



Understanding Paving Design

Featuring Marshalls Paving Design Tool



Marshalls

Creating Better Spaces

Marshalls Paving Pedigree

Over the past 120 years, Marshalls has built an enviable reputation for paving expertise in the UK. Its natural stone paving graces world-famous heritage sites and its concrete landscaping products are the first choice for architects and contractors in towns and cities all over the country.

Not only does its current product output meet or exceed all relevant industry standards – all carry an independently verified carbon footprint label, making Marshalls the most sustainable manufacturer in its industry.

Furthermore, through a combination of its proud heritage and forward-thinking product innovation, Marshalls has been recognised with UK Superbrand status for the 7th consecutive year.



Marshalls brand is acknowledged in its sector as a leader in ethical and sustainable product development. It is proud of its support of the UN Global Compact promoting strategies to improve human rights, the environment and ethical business.



Marshalls is a member of the Ethical Trading Initiative (ETI).



Paving Research Innovation

As a brand known for product innovation, Marshalls takes its responsibility for quality and reliability very seriously. Extensive research and development underpins every new product, with a heavy focus on laboratory and field testing.

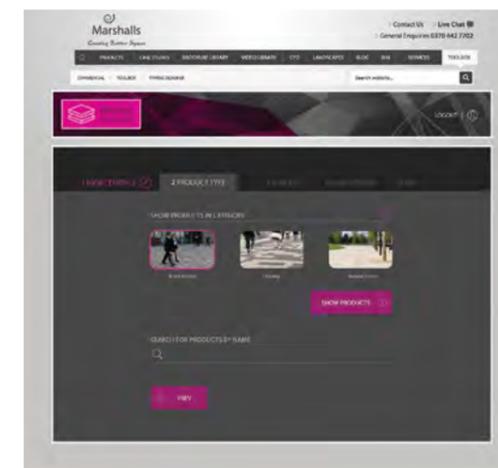
However, Marshalls understands that durable, robust pavement performance is as dependent on design and installation as it is on product. To demonstrate this, it has undertaken extensive research into the field of sub-base design, looking carefully into the build up of materials beneath the surface layer to confidently deliver the most durable, practical, and cost effective solutions.

As a result of these studies, Marshalls and its collaborators have arrived at a series of sub-base designs which eclipse those currently offered by the British Standard 7533 series. They believe that these new designs, based on thorough analysis by an industry expert, will eliminate failures and extend pavement longevity – and, in many cases, offer significant cost reductions compared to the BS.

This booklet explores the principles of good paving design, balancing performance, aesthetic and cost. The final section includes a guide to the innovative new webtool Marshalls has developed to make sub-base design easy for all of its customers regardless of their technical experience.

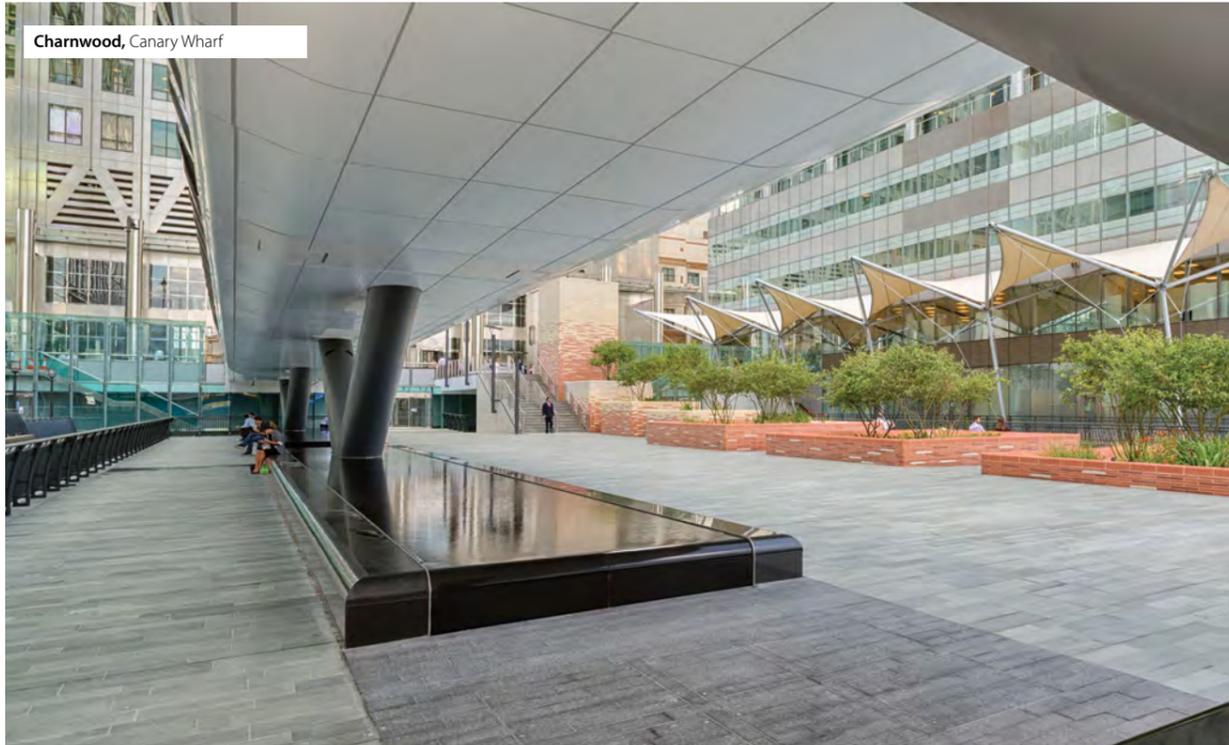
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Visit www.marshalls.co.uk/pavingdesigntool to use our free Paving Design Tool! See Page 25 for more details.





Charnwood, Canary Wharf

Aesthetics is the area where the designer is allowed freedom; this is explored over the following pages.

Performance should be considered to ensure that the pavement stays safe and looking good for years to come; this is explored at the back of this book.

Cost can be a complicated issue; it's rarely as simple as comparing the cost of one surfacing product with another. There are a number of elements which should be included in your calculations to arrive at a complete cost for the paved system, including (but not limited to) installation, sub-base materials, the type of drainage required, and the anticipated lifetime of the project. The fully trained Marshalls design team are perfectly placed to help you understand the whole cost of your chosen paving structure – not just the price of the paving. Speak to your local Marshalls contact to find out more.

