NRP NORMAN ROURKE PRYME METIS

CONSTRUCTION CONSULTANTS
HIGHWAYS AND INFRASTRUCTURE
TRAFFIC AND TRANSPORTATION

Public Realm Materials in Westminster

Materials Palette

CITY OF WESTMINSTER

Updated by

City of Westminster

wsp

CONTENTS

CONTEXT

1.1.1 This document is complementary to Westminster City Council's Public Realm Guidance Supplementary Planning Document (SPD) and sets out a materials palette for the public realm within the City. It is a revised version of a document produced by NRP with and on behalf of the City Council in 2022.

1.1.2 Recommended materials for use in new public realm projects and maintenance schemes are defined within this document. Their incorporation in a project will depend on several aspects, such as the location and planned end use of the materials, and will be subject to relevant assessments and approval processes in place and determined by the City Council.

1.1.3 The standards, dimensions, and pavement loading case for each of the main material types is set out in the attached "Footway Pavement Design Guidance" in this report. A Surfacing Matrix is included for carriageway materials.

1.1.4 The City Council encourages using random lengths of materials, which reduces wastage. “Setts” and “Cobbles” refer to square and rounded edges respectively.

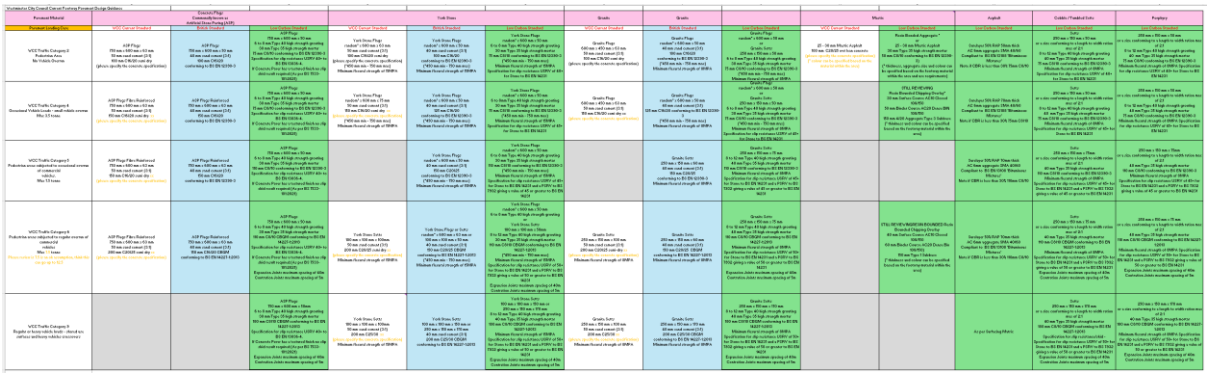
1.1.5 To ensure longevity and minimise carbon emissions throughout the project’s lifecycle, all chosen materials must comply with the standard technical requirements.

1.1.6 Carbon associated with materials transportation should be minimised to achieve a carbon-neutral future. It is expected that opportunities to achieve better sustainability are maximised through minimising trips and import distances as well as other considerations – maintaining a simple palette of materials and reducing waste.

1.1.7 All the materials proposed and implemented in the City must come from a supplier that guarantees that they have been manufactured in accordance with the current regulations and standards for technical, structural, strength and design requirements.

1.1.8 All references to British Standards and related documents relate to the most current version of each document as available at the current time of reading.

1.1.9 The attached WSP provided Materials Matrix set out the dimensions required, and typical loading properties of each of the main paving materials used in Westminster.



See SD-11-40 Working Draft Materials Details 22_7_2024.xlsx for full version of table above.

MATERIALS

2.1 Yorkstone - Carboniferous Sandstone Slabs & Setts

Image: Sandstone

Definition and Source

2.1.1 Yorkstone (a type of sandstone), is a sedimentary rock found in the English Pennines. Yorkstone comes in a variety of colours based on the minerals found in the rock. It is composed of sand-sized silicate grains.

2.1.2 Known sources of the material are:

- The UK, specifically The Pennines (preferred)
- Forest of Dean
- Spain

Colour

2.1.3 The most common colours are blue/grey, tan, brown and yellow/buff and appear in general mixtures with the appropriate finish selected from flame, diamond-sawn and capital.

Blue/Grey	Brown	Tan	Yellow/Buff

Image: Sandstone colours

2.1.4 Colour should be chosen to reflect the context of the area.

Application

2.1.5 Sandstones vary in strength, water absorption and other desirable properties, so it is essential to assess each sandstone in its own right.

