

Design in transport infrastructure

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Project reports

Crossrail station, Paddington
Salerno Maritime Terminal, Italy
Dundee Railway Station

Comment

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Design in transport infrastructure supplement

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From the Editor



Achieving excellence in transport infrastructure design is more crucial than ever, as we continue to require increasingly sophisticated facilities to handle ever greater numbers of people on the move.

Growing usage demands that the associated buildings and infrastructure have to be able to handle complex passenger flows, meet today's customer expectations and, in an uncertain world, address safety and security concerns.

In our Design in Transport Infrastructure supplement we present in-depth articles on three major projects which deliver practical solutions with great aesthetic flair.

A feature on Italy's Salerno Maritime Centre by Stephen Cousins takes a close look at the striking cruise ship terminal building that is the swan song of world-famous architect Dame Zaha Hadid.

Turning to London, we explore how the forthcoming Crossrail station at Paddington meets the challenge of designing a modern metro rail building that both integrates with and enhances Brunel's iconic 19th century terminus building.

In Scotland the spotlight is on Dundee station, soon to be the new gateway to a revitalised city and waterfront, and the UK's first significant example of a combined railway station and hotel for around 100 years.

And in a fascinating comment piece, Rachel Skinner of WSP | Parson Brinckerhoff examines how the arrival of driverless autonomous vehicles might change the shape of our public realms, while Arup's Nille Juul-Sorenson argues the case for designing out the worst nightmares of the working commute.

Elsewhere, experts offer practical advice and research on fencing, entrance systems, exterior lighting, high security glass and washroom facilities for the transport sector.

We're confident you'll find the supplement a stimulating read.

Ray Philpott



On the cover...

The oyster-shaped profile of Salerno Maritime Terminal is a striking sculptural presence on the Amalfi Coast, made all the more significant because it is the late Dame Zaha Hadid's swan song.

© Helene Binet

For more information, see page 17.

COMPETITION WINNER



Broadway Malyan wins first US job to design Miami cruise terminal

Broadway Malyan has been appointed by Royal Caribbean Cruises to design its new \$100m cruise terminal in Miami, which is the firm's first North American project.

The proposed scheme will not only provide a "gateway to Miami" but will also see the creation of a "new icon on the waterfront" which will serve the world's largest cruise ships.

The Terminal has been nicknamed the Crown of Miami because of its shape which evokes the points of a crown when viewed from the water. From the eastern or western approaches the building presents the shape of the 'M' of Miami, and when viewing the terminal side-on a sense of waves rising or ships passing is revealed.

Ian Simpson, director at Broadway Malyan, said: "Our aim was to create an iconic destination and arrival experience for passengers, which provides a great experience from kerbside to ship in an innovative and modern cruise terminal.

"The terminal extends along the waterfront to maximise views of the ships when docked, and the sides of the building have been angled to reflect the water and provide the terminal's unique shape which echoes the Royal Caribbean brand.

"We have worked very closely with Royal Caribbean to develop a design that both has the 'wow' factor and will operate efficiently as an innovative cruise terminal."

The proposals centre on making the most of the arrivals experience. The building profile has been designed to provide a dynamic addition to the port and clear views are prioritised via the inclusion of deliberate void space to ensure that

passengers have the impact of seeing their cruise ship as soon as they approach the terminal.

Simpson comments on the importance for the practice of winning its first North American commission: "Winning this competition is a major coup for Broadway Malyan and it represents a fantastic opportunity for us to expand into a new region of the world."

The design incorporates a number of sustainability focused enhancements to reduce its environmental impact including rainwater collection and recycling so that it can be used for cooling, toilet flushing and irrigation.

The design and materials have been chosen with efficiency and cost in mind. Using a simple prefabricated frame, prefabricated flooring panels, and a repetitive system, the core of the building can be constructed quickly. Steel beams will form the shape of the building's profile and the roof will be clad with waterproof aluminium.

The main glazing wall faces north to maximise views and energy efficiency. The south side of the scheme forms a car park with 1,000 spaces, loading bays, and passenger drop offs (including taxi and bus stops) at every level to keep traffic moving. Aluminium fins and spacing enable ventilation for the parking levels and M&E spaces below and the car park forms a buffer between the terminal building and the noise and views of the shipping port next to the site.

Subject to planning approval, the terminal construction will begin in Q1 of 2017.

NEW STATION

Moxon designs Barking Riverside station

Barking Riverside terminus for east London's new suburb has been designed by Moxon Architects for Transport for London (TfL).