The Marshalls Approach to Good Paving Design

Balancing Aesthetic, Performance and Cost



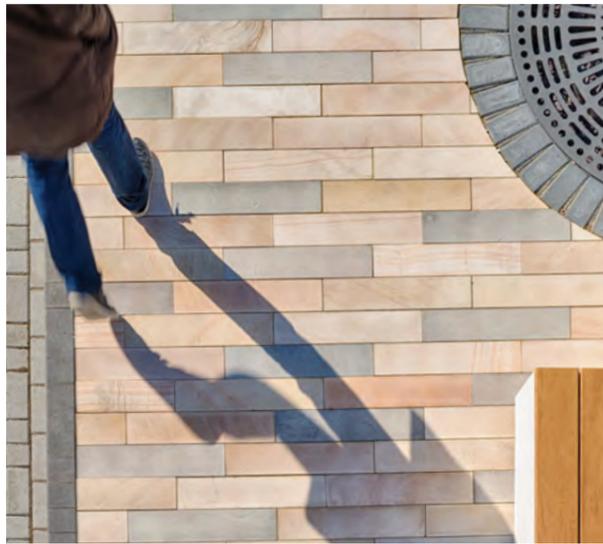
La Linia, Various Colours, Brown Fields



Scoutmoor, Trafalgar Square



Moselden Yorkstone, London



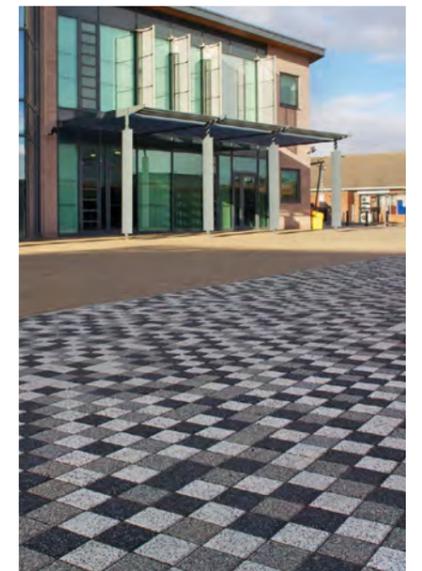
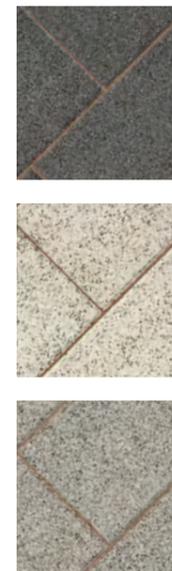
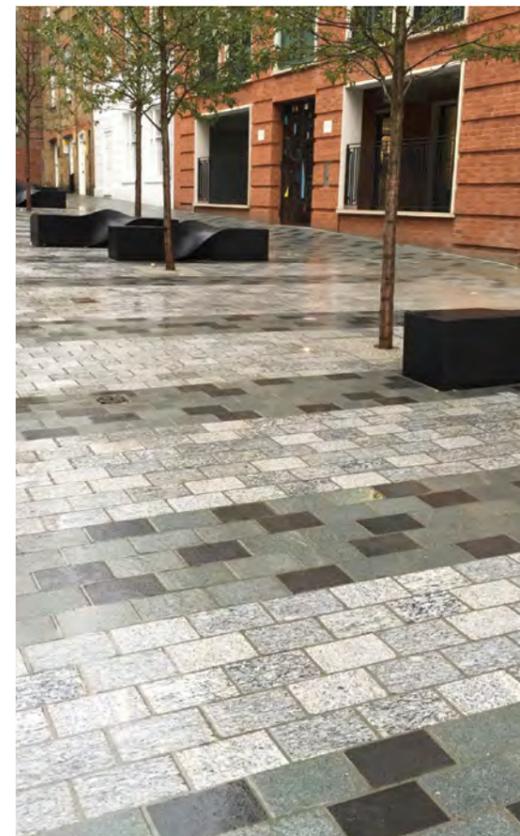
Colour

Adding small areas of buffs, reds or browns into a paved landscape adds an engaging warmth to even the sleekest and most sophisticated spaces. Alternatively, using bold splashes of colour can complement adjacent architecture or reinforce the branding of a location. Naturally forming patterns and variations in natural stone effortlessly break up large areas, and remember: there's so much more to concrete than just acres of grey!



Exciting colour contrasts...

...can create a vibrancy and spectacle in any shopping thoroughfare



Example colour contrasts...

...allow strong patterns to emerge and add interest to large spaces



Corby Station Colour



Challenge

Corby Rail Station is a brand new £17m passenger interchange that has won several awards for excellence in design and partnership working. Construction of the station took just 10 months and was the culmination of a 40-year campaign to bring a passenger rail service to Corby, which had been described as the largest town in the UK without a railway station.

The project was acclaimed as winner of the Institute of Highways and Transportation (IHT) Award for Effective Partnership. This award was given due to the recognition of the close partnership arrangement that enabled the station to be built on time, on budget and to a very high standard.

Corby Station is owned by Network Rail and managed by East Midlands Trains. The new station means Corby will have its first direct train link with London since the 1960s.

The modern design of the station meant that the hard landscaped areas needed to reflect this vibrant, dynamic image. Corby Borough Council was delighted with the paving and, as a result of this, is planning to extend it from Corby Rail Station right through to the town centre and in doing so create the "Corby Walk."

Solution

North Northants Development Company, working on behalf of Corby Borough Council, wanted to create a hard landscaped area that had visual impact and complemented the modern design of the new station building. The development company worked with Architects WYG which specified blue from the La Linia range, because blue is synonymous with the town of Corby and it was felt would add impact. Blue is widely used on street furniture, shop fronts and signage, therefore it was the natural colour choice to provide the design element to this innovative paving scheme.

The theme was continued by the use of blue railings along the track side and blue ceramic tiles on the feature wall to the entrance of the station building.

Light Granite and Anthracite Basalt paving, again from the La Linia range, were specified alongside blue, as they complemented the designer's colour scheme.

Michael Ashley, Project Consultant for Marshalls, said: *"The aesthetics of the paved area was all important on this project and the architect's choice of three different colour finishes from the La Linia range was inspired, as it complements the look and function of the station building and reflects its contemporary appearance. The paving was completely bespoke to the project, in that this was the first time we have been asked to incorporate stainless steel strip into the design. However, it worked out really well and further enhanced its aesthetics and created a really unique design. It is very satisfying to learn that the paving is now being extended from the railway, right through to the town centre, encouraging people to reduce their carbon footprint by using public transport and walking, rather than travelling by car – all of which is thanks to the paving scheme!"*

Benefits

Corby Station is a flagship station in terms of paving design and is a great example of how the landscaped areas are an integral part of the overall design theme, which helps to engage visitors and add impact.