2.1.6 Synonymous with character areas such as Mayfair, Knightsbridge, Belgravia, and the West End, these materials are staples to the City's heritage.

2.1.7 The preferred location for using Sandstones, especially light-coloured ones, is in heritage areas with high pedestrian footfall.

2.1.8 The use of this material is not preferred in areas with food establishments, and at street markets, where food and drink spillages are likely on street. This minimises the risk of staining the sandstone when exposed to grease, especially if bin collection is carried out on the street too.

2.1.9 Sandstones should not be used in parking bays or loading bays as the risk of staining from grease and oils is increased.

2.1.10 If sandstones are to be used, in areas prone to staining, they must be sealed with silane sealers at scheme construction, however this comes with high maintenance costs, as these sealant materials will need to be reapplied regularly.

- Slabs must have a minimum plane area of no less than 45,000mm2to promote longevity by limiting the slab's failure.
- Slabs must have a length-to-width ratio of no more than 2 to avoid cracking of the slab if unsupported at any point.
- Slip resistance measured as wet slip resistance (EN 14231) > 60.
- The maximum expected value of water absorption (EN 13755) is 2.5% for sandstone.

.

2.2 Granite Slabs, Setts & Cobbles

Granite

Chinese Magma Granite

Definition and Source

2.2.1 Granites and Basalts are igneous rocks formed through the cooling of molten rock. Setts and Cobbles refer to square and rounded edge elements, respectively.

2.2.2 Known sources of the material are:

- The UK, specifically Scotland (preferred)
- Portugal & Spain(preferred)
- The Far East

2.2.3 Preferred sources have shorter transportation distances and, therefore, reduction in carbon emissions.

Colour

2.2.4 They come in various colours: yellow/buff, pink, a range of greys and black.

Application

2.2.5 The City has had prolonged success with the use of mixtures of colours and the utilisation of darker greys and black in areas where paving is significantly prone to staining due to the likelihood of food, drinks, and other dirt spillage.

2.2.6 Granite setts should be considered on carriageways and footways with high footfall and where the public uses the space for food consumption and socialising, for example, markets and other areas such as the West End / Leicester Square with high levels of outdoor drinking and dining. .

2.2.7 Darker setts and cobbles maybe used in areas where the risk of staining through grease and oil is elevated, such as parking bays and loading bays.

2.2.8 Utilising such materials in those areas enables more resistance to dirt and staining in the public realm and easier cleansing than other material options

2.2.9 Granite setts can also be used in trafficked areas such as on speed tables or vehicular crossovers, due to their strength.

2.2.10 Granite and Basalt setts and cobbles have performed exceptionally well under traffic loading when designed correctly.

2.2.11 Assessing the origin of granite is essential in ensuring the carbon targets are met and exceeded.

2.3 Porphyry Slabs, Setts & Cobbles

Porphyry

Definition and Source

2.3.1 Porphyry are igneous rocks formed through the cooling of solid hot rock. WCC is currently assessing the use case for this in Westminster.

2.3.2 A known source of the material is Italy, Trentino. However it is unlikely that this material's use would be supported in terms of carbon impact of delivery over other materials listed in this report.

Colour

2.3.3 They tend to come in a limited number of colours, namely purple and tan.

Mixed	Red

Application

2.3.4 The application of porphyry in Westminster has been limited to streets, including Ramillies Street and Floral Street.

2.3.5 The setts are hard-wearing and perform well under traffic. Porphyry is highly resilient to staining, easily cleaned and durable if installed correctly. The material is resilient to UK weather, however there is no significant carbon benefit to using this material over others listed. As such the use of porphyry in Westminster is not generally supported. This will be kept under review.

2.3.6 Porphyry's vibrant colours can provide contrast, but may not be sympathetic to all areas in Westminster.

2.4 Black and Dark Grey Sandstones and Mudstones Slabs & Setts

Caithness Sandstone

Definition

2.4.1 Mudstones such as Caithness, sourced from Scotland UK, are sedimentary rocks from the Devonian period. This makes Caithness and similar materials exceptionally strong and hardwearing.

Colour

2.4.2 Mudstones such as Caithness can have tan veins within them, but tend to come in limited shades - dark grey to black.

Application

2.4.3 Recent works such as those in Hanover Square show that these materials can successfully be used in areas of high pedestrian footfall and vehicular loading where setts and cobbles are inappropriate.

2.4.4 The limited colour range mean the City Council is not currently considering wider use of these materials ahead of others listed here.