The new station, which is due for completion in 2021, will extend the Gospel Oak to Barking line, playing a vital role in connecting the development to the capital, and its wider transport network. The project has received support from the Mayor of London for work to proceed.

The station will sit at the end of a 1.6 km viaduct connecting to the existing Tilbury Line, to permit London Overground services to be extended from Barking Station to the Barking Riverside development.

Moxon commented: "The human scaled design for this prominent piece of transport infrastructure has been envisaged as a series of stainless steel panels that transition from solid to perforated, designed to accentuate the



deceleration of approaching trains." All of the station's operational facilities will be accommodated within the footprint of the viaduct, and, the facade cladding is proposed to "extend seamlessly to platform level to provide a protective environmental barrier," the firm said.

The station design features a prominent open entrance space, with ticketing and information points all located at ground level. A central concourse guides customers via large stairways and lifts to the raised platform

level on top of the viaduct. In addition to the terminus, the design includes a secure bike storage facility and shops facing onto newly created areas of public realm surrounding the station.

With planning permission for almost 11,000 new homes, as well as new schools and associated local community infrastructure, Barking Riverside is currently the largest housing development site in east London, and a cornerstone of the GLA's London Riverside Opportunity Area.

Heathrow shortlists four architects to produce final design concepts

Heathrow airport has revealed the shortlist of four leading UK architectural practices who will bid to provide the final design concept for the airport's expansion, which includes Grimshaw, Zaha Hadid, HOK and Benoy, as well as conceptual images of their designs.

With the Government due to make its long-awaited decision on whether Heathrow or Gatwick will be the recipient of a new runway as the UK's main hub airport this summer, Heathrow asked the practices to come up with visions of a "sustainable" airport for the future.

In a statement Heathrow airport commented: "We challenged the architects to push the boundary of what an airport could and should be. They were asked to come up with bold



© HOK Courtesy of Heathrow Airports Limited

ideas to create a world-class sustainable airport that would deliver innovations in passenger service, integrate local communities and showcase the best of British design." Affordability and flexibility were also key to the brief, "to ensure that Heathrow remained adapt-

able in the fast-paced world of global aviation," the airport commented.

The architects will be asked to further refine their briefs in the next phase of the tender process before a final concept designer is selected.

(Concept design pictured: HOK)

news bytes

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appoints...
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Murphy Crossrail work
offers testbed...
Ref: 71386

WSP | Parsons Brinckerhoff wins £36m Sussex council infrastructure framework

Professional services consultancy WSP | Parsons Brinckerhoff has been appointed by West Sussex County Council for its six-year, £36m Professional Services Framework.

WSP | Parsons Brinckerhoff will provide design and development services for West Sussex County Council. The framework will cover highways, transport and environmental services.

The primary aim is to support the delivery of major schemes in West Sussex. WSP Parsons Brinckerhoff will develop schemes, secure funding and deliver infrastructure to support the County Council's strategic economic plan.

The contract is with West Sussex County Council, but there is a provision for neighbouring local authorities, including Surrey, East Sussex, Kent, Hampshire, Brighton & Hove, and Medway Councils, to also use it.

WSP | Parsons Brinckerhoff will deliver the contract from its Basingstoke, Godalming and Southampton offices.

Project director for WSP | Parsons Brinckerhoff Peter Day commented: "Local government is a key target for our transportation business and this contract enables us to continue our excellent working relationship with West Sussex County Council. It also provides a significant platform to grow our transport, highways and environmental teams in the South East as we deliver for the council."

AIRPORT EXPANSION

Government approves City Airport expansion project



The UK Government has approved the £344m expansion of London City Airport, a project which was opposed by former London Mayor Boris Johnson.

The expansion will add a new air new aircraft taxiway, enabling more modern, larger aircraft to operate and expanding the range of connections between London and mainland Europe. It will also see the construction of new aircraft parking spaces, and add to existing terminal capacity. The project will increase the number of take-offs and landings at the airport from 70,000 a year to 111,000.

New Chancellor of the Exchequer Philip Hammond welcomed the scheme, saying that it would "make it easier to visit and do business in the City of London, help drive forward our economy and further strengthen the city's status as the world's leading financial centre."

Ex-Mayor Johnson had previously raised objection to the purchase of land needed for the expansion, however his successor Sadiq Khan gave approval to the project in his second week in office. The Government announced its decision even though Parliament had already risen for its summer recess.