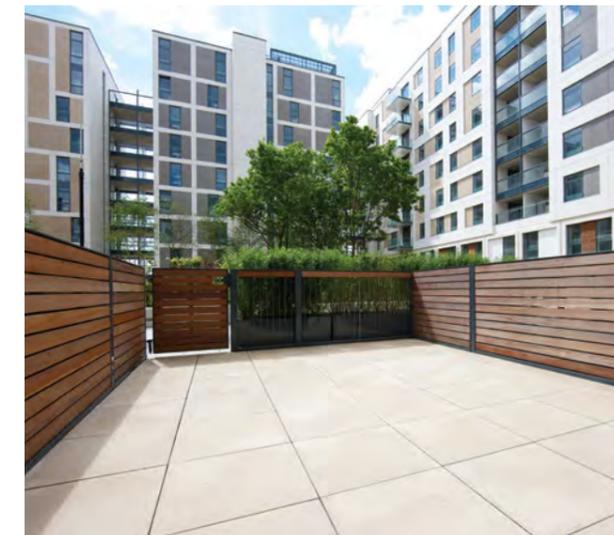
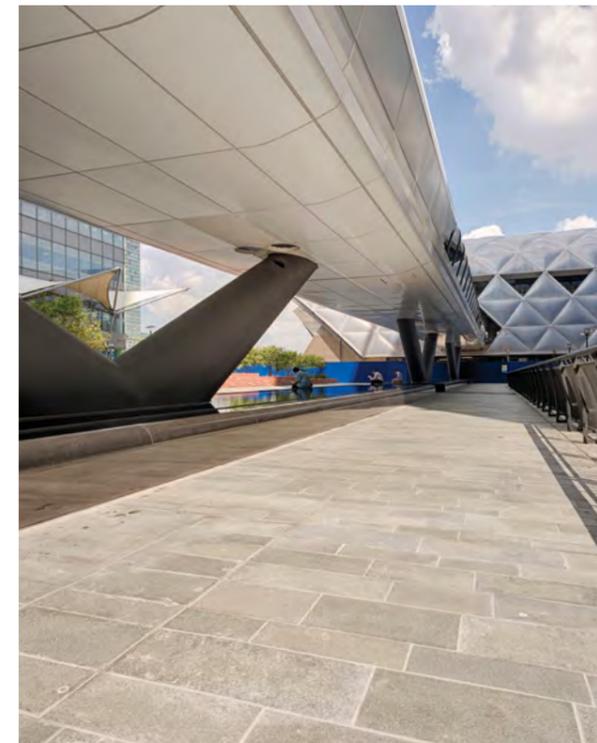
The architect cleverly incorporated three different colour finishes available within the La Linia range to create the railway track design around the entrance to the station. Marshalls incorporated its technical expertise and bespoke capabilities to make it possible to incorporate stainless steel 'tracks' into the design, making it completely bespoke to the building.

Corby Station is the epitome of good design and the landscaped area reflects the quality of the station build, whilst immediately setting the scene for visitors using the station. The overall effect has been to enhance the area, creating a bright modern image that reflects the true character of Corby.

The choice of robust, but eye-catching street furniture from Woodhouse provides both functional and aesthetic benefits, which are perfectly in keeping with the attractive, contemporary design of this flagship station building.



Plan sizes can...
*...differentiate the function
 of adjacent areas*



Plan sizes add to the...
*...appreciation of surrounding
 architecture*



Plan size is...
...influential on pattern and shape



Plan Size

The size of the specified units and the order in which they are laid have a significant impact on the look and feel of a space. Long, clean, straight lines can help to mirror surrounding architecture while different laying patterns can help to break up large areas. Mixing different plan sizes across the same area creates a more relaxed feel by dissipating the regimented dimensions dictated by surrounding buildings.





St. Catherine's Academy

Plan Size



Completed in 2012, Bolton St Catherine's Academy, Britain's first 'super-school', offers state of the art learning facilities for children and young people aged three to 19, and an inspirational place of learning for students with special educational needs.

Challenge

Awarded the contract to build the 16,800m², £35 million academy, Kier Education was faced with the challenge of choosing materials which would complement the design of the building whilst also being cost-effective.

The aim of the project was to meet the needs of students and teachers, primarily providing a safe and functional exterior to the building. Hardwearing, anti-slip/skid and design-led products were therefore essential to the specification.

The modern exterior to the building represents the state-of-the-art facilities which students and teachers can expect inside. It was important that modern designs were reflected in the outside environment whilst considering the changing needs of students and teachers.



Solution

Launched in 2011, Marshalls Metrolinia block paving is the perfect product for public spaces. The innovative product can be used to enhance modern architecture and urban landscapes and offers excellent slip/skid performance and high levels of durability.

Kier and landscape architect Planit used this product to create long contemporary lines to match seamlessly with the modern exterior of the building. This was achieved using Metrolinia flat top sets in the striking colours City Charcoal and City Silver Grey.

Safety measures are vital in any public place, but none more so than a school environment where the safety of students is paramount. A range of Marshalls Street Furniture products were selected to feature in the project for their robust properties including a Venus Cycle Shelter and R10 Hoops, Bollards – RS001, Fold Down Bollards-R10 Keyop and Heavy Duty Bollards–RT R8.

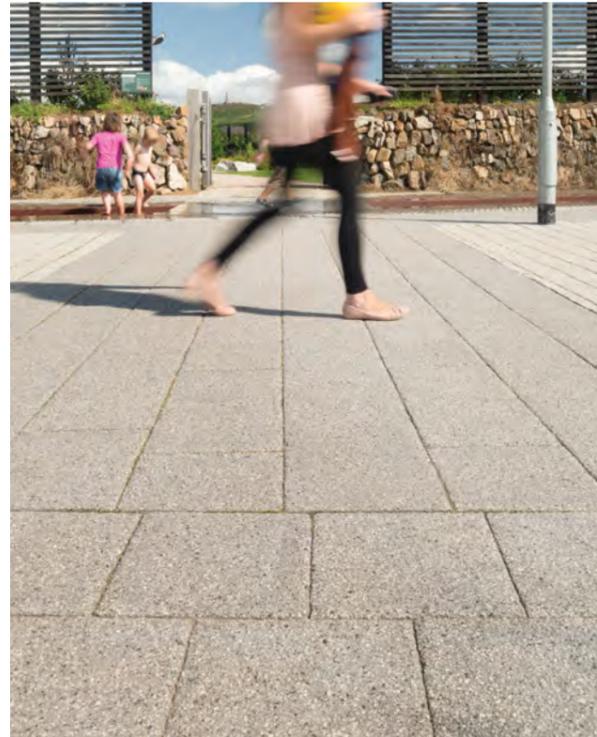
Marshalls worked with all relevant parties to establish the palette of materials to meet the specifications and allocated budgets.

Benefit

The colours and pattern complement the exterior of the building allowing a modern theme to flow from the exterior to the interior of the academy. Metrolinia is a durable and robust product which performs the necessary technical and functional needs required to ensure a safe and sophisticated environment for both students and teachers.