2.5 Natural Stone Kerbs

Images from Westminster

Definition

2.5.1 Kerbs in the City tend to be granite. They come in a multitude of shapes intended for different purposes.

Colour

2.5.2 Natural stone kerbs come in silver grey with lighter or darker tones. Silver grey granite is norm in Westminster, with a fine picked finish.

Application

2.5.3 Kerbs are prevalent within the City as part of the structure of the footway. Double (or more) kerbs are not to be installed unless there are extenuating circumstances and all other design options have been exhausted.

Dimensions

2.5.4 The preferred dimensions to retain the best performance of Natural Stone Kerbs in the public realm

	Width	Length	Thickness
Kerb	Minimum 300 mm	900 mm	150 or 200 mm

2.5.5 Kerbs should be strong to resist trafficking and reduce chipping. The desired technical properties should be as follows:

- Kerbs at the edge of carriageways should have rounded edges (battered / bullnose kerbs) to prevent early cracking and deterioration of performance, unless used as flat kerbs for conveying drainage or delineating materials.
- The minimum compressive strength of natural stone used in kerbs should be 170MPa, with maximum water absorption of 0.5%.
- Kerbs should be installed in accordance with BS 7533and the Westminster Specification for Highway Works.

2.5.6 Consideration should be given to the reuse of kerbs and other materials wherever possible.

2.6 Concrete Flags

Concrete Flags

Definition

2.6.1 Concrete Flags, also commonly known as Artificial Stone Paving (ASP), are a staple of the English streetscape with its first British standard published in 1929 as BS368:1929 Concrete flags in Portland cement.

Colour

2.6.2 These come in a range of colours, but are mostly grey.

Application

2.6.3 Concrete flags have been installed in all areas of the City. However, other material types should be considered first before concrete flags to ensure the best material is selected for each location, especially when functionality, durability and sustainability are taken into account.

2.6.4 Concrete flags should be avoided in locations with expected vehicle overruns. If they are needed in areas of known or expected vehicle overrun, designers should consider reinforcing the slabs with steel fibres. This is to prevent failure of the material and associated increased need for replacement.

2.6.5 The sustainability, functionality and durability of concrete flags should be considered over the whole life of the scheme when proposed within the public realm.

2.7 Mastic Asphalt

Mastic Asphalt around Basement

Definition

2.7.1 Being a mixture of asphalt and other material (such as sand or crushed rock) used like cement, mastic asphalt is softer and more pliable than regular asphalt. It is a generic footway material with multiple use cases.

Colour

2.7.2 Mastic Asphalt is commonly grey or black. The colour should be consistent with the surrounding public realm for coherence, especially where patching is required.

Application

2.7.3 Mastic asphalt is used in the City, especially around basement slabs, suspected vaults or for other applications where construction depth for slabs or setts cannot be achieved.

2.7.4 Mastic asphalt should be installed by contractors affiliated with and approved by the Mastic Asphalt Council.

2.7.5 The location and usage requirements and maintenance needs should be considered to ensure adequate repair or installation is carried out where necessary.

2.7.6 Mastic asphalt does not generally perform well under heavy loading and should be avoided in areas where this expected vehicle overrun or parking.

2.8 Other Homogenous Materials

Definition

2.8.1 Homogenous materials include imprinted thermoplastics, fine concrete mixtures, and imprinted asphalts.

Colour

2.8.2 These materials could come in a range of colours which should be carefully considered.

Application

2.8.3 Homogenous materials other than mastic asphalt are used in the public realm in cases of the presence of shallow utilities, waterproofing requirements, or different scenarios as per requirement from the City Council.

2.8.4 They can be designed to look like adjacent materials -giving the impression of paving slabs, where there would not otherwise be space to lay paving slabs, however their use is not generally encouraged as these materials do not possess the same structural properties as the materials they would replicate.

Dimensions

2.8.5 There are no set dimensions for such homogenous materials.

2.8.6 Such materials must be installed by trained individuals following the material installation guidance notes issued by the manufacturer.

