efflorescence

Efflorescence, or lime bloom, is a transient phenomenon of ordinary Portland cement. Its effect is to lighten the colour of concrete and can appear as a white deposit covering part or the entire surface. Except in severe cases, the phenomenon disappears completely when the surface is wet and reappears as the units dry out. The phenomenon is temporary, and will with time disappear as a result of natural weathering and trafficking processes.

Efflorescence is not a manufacturing fault and is not detrimental to the long-term performance and durability of the units in any way. Alternatively efflorescence can be removed chemically by using a suitable acid cleaner. Guidance on the safe use of chemical treatments is given in the Acid Washing Section of this document.

Note:

Vanadium staining can react badly to the application of acid cleaners. These types of cleaning substances have been known on occasions to have the effect of “fixing” the vanadium staining to the surface of the paving.

It is therefore 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.

Other Landscape Elements

Daily Inspection Litter Collection (every working day)

Including: Look at the equipment's basic condition, especially faults due to recent vandalism and check to ensure safety surface and surrounding areas are free from debris which could cause hazards.

Operational Inspection (weekly)

This looks in more detail at the equipment, essentially at vandalism and certain types of minor wear. Such inspections to be carried out by a competent person.

Inspection should focus on the following key headings:

General Site

Barriers present and in place

Gates in working order

Nearby trees in good health with no noticeable defects

Site free from litter, glass or any other dangerous objects

Pathways in good condition with no noticeable damage

Free from dog fouling

Ancillary

Seats and benches undamaged and in good condition

Litter bins emptied, undamaged and securely fixed (where appropriate)

Planting undamaged and in good health

Surfacing

Safety Surfacing undamaged, with no trip hazards

Any loose material level with surrounding areas (where appropriate)

No weeds present

Site is well drained with no evidence of puddling or ponding.

This inspection should include the general condition of the equipment, any damage to the fixtures and fixings, ensuring the equipment is securely fixed to the ground where appropriate, any safety surfacing is sound and correctly positioned, and the general area around the equipment is in good condition, free from rubbish any dangerous objects or protrusions.

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