Andrew Bruce, Design Manager at Kier, commented that the varied product portfolio which Marshalls had to offer and the willingness it had to collaborate gave Kier the opportunity to provide the client with products which achieved the functionality, aesthetics and quality required within budget.





Texture can affect...
...the appreciation of colour and form

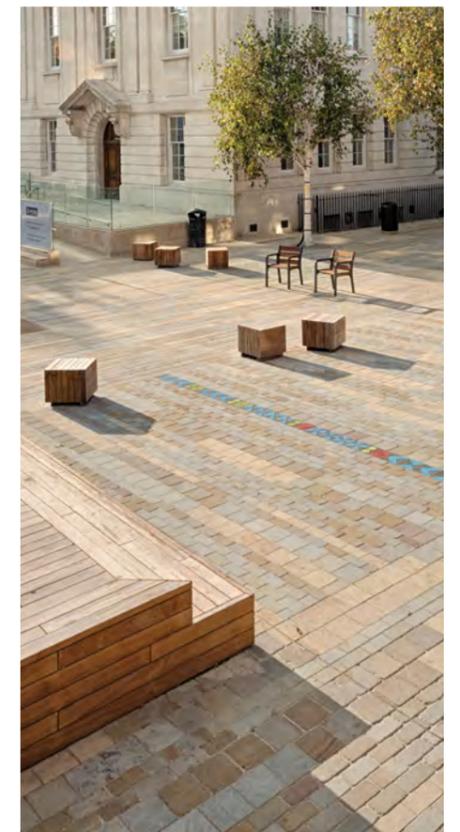
Texture provides...
...a uniquely tactile appreciation of paving



Textures change...
...as the light changes



Texture can be...
...an alert to function or purely a decorative effect



Texture

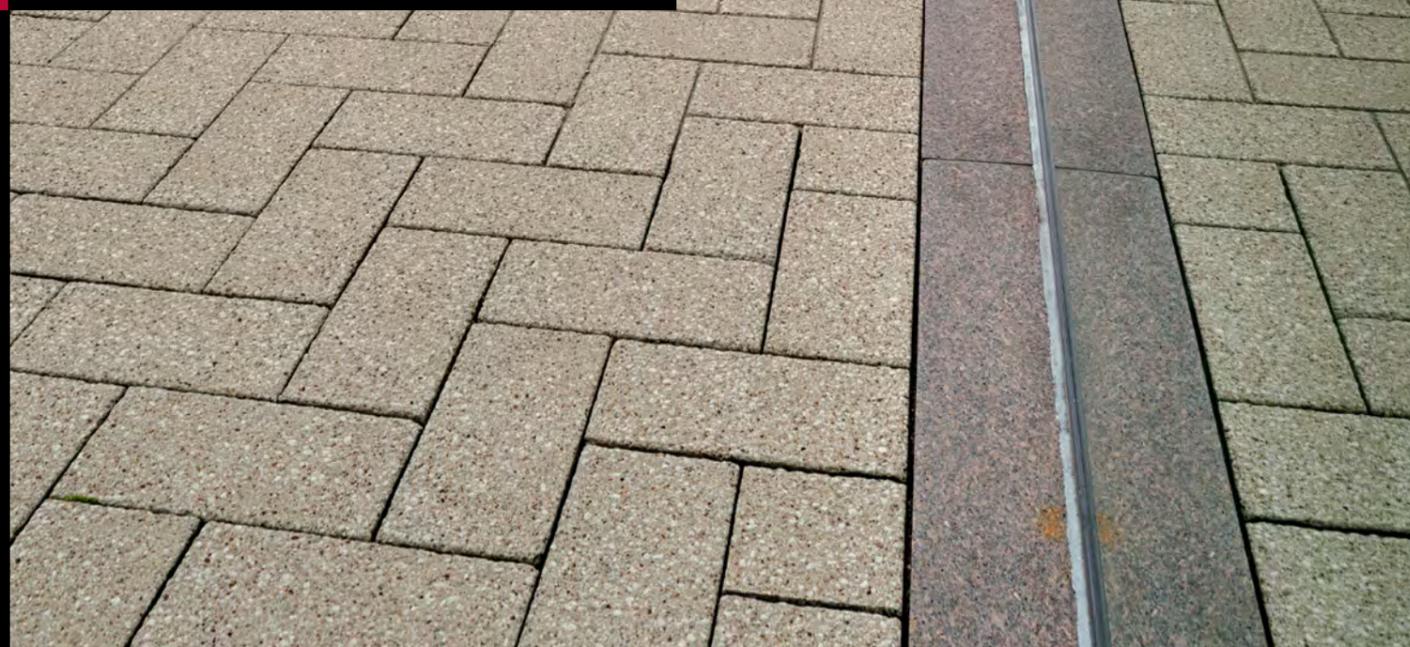
The finish of the paved surface can lend a specific feel to a space. Undulating riven surfaces complement traditional rustic aesthetics, whereas smooth ground (or even polished) pavements are the perfect finish to uber-contemporary, modern spaces. In between those, a variety of different types of texture can provide the designer with a subtle suite of tactile indicators.





Canary Wharf

Texture



Canary Wharf is a 97-acre estate with about 15 million sq ft of offices and retail located in London's Docklands.

Around 105,000 people work in Canary Wharf and it is home to the world or European headquarters of numerous major global banks, professional services firms and media organisations including Barclays, Citigroup, Credit Suisse, HSBC and JPMorgan.

Canary Wharf Group is looking to double the size of the east London financial hub of the same name by 2021, soaking up capacity for an extra 100,000 passengers a day from Crossrail and undertaking demand-led developments.

Challenge

In 1985, architects SOM began work on a master plan for the area, which called for transforming a derelict industrial area into a thriving financial district.

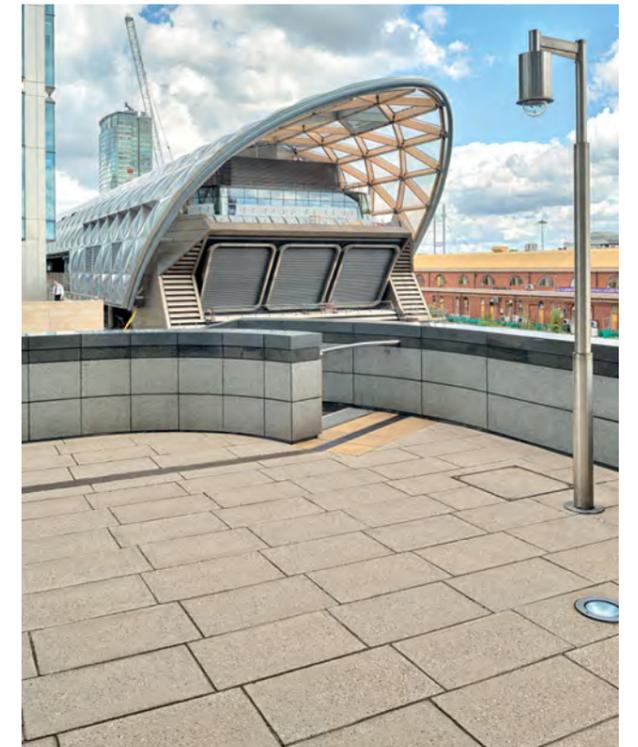
The master plan established a clear urban framework of streets, public squares, and green space. SOM worked with local artists and landscape architects to create memorable and functional gardens, plazas, fountains, shopping arcades, and waterfront promenades. It also enhanced tree-lined boulevards with designated areas for VIP drop-offs, taxis, and bus stops. To establish aesthetic continuity, SOM proposed that design elements such as cornice lines, stone bases, and street furniture be consistent throughout the site.