2.9 Tactile Paving

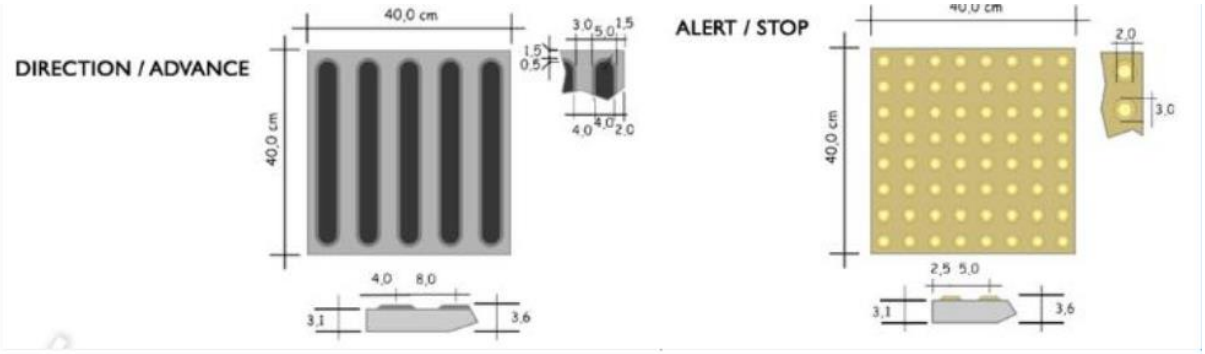
Definition

2.9.1 Tactile paving units bear a distinctive colour and raised surface profile to be detected by both sighted and visually impaired pedestrians, providing a warning system and valuable information for their movement and safety.

2.9.2 They facilitate universal accessibility in urban areas, providing safe and inclusive pedestrian mobility.

Colour and Application

2.9.3 The choice of colour should facilitate visual differentiation from the surroundings to facilitate identification and guarantee contrast.



2.9.4 Grey tactile paving should not be used where it does not contrast with the surrounding area.

2.9.5 The correct use of tactile flooring is an excellent help for visually impaired people. If, on the other hand, they are used excessively or inappropriately, they could confuse and lead to decisions that endanger users. Their use should be reserved for specific spaces.

2.9.6 Blister paving, indicating where there is a crossing point with no kerb upstand, is the most recognised form of tactile paving. It is recognised as a warning signal to stop in the first instance and scan the environment for decision-making (turn, crossing, etc.).

2.9.7 Corduroy paving is recognised as a safe forward movement signal for straight movements and moderate turns (less than 45°). The long direction of the strip must be parallel to the direction of pedestrian traffic.

2.9.8 Tactile paving at controlled crossings should be laid in an L-shape, as per official guidance, to alert the visually impaired pedestrian that there is a controlled crossing coming.

2.9.9 At uncontrolled crossing points, tactile paving at the dropped kerb is sufficient. This be buff, or another colour that provides a clear contrast with the surrounding footway and the road. The distinction between the two styles helps visually impaired people understand whether they are at a controlled crossing or not.

2.9.10 Surface mounted (stick-down) tactile paving shall be a plastic-based product capable of adhering to concrete, natural stone, asphalt, metal, wood and clay products to provide the desired Equality Act 2010 compliance without the need to dig and the use of bedding materials. They shall achieve a minimum skid resistance value of 50.

2.9.11 TfL's 2019 Streetscape Guidance provides many useful evidence-based examples of the use of tactile paving.

Dimensions

2.9.12 Blister paving comprises rows of flat-topped domes around 5mm high.

2.9.13 Corduroy paving comprises rounded bars running transversely across the direction of pedestrian travel. The bars are around 6mm high and 20mm wide, with centres spaced at 50mm.

2.9.14 Surface mounted tactile paving should be embossed, tramline, corduroy, or blister as necessary and should be 400mm x 400mm .

2.9.15 Tactile paving within Westminster must comply with BS EN 15209 Tactile paving surface indicators produced from concrete, clay and stone and applied alongside the Inclusive Mobility Guidance on the use of tactile surfaces by the Department for Transport.

2.9.16 New schemes should meet London standards and eventually provide a step-change towards a consistent approach across the City.

2.9.17 Where dropped kerbs are present or installed, particularly at junctions, consistent use of tactile paving is best practice.

2.9.18 Metal studs are generally disliked, widely regarded as being slippery when wet, and generally more painful for people with sensitive feet; too hot for guide dogs' feet in summer; and more uncomfortable –even an obstacle –for wheelchair users.