The aim was to create a brand new financial district for London which would attract some of the world's most prestigious companies to house their European HQs there. As well as an ultra modern and high-end look and feel this area would need an infrastructure to cope with the thousands of people travelling to and from the district every single day, and enough facilities (shops etc) and open spaces to cope with the needs of these workers.

Solution

The clients were seeking a product which would match the aesthetics of the surrounding buildings as well as the look and feel of the site as a whole. The product was also required to be highly durable to cope with the high levels of footfall.

It was also important to the client to find a supplier that could guarantee the supply of the large quantities needed of the product, as well as a supplier who would be able to supply the product well into the future with planned expansion of the site and the wish to retain continuity in look and feel. In 1986 Marshalls won the tender for all of the concrete paving for the entire Canary Wharf site.



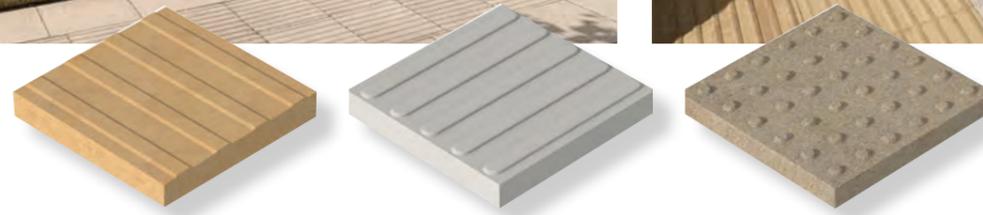
Marshalls Charnwood paving was chosen in a bespoke size which was specially created for the site. This product combines a modern look and feel with high performance. Marshalls continues to supply Canary Wharf with this bespoke product.

Benefit

Canary Wharf has become a leading global financial district with BALI award winning public realm giving the over 100,000 workers located at the site the space needed to move freely around the site as well as areas for rest and relaxation.

Marshalls has been supplying its bespoke Charnwood paving to the district for nearly 30 years. In 2014, Marshalls is supplying this product as part of the ambitious plans to double the size of the area by 2021 including the construction of the largest Crossrail station in London. Marshalls looks forward to working with Canary Wharf Group well into the future.



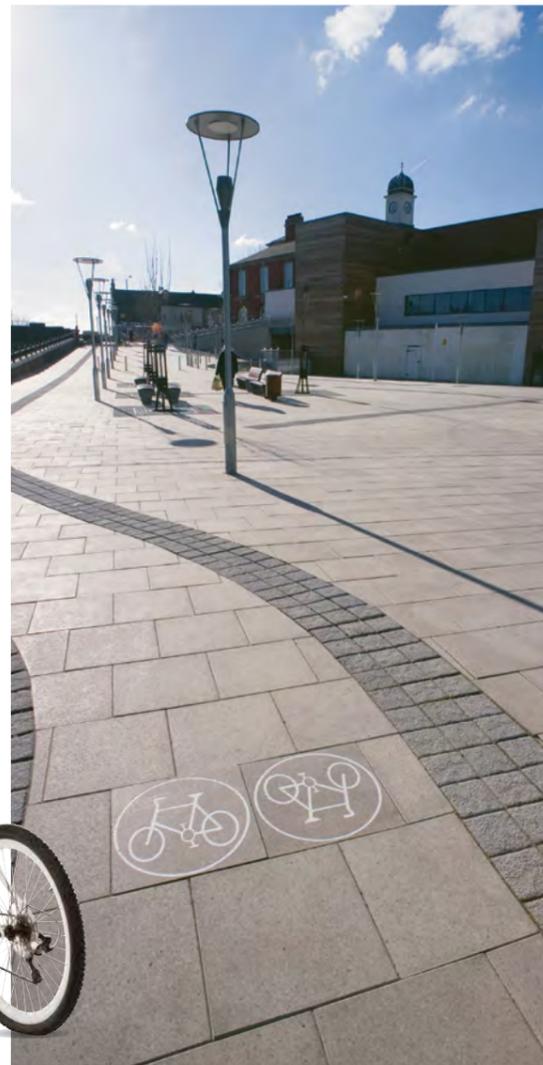


Paving uses...

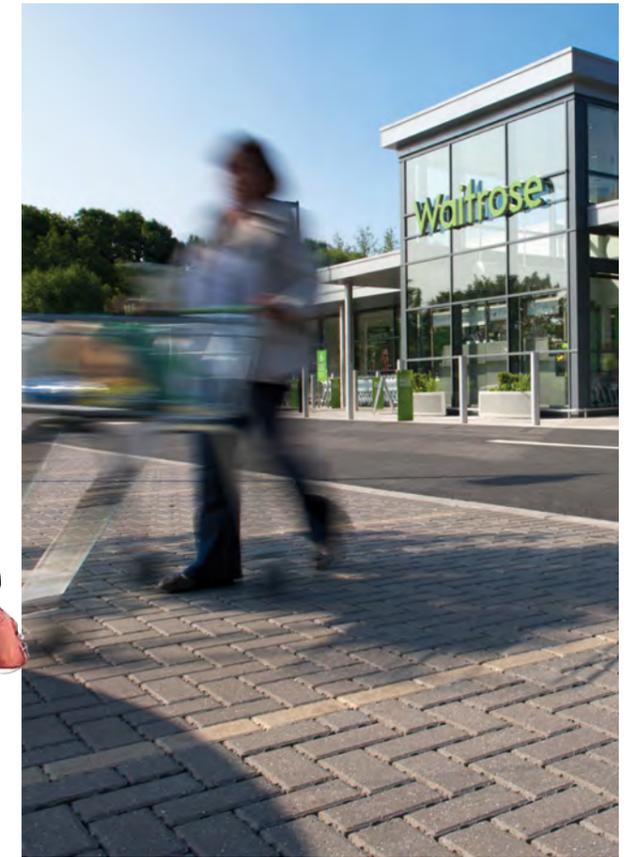
...colour and texture to signpost function

Function

Paved areas can do so much more than just look great. Using contrasting colours helps to delineate specific areas, making it easier for users to make their way around the space safely and efficiently. Specially shaped tactile units provide essential guidance for disabled pavement users. Signage can be inferred by using coloured units, or even inlaid into individual units, to avoid cluttering the space with vertical signage.

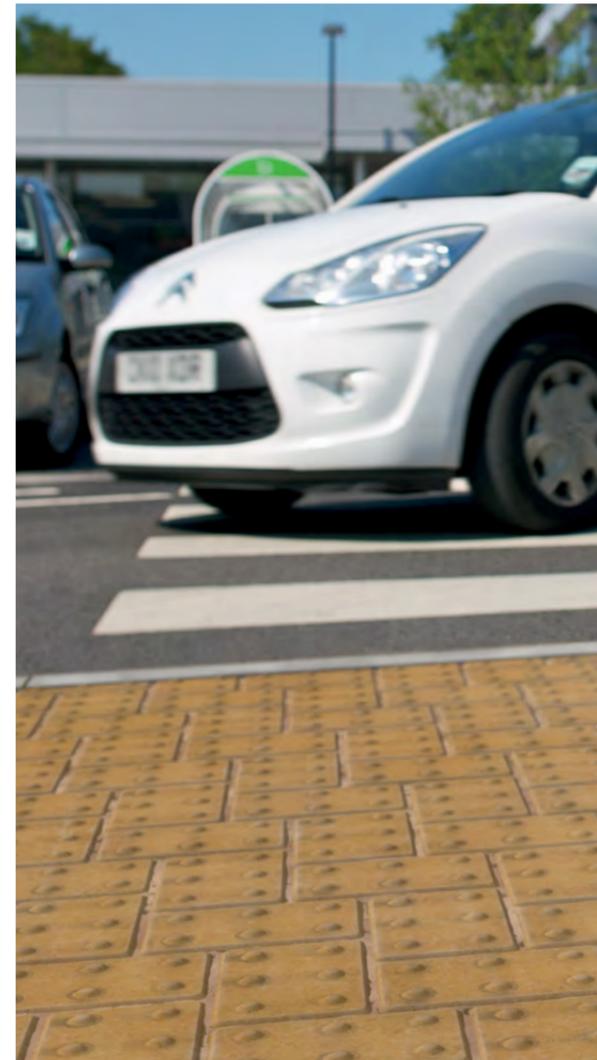


Paving can...
...warn or deter



Paving can...
...be permeable and aid sustainability

*nb - See the Marshalls Permeable Paving Design Guide for information regarding Piora Permeable Paving



Paving designs...
...can be informative





Exhibition Road Function

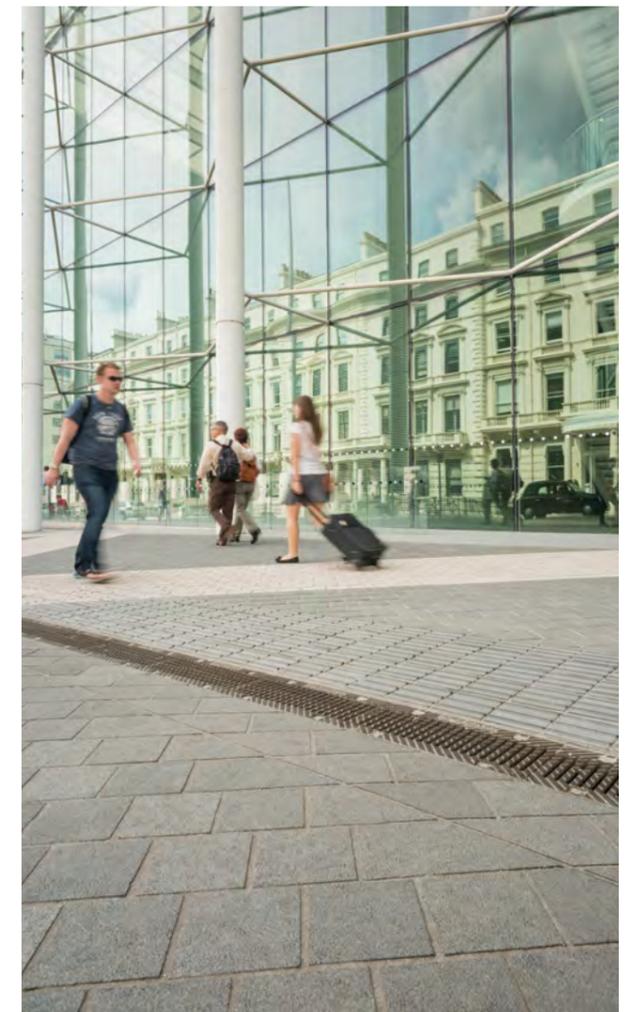
The RIBA Award winning £28million redevelopment of Exhibition Road has transformed one of London's most visited streets into one of the most accessible cultural destinations in the world.

It is one of London's most high profile streets, being home to leading cultural and academic institutions such as the Natural History Museum and Imperial College, but over time had become inefficient, being dominated by traffic with narrow, crowded pavements and street clutter, and was unable to handle the millions of people who visit every year. A complete redesign was needed to improve infrastructure and access to facilities.

Architects Dixon Jones' vision was a complete overhaul of the street, creating a 'shared space', which means that pedestrians and vehicles co-exist without one being the dominant force. This is created by the removal of kerbs, pavements and other obstructions, this encourages motorists to slow down and engage with the pedestrians creating a safer and more secure environment for all.

Marshalls supplied a range of key physical features of the redevelopment; natural stone, bespoke street lighting, drainage solutions and street furniture.

22,000m² of Yorkstone paving and Granite setts banded in black and pink, which create the diagrid crisscross paving pattern giving the street its unique visual identity.



The street's drainage solutions are provided by two continuous linear drainage channels, and include bespoke cast iron tops.

Woodhouse, part of the Marshalls PLC group, provided a new multi-function street lighting concept; 28 bespoke lighting masts which define the centre of the carriageway. Woodhouse also supplied coordinated Geo benches and litter bins.

The finished result makes Exhibition Road one of the most striking thoroughfares in London. The paving's diamond shape pattern naturally leads users across the street from one famous cultural centre to another.

The clutter free environment feels calm, and allows crowds to flow more freely over the paving allowing for easy passage from South Kensington tube station to the museums which line the famous road.