Carriageway Materials

SURFACING MATRIX

City of Westminster

Mix No	Mix Name	Depths	Hierarchy	Best Use	Street Characteristics	Street Usage	Strengths & Weaknesses
1	Surelane with heavy duty PMB	Assume 50mm Depth Surface Course	SR, A1, B,	Heavy Trafficked Streets	Strategic route or key link road, Wide Streets, , several bus routes	High profile, Government & Municipal buildings, theatres, department stores, tourist attractions, events	Specially designed to reduce rutting. No long term case study information available.
2	Warm mix Binder & HRA & precoated Chippings Surface	Assume 50/50mm Binder & Surface	A1, A2, B, C, D	Any street except slow moving bus routes. Streets requiring higher skid resistance	Any street, better not to use in quiet residential streets, narrow streets or bus routes with a risk of rutting	All	Proven long life material, good skid resistance. Use of chipper means that all roads need to be closed during works, more chance of failure in cold weather. Prone to channelised rutting on heavy bus routes
3	Surelayer 50% RAP Single layer treatment	Assume 70mm Depth	A2, B, C, D	Residential Streets. Schemes where carbon footprint is major consideration	Residential or business street, medium trafficked	All	Single layer 70-100 mm. Good use of recycled material. Reduces need for total road closures, fastest material to install, can be installed in colder months, best material if high number of ironworks. No long term case study information available.
4	HRA Binder with Surepave surface	Assume 50/50mm Binder & Surface	B, C, D	Streets with vaults and other difficult underground situations	Streets with basements under the carriageway, e.g. Soho	Residential streets with cellars or shopping streets with basements	Less vibration required therefore less chance of damage to properties in sensitive areas. No long term case study information available.
5	Surepave Binder & Surface Course	Assume 50/50mm Binder & Surface	B, C, D	Streets needing to stand out, e.g. Grosvenor Streets	High end shopping areas, e.g. Mayfair	Shopping streets, streets looking to compliment high end paving	Similar benefits to Surelayer. Best aesthetic finish. No long term case study information available.
6	Warm mix binder and surface HRA 55/10	Assume 50/50mm Binder & Surface	B, C, D	Narrow Streets	One way streets, residential or business streets	All	Good alternative to HRA with chips where chips can't be installed due to physical factors or weather
7	6mm SMA - surface treatment only	Assume 50mm Depth Surface Course	D,E	Superficial treatments	Quiet streets	Residential	Cost effective, long lasting solution for lightly trafficked streets. Not suitable for heavy traffic
8	Sureflex 6mm-surface overlay only	Assume 25mm-40mm depth	D,E	Over concrete or other hard surfaces difficult to remove	Quiet streets	Mainly residential	Designed to overlay difficult to remove setts or concrete. Not suitable for heavy traffic and levels must be carefully checked before selecting this option

Notes:

1. All surface mixes types are warm mix with the exception of HRA & Precoated Chippings
2. All binder courses are warm mix
3. With the exception of Mix Type 3 and 7 all surface courses will use 10mm aggregate to reduce risk of ravelling at turning circles
4. Type 3 Surelayer is available in 10mm but as virgin material only - no RAP
5. Mix Type 5 and 6 can be used as a 50mm surface course only
6. Several mixes could be suitable for a location, the design team will use their discretion
7. Other factors such as existing materials to keep the aesthetic of the carriageway and avoid patching may factor into material selection

2.10 Undesirable Materials

2.10.1 Certain materials have been deemed unacceptable based on both appearance and functionality.

2.10.2 The materials deemed unacceptable are as follows:

- Concrete block paving conforming with BS EN 1338 Concrete paving blocks -Requirements and test methods
- Clay Pavers conforming with BS EN 1344 Clay pavers -Requirements and test methods
- Coloured Concrete Flags conforming with BS EN 1339Concrete paving flags -Requirements and test methods replicating natural stone products
- Small element Concrete Flags conforming to the aforementioned BS EN 1339 in 450by 450mm, 400by 400mm and 300by 300mm
- In addition non-rectangular or non-square elements are not generally accepted on Westminster's highway.

2.10.3 These types of elemental paving are not deemed to fit the City's streetscape, and/or being hard to source and maintain.

2.10.4 It should be noted that some elements may need to be removed whenever encountered during a works programme. They should not be replaced in the same way and will need to be substituted for more appropriate items where possible.

CONSTRUCTION

3.1 General Requirements

3.1.1 All works within the highways in the city of Westminster must be carried out in accordance with the latest requirements / legislation / guidance.

Installation of Modular Paving

3.1.2 When installing modular paving in concrete flags, natural stone slabs/setts and paviours should be certified to the National Highways Sector Scheme 30 –Scheme for the Installation, Maintenance and Repair of Modular Paving.

3.1.3 Construction should comply with the relevant clauses specified in the BS7533 standards.

Installation Around Utilities

3.1.4 Wherever possible, public realm projects in the City should seek to install recessed covers around utilities infilled with paving materials to match their surroundings.