Mayor of London, Boris Johnson, said: *'This clever approach to rearranging the streetscape at the heart of one of the most important cultural and academic corners on the planet will heighten the whole experience for visitors. In particular it will make it much easier and even more pleasurable for families visiting these unique attractions with space to wander unhindered in an area that puts people first.'*

Councillor Sir Merrick Cockell, leader of the Royal Borough of Kensington and Chelsea, said: *'We now have a unique streetscape that will delight our many millions of visitors and which sets a new standard for urban design.'*

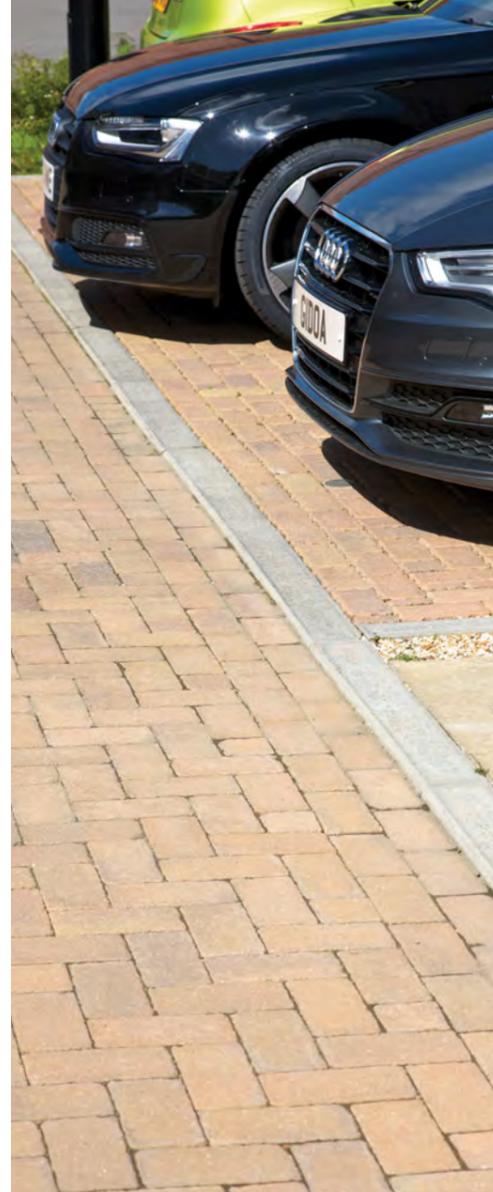


Installation Developments

Marshalls approach has always been to ensure that the materials, the structural integrity and the construction of its products are sound and beyond current British Standard specification.

To that end it has commissioned independent research and experimentation to establish an optimum sub-base composition for all possible paving and road construction circumstances.



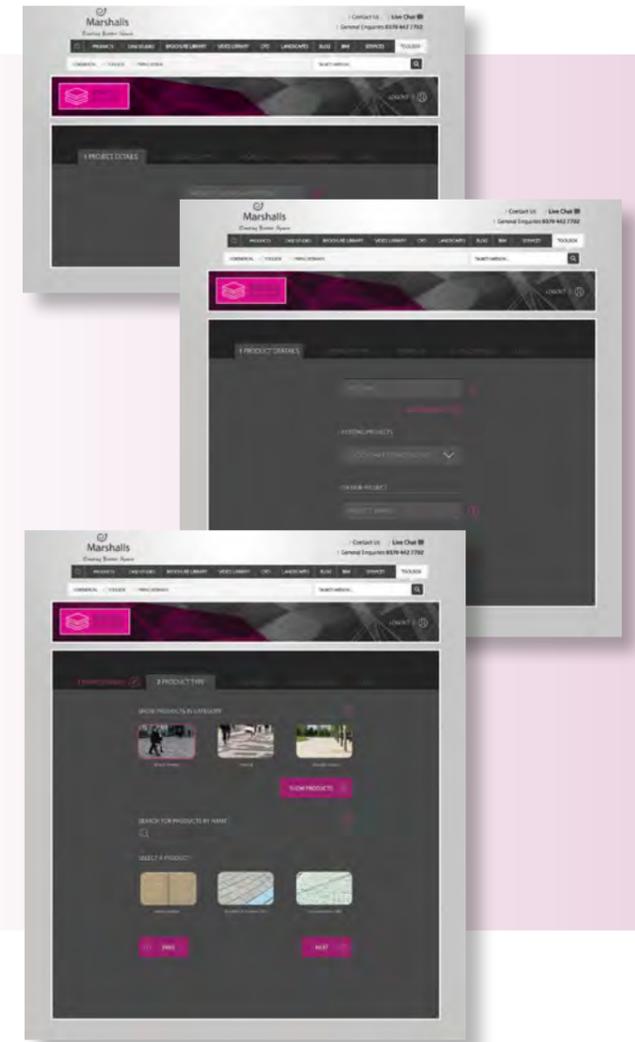


To make the correct sub-base specification as easy as possible, Marshalls has created its own brand new Paving Design Tool. By entering a few site details along with your chosen Marshalls surfacing product, you will be issued with a specific design which can be output as a 2-page pdf document. This document outlines the sub-base build up and the specification of all materials required – including the selected Marshalls surfacing product.

Visit the Marshalls Commercial Website and create (or login to) your personal Marshalls Toolbox. Alternatively, enter www.marshalls.co.uk/pavingdesigntool into your search engine.

USING THE TOOL IS SIMPLE:

- 01 **Select the type of surface**
Choose from Blocks, Paving or Natural Stone
- 02 **Select the product you require**
From the expansive Marshalls range (nb – if using a range of different sized units, select the largest size at this stage)
- 03 **Select the maximum loading requirement your site will be subjected to**
From 11 loading categories
- 04 **Indicate the CBR of your site**
From 1% to >5% - and also whether you wish to use Marshalls MG15 Grid



Marshalls New Paving Designs



John Knapton

In order to keep a paved surface safe and looking great for years to come, what goes beneath the pavement must be considered just as carefully as the paving itself.

Working with Professor John Knapton, the UK's pre-eminent structural engineer, Marshalls spent nearly 2 years re-evaluating the accepted methodology for calculating sub-base designs for all of its paving products. Using a combination of Finite Element Analysis, desktop studies and years of field-based experience, it has created a suite of brand new sub-base designs which eclipse those offered by the British Standard 7533 series.

In many circumstances, Marshalls new designs provide shallower, more cost effective solutions than the BS. However, in some circumstances, the new designs provide a deeper construction, providing additional security for long-lasting performance with minimal maintenance.

Marshalls New Paving Design Tool



The correct CBR value and loading requirements are essential to creating a functional paving design. Assuming that these details are correct and that the pavement is installed by professional installers, exactly as per the design and using the exact materials indicated, Marshalls is confident that the pavement will function for a design life of 25 years. However, the design output created by the Marshalls Paving Design Tool should be considered only a suggestion until it has been discussed with (and signed off by) a member of the Marshalls Design Team or your local Marshalls paving engineer, who will also be able to discuss the Marshalls Design Warranty.

If you have any queries whatsoever, please contact a member of the Marshalls Design Team or your local Marshalls paving engineer.

Rigid or Flexible construction?

Rigid sub-bases utilise a mortar laying course and a solid "roadbase" layer to provide maximum strength. Flexible sub-bases use an unbound sand laying course, which results in a less expensive system.

To minimise costs, the Marshalls Paving Design Tool is designed to automatically recommend a flexible construction wherever possible. However, should you wish to use a rigid installation instead, please contact a member of the Marshalls Design Team or your local Marshalls paving engineer.

How do I determine the CBR?

The CBR (California Bearing Ratio) is a penetration test to ascertain how easy it is to penetrate the subgrade - in essence, an indication of how "stable" the ground is. It is measured in percentages, with 1% being very loose, poor ground and anything greater than 5% being considered reasonable ground on which to build.

It is essential that a CBR test is carried out and that the correct value is entered into the tool. Incorrect data is likely to result in an under-specified pavement, which will result in surface rutting or product failures.

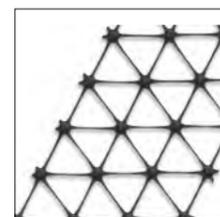
How do I determine the Loading Requirement?

In order for the surface to perform for years to come, it is vital to consider what kind of loading the area will be subjected to during its lifetime. Modern multi-functional spaces are frequently exposed to a wide variety of loadings ranging, for example, from pedestrian foot traffic right up to fully laden bin wagons.

Marshalls new design method now recognises 11 different loading categories, meaning that your design will be even more prescriptive than ever before and is less likely to be over-engineered. Simply select the category which represents the heaviest loading your project is likely to be subjected to.

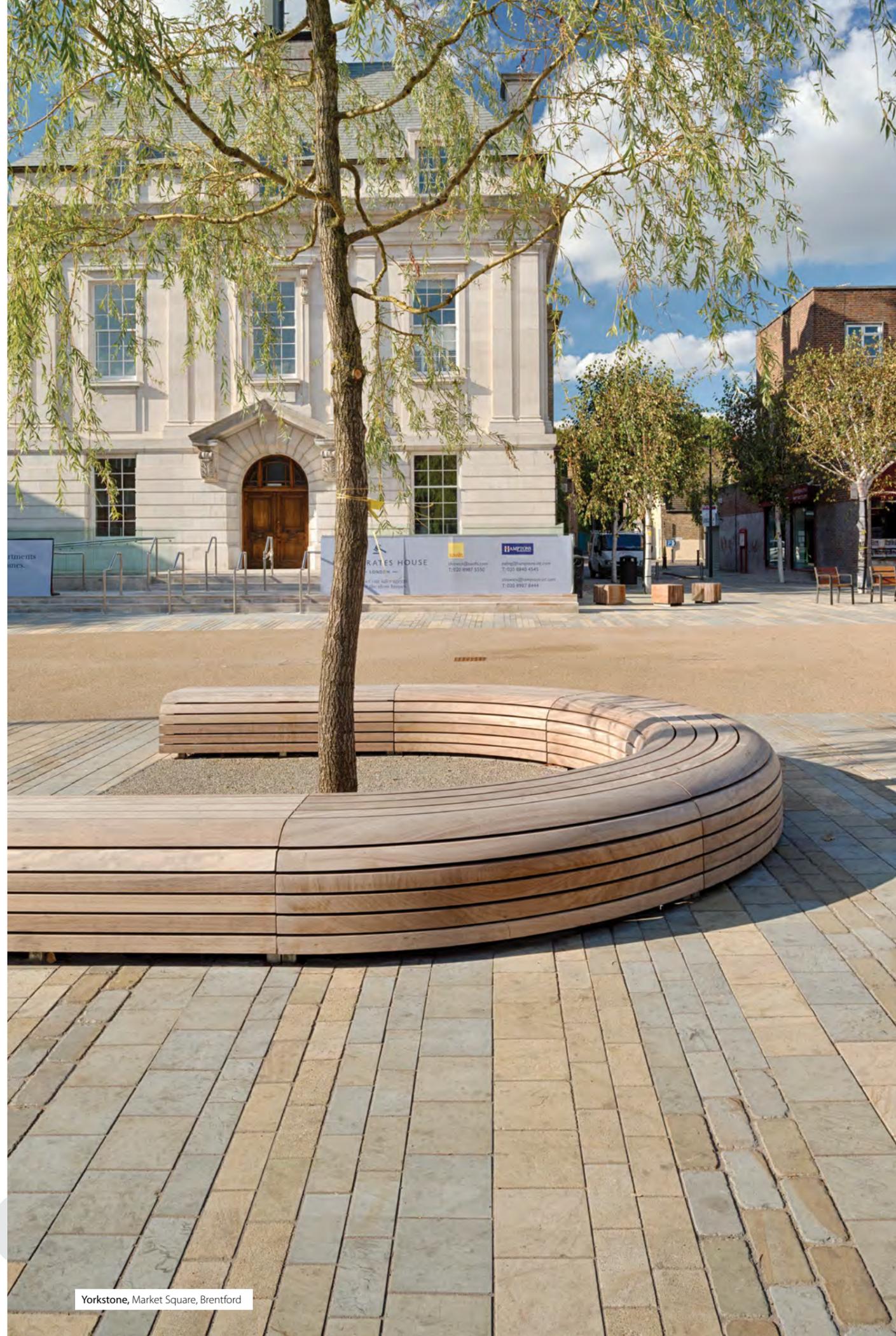
 CAT 1 Pedestrian and Domestic Driveways	 CAT 2 Car and Light Vans	 CAT 3 Traffic upto 7.5 tonnes
 CAT 4 Emergency Large Goods Vehicles only (100 standard axles cumulative)	 CAT 5 One Large Goods Vehicle per week (0.015 msa)	 CAT 6 Ten Large Goods Vehicles per week (0.15 msa)
 CAT 7 100 Large Goods Vehicles per week	 CAT 8 1.5 to 4 msa	 CAT 9 4 to 8 msa
 CAT 10 1000 Large Goods Vehicles per week (8-12 msa)	 CAT 11 Heavy Duty Pavements for Ports and similar industries	

FAQs



Should I use Marshalls MG15 Grid?

Marshalls MG15 Grid is a plastic mesh of triangular apertures which is laid right at the bottom of a pavement construction, directly on top of the subgrade. Quite simply, MG15 Grid improves the CBR of a subgrade by 1%. Where the CBR is 4% or lower, this will result in a shallower pavement construction and can therefore lead to reduced costs.



Yorkstone, Market Square, Brentford



Marshall's

Creating Better Spaces

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