3.1.5 Where a utility repair is carried out, and the reinstatement work is not in accordance with the Specification for the Reinstatement of Openings in Highways (SROH), the utility company will be required to make good reinstatement at their cost. Where this cannot be achieved, then it will be re-instated by the City Council, and the utility provider will be charged for the work.

Slopes and Transitions

3.1.6 No public realm area should have a slope of more than 1:9 in ramped sections, and where possible, slopes should be kept to lower than 1:18.

Line Marking

3.1.7 Installation of line marking on natural stone paving should be carried out in chlorinated rubber paint to ensure adhesion to the substrate. This is recommended for longevity of line marking on natural stone paving.

3.1.8 Line colour –should be primrose yellow.

3.1.9 The preferred method of removal is hydro-blast rather than burning off with its carbon implications.

3.2 Bound Surface Construction

3.2.1 Bound Construction on a bound or unbound base is the general construction method in the City. Sand cement bases are an established standard in Westminster which is considered a lower carbon alternative to cementitious mortar. Appropriate consideration of maintenance and cleansing processes should be allowed to avoid issues that could compromise bases where sand is used.

3.2.2 When designing in bound construction, the design must take into consideration:

- Edge restraints
- Bedding material
- Jointing material and jointing alignment
- Movement joints -contraction, expansion and building joints
- Surface sealers

Where grout is used, 6mm grey or natural is preferred.

Edge Restraints

3.2.3 Edge restraints such as kerbs provide stability to the pavement. It is essential to design and construct these in accordance with BS7533-101 Annex I.

3.2.4 Kerbs should not be laid in dry concrete to ensure compaction. The haunching should be as shown in Annex I of BS 7533-101.

3.2.5 The expected concrete strength should be a minimum of 12MPa for general footways and 30MPa for public realm areas to ensure the longevity of the pavement structure.

Bedding material

3.2.6 Bedding materials should comply with the requirements set in BS7533-101. These may be site-batched mortars or manufactured products as required.

Jointing materials

3.2.7 Jointing material should comply with the requirements set in BS7533-101.

3.2.8 When selecting jointing material, assessing the area and its general utilisation is essential. Light grey and white jointing material should not be used in food consumption areas and the high staining risk. The colour of the jointing material should be coherent with the context of the public realm.

Movement Joints

3.2.9 Joints should be designed and installed in bound pavements in accordance with BS7533-101 Annex L.

3.2.10 Contraction joints should be paper joints that can be formed through the pavement using a thin damp-proof membrane.

3.2.11 Expansion joints, on the other hand, should be a low modulus sealant or a metal joint in stainless steel or aluminium filled with an elastic polymer.

3.2.12 Joints around buildings and other structures should be done in a low modulus sealant.

Surface Sealers

3.2.13 Surface Sealers specified in the City should be Silane in nature rather than water-based. They should impregnate the surface material without changing the appearance of the natural product. These are recommended for areas of high footfall and shopping streets.

3.3 Unbound Surface Construction

3.3.1 Although unbound construction is not a common construction method in the City, this type of construction could be considered to support climate emergency goals and implement sustainable drainage systems.

3.3.2 Unbound systems also support utility interventions, reducing the intervention time and thereby impacting the network less, and reducing the need for replacement materials to be sourced.

3.3.3 When designing in unbound construction, the design must take into consideration:

- Edge and Intermediate restraints
- Laying course, jointing material, and jointing alignment

- Cleansing requirements and regimes
- Safety

Edge and Intermediate Restraints

3.3.4 Edge and Intermediate restraints such as kerbs provide stability to the pavement. It is essential to design and construct these in accordance with BS7533-101 Annex I.

3.3.5 Kerbs against unbound surfaces should not be laid in dry concrete to ensure compaction. The haunching should be as shown in Annex I of BS 7533-101.

3.3.6 The expected concrete strength should be a minimum of 12MPa for general footways and 30MPa for public realm areas to ensure the longevity of the pavement structure.

Laying course, jointing material, and jointing alignment

3.3.7 The laying course for unbound modular pavements should be sand compliant with BS7533-101.

3.3.8 The jointing sand should be kiln-dried and comply with the requirement set in BS7533-101.

3.3.9 A minimum overlap of 150mm should be provided when laying modular paving in stretcher bond, with stack bonds avoided completely.

ADDITIONAL CONSIDERATIONS

4.1Shared Spaces

Inlaid symbols in paving to denote spaces with high-spec paving.

Interfaces between Materials

4.4.1 Where different paving and construction are to meet, it is recommended that the design considers the use of intermediate edge restraints.

4.2 Sustainable Drainage Systems

4.2.1 Sustainable Urban Drainage Systems (SUDS) should be used where practical to achieve reductions in predicted flooding risk. Suitable surface water drainage methods must be designed into all public realm schemes. Surface materials must be useable and safe in all weather conditions and at all times of day and not introduce trip or fall hazards.

4.2.2 When designing the public realm using SUDS, the City requires full compliance with BS7533-13 Pavements constructed with clay, natural stone, or concrete pavers-Guide for the design of permeable pavements been built with concrete paving blocks and flags, natural stone slabs and setts and clay pavers.

4.2.3 The use of permeable bedding mortars and joints is allowed as long as the permeability of these materials exceeds1x10-3 m/s.

4.2.4 Materials should be of high quality and appropriate to their function, e.g. for primarily pedestrians, traffic or a mix of uses.

4.3 Tree Pits

Soil

4.3.1 The majority of newly planted trees in Westminster are planted in soil, without any further surfacing. Soil allows good permeability for air and water and so aids tree establishment, but it is easily compacted, and can be displaced by pedestrians, vehicle overrun or street cleaning operations. Relatively high maintenance is required, including, weeding, and topping up when settlement occurs.

4.3.2 Community gardening activities are not encouraged around trees which have been in the ground for at less than 4 years, as competition for water and nutrients from other plants can prevent their successful establishment, and there is also a higher risk of physical damage to their roots.

4.3.3 Around established trees, existing soil, sometimes supplemented with additional topsoil, can provide an adequate medium for community gardening.

Resin bound gravel

4.3.4 Resin bound gravel is a permeable surface which allows roots access to air and water. It is hard wearing if properly installed, and is used in Westminster for townscape and practical reasons, as it is aesthetically neat, limits compaction in areas of high footfall, and can allow tree planting in narrow footways where otherwise the width of the pavement would preclude tree planting altogether.

4.3.5 When resin bound gravel is selected as a surface around newly planted trees in Westminster, the standard specification includes a precast perforated galvanised steel tray to accommodate the resin bound gravel, with the central aperture filled with loose gravel to allow space for the tree trunk to expand. Recent examples can be seen in Queensway and Strand/Aldwych.

4.3.6 Once trees have matured to fill the available space, the trays can be removed and the tree pit can be surfaced with another material.

4.3.7 Resin bound gravel is sometimes installed around established trees in Westminster in order to address specific issues such as settlement of soil in tree pits resulting in trip hazards, or to accommodate pedestrian movement on streets with higher footfall. Unless it is installed on a suitable sub base it is not a long lived material. It is not installed as a preferred material, but in some circumstances it is the most appropriate solution. Where appropriate, resin bound gravel can be replaced with self-binding gravels which can accommodate root expansion without cracking and is easily installed and replaced at low cost.

4.3.8 Recent guidance on community gardening in tree pits advises residents should contact the City Council if they seek to establish plants in tree pits which are surfaced with resin bound gravel.

Self-binding gravel

4.3.9 Self-binding gravel is cheap and hard wearing material which provides a firm finish, tolerant to pedestrian traffic and is relatively permeable. Frequently used self-binding materials include Breedon gravel and hoggin, which is a mixture of clay, gravel and sand. These natural products are used in Westminster to top up tree pits where settlement has taken place, and can be used around new trees if needed, provided care is taken in installation to avoid damage to root balls of the trees when the surface is compacted during installation. For this reason, resin bound gravel can be preferable as it does not require compaction.

4.3.10 Self-binding gravel helps to suppress weed growth and provide a neat appearance, although if the area immediately around the tree is subjected to significant levels of footfall then the material can become compacted and less permeable . Both hoggin and Breedon gravel are natural materials so come in different colours. If the gravel content is too high, or if the surface is not properly compacted on installation, it can become messy and spread over footways.

4.3.11 Self-binding gravel is relatively easy to remove and can be replaced with topsoil by community gardeners.

Inorganic mulch

4.3.12 Inorganic mulch includes materials such as gravel and pea shingle. Whilst these materials are permeable, they do not provide a firm surface in the way that self-binding materials do, and are susceptible to displacement over the footway. Given relatively high footfall in many locations in Westminster, the use of inorganic mulch is limited, but gravel is used for newly planted trees in conjunction with resin bound gravel in order to suppress weed growth around the trunks of trees, and allow room for trunk expansion.

4.3.13 Inorganic mulch can be easily removed by community gardeners, if needed.

Organic mulch

4.3.14 Organic mulch, such as composted bark chip, is a low cost permeable material which can help to suppress weed growth around newly planted trees. However, it is very easily displaced over the highway and can be blown out of tree pits in windy weather. For this reason, it is rarely used for highway trees in Westminster, although it is appropriate in parks and open spaces where trees are planted in grassed areas.

Asphalt

4.3.14 Asphalt is sometimes used around trees in Westminster, for example where issues of overrun by vehicles are identified, where settlement of the soil has occurred, or where the footway treatment requires a consistent approach for pedestrian movement or townscape reasons. Asphalt provides a low cost and firm surface for pedestrian and vehicular traffic but the standard specification is not permeable and for this reason it is not used for newly planted trees. For established trees, installation of asphalt does not usually cause harm, as the tree roots have grown beyond the confines of the tree pit. Permeable asphalt is available and may be appropriate to use in certain situations, although it is more costly.

4.3.15 Guidance on community gardening suggests residents should contact the City Council if they seek to establish plants in tree pits which are surfaced with asphalt.

Grilles

4.3.16 Traditional cast iron tree grilles are rarely used around new trees in Westminster, and are not suitable for fitting around existing trees. Whilst they are usually permeable, they can become weedy, act as litter traps and can create trip hazards if displaced by tree roots. They are also difficult to maintain and troublesome to remove if this is required as a result of trunk expansion or root growth.

4.3.17 More modern modular grilles which can support paving are sometimes used in Westminster to accommodate new tree planting. They are permeable and can be removed in sections to allow for trunk expansion. They are valuable in public realm schemes where the design requires a high quality finish and space for street furniture and pedestrian movement. They provide limited space for community gardening activities, but these locations are not usually suited to planting.

Rubber crumb

4.3.18 Rubber crumb surfacing is often made from recycled rubber tyres and is similar to the soft surfaces used in play areas for children. It is relatively flexible and permeable although permeability can decrease over time. It is used infrequently in Westminster, and generally only where tree roots have lifted paving and created an uneven surface. It has a tendency to crack with root expansion, or if is not laid with a suitable foundation, but nevertheless it is a useful surface where other options have been ruled out for site criteria reasons. Some specifications include a percentage of gravel, which improves the durability and appearance of the product. Rubber crumb is not used in Westminster around newly planted trees.

4.3.19 Rubber crumb installation will usually preclude community gardening activities but it is not usually used where such activities are anticipated.

4.4 Inspection and Test Plan (ITP)

4.4.1 For each project in the City, the main contractor must produce an inspection and test plan. This should include the following.

Materials

- sources of materials and copies of technical data sheets
- a reference sample, e.g. an adequate number of pieces of natural stone of sufficient size to indicate the general appearance of the finished work
- samples for jointing mortars
- identification of materials (a reference to brand names, primary or recycled materials, etc.)

Assessment and Testing

- acceptance of purchased material and storage location of delivery tickets
- tests carried out on materials by the contractor or supplier
- tests to be carried out on the formation
- checks on cutting in and minimum paving unit dimensions
- checks on the thickness of sub-base and base
- checks on falls to surface drainage and subsurface drainage for all structural layers
- checks on levels of edge and intermediate restraints
- checks on final levels and falls of laid paving
- checks on joint widths
- setting out methods
- correction of defects

REFERENCES

- British Standard (BS) 368:1929 Concrete flags in Portland cement
- BS EN 1341 Slabs of natural stone for external paving -Requirements and test methods
- BS EN 1342 Setts of natural stone for external paving -Requirements and test methods
- BS EN 12372Naturalstone test methods -Determination of flexural strength under concentrated load
- BS EN 13755Natural Stone Test Methods -Determination of Water Absorption at Atmospheric Pressure
- BS EN 14231Natural stone test methods -Determination of the slip resistance by means of the pendulum tester
- BS EN 1338 Concrete paving blocks -Requirements and test methods
- BS EN 1339 Concrete paving flags -Requirements and test methods. Annex D/ E/ F
- BS EN 1344 Clay pavers -Requirements and test methods
- BS EN 13108-6 Bituminous mixtures -Material specifications -Part 6: Mastic Asphalt
- BS EN 15209 Tactile paving surface indicators produced from concrete, clay, and stone
- BS7533Suite of Documents. Specifically BS 7533-101.AnnexeI/ L
- BS7533-13 Pavements constructed with clay, natural stone, or concrete pavers-Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay pavers