Driverless cars will drive positive changes in the urban landscape

Autonomous vehicles and driverless cars are definitely coming our way, but what impact will they have on way we design public spaces? Rachel Skinner of WSP | Parsons Brinckerhoff argues that they will have a positive effect.

‘There is enormous potential for architects and planners to create a new generation of living streets and communities, designed for vehicles’

Rachel Skinner, development director at WSP | Parsons Brinckerhoff



Autonomous vehicles will be transformational. They have the potential to support a better quality of life, economic growth, health, safety and social connections.

They offer convenient and affordable mobility to all of us, regardless of where we live, our age or ability to drive. They could also help to improve the way that our existing places and routes work, while offering new potential for more valuable land, and additional homes and jobs.

WSP | Parsons Brinckerhoff and architects Farrells teamed up to produce a report on how connected and autonomous vehicles (AVs) will help to “make better places”. To do this we created future visions of what the UK might look like in an autonomous vehicle world, from the city centre, to motorways and suburbs to the market town. What we found was that the transition has already begun. So these visions put aside, quite intentionally, futuristic townscape designs, and to a degree, resemble existing and familiar places.

We concluded that there is enormous potential for architects and planners to create a new generation of living streets and communities, designed for vehicles, but putting people first.

It’s important to recognise neither driverless cars nor AVs will require significant on-street infrastructure investment before they can be used. Inbuilt technology will allow AVs to navigate on all types of roadway while taking account of other users including pedestrians and cyclists.

That said we have the opportunity to adapt our public realms and roads to maximise the benefits offered by AVs over time.

Most of these changes will be long-term and evolutionary, accruing more benefit as a larger proportion of vehicles become equipped to operate in a driverless and then autonomous environment.

Designing out parking spaces

For example, a new development designated as a dedicated zone for shared AV use, which means the cars would not be owned privately but rented for journeys from a supplier, could offer between 15 and 20 per cent additional developable area compared with a typical central urban layout. This is primarily due to the removal of almost all parking spaces (due to renting not owning cars), but also because road space simplification will save space.

AVs would move seamlessly between ‘booked’ journeys or would return to a designated hub for storage, charging and maintenance until they are next needed. Available data confirms that central London has a parking coverage of around 16 per cent and a total of around 6.8 million parking spaces, on and off street. Assuming a typical average parking bay size, this means that around 8,000 hectares of central London is used for parking.

General figures of 15-30 per cent parking coverage are typical of New York, Paris, Vienna, Boston and Hong Kong. Designing out the majority of parking spaces from a new AV zone would create at least 15 per cent additional land area (at ground level) for more valuable uses, compared with our existing urban centres. Depending on scale, this could create the potential for thousands of additional homes and jobs, as well as extra land for quality green and open spaces.

It could also reduce costs as the same developable area could be achieved with a more efficient use of ground level space (and perhaps above or below as well, depending on the situation).

Some newer city centre developments are already planned and delivered without car parking, usually where they are near to a station offering fast, frequent public transport services. AV zones would allow this strategy to be delivered equitably across far larger development areas, giving everyone a high-quality transport solution at their front door.

Putting people first

One of the key changes that will make an AV zone significantly safer than today’s urban areas is that AVs will put people at the top of the user hierarchy, rather than vehicles. This offers many of the benefits of a pedestrianised area without the need to compromise on accessibility.

This shift in urban design creates the opportunity to bring forward high quality, high density communities enhanced by open and green spaces. At the same time, the streets themselves become more functional and efficient thoroughfares.

Street clutter can also be virtually eliminated, as AVs will not need to gather information from the roadside. In a zone designed and built for AVs from the outset, direction signs, speed limit signs and traffic lights will no longer be required. Visibility splays can be reduced and intersections can be simplified.



© Weston Williamson

Making a grand entrance at Paddington

Integrating a major new Crossrail station into a world-famous London railway terminus brings great opportunities as well as significant challenges, as Ray Philpott discovers.

Trains on London's new Elizabeth Line will begin serving Paddington station in two years' time as the long-running Crossrail infrastructure project finally bears fruit.

However, Crossrail's Paddington station is no mere extension of Isambard Kingdom Brunel's iconic glass and wrought iron cathedral. An architectural entity in its own right, it also forms a dramatic new entrance to the old station and creates an exciting public realm, too.

The underground metro station cleverly integrates the old and the new to create a grand entrance and stronger presence on the western side of the Grade 1-listed, 1853-built original, reaching out into the locality in a way it hasn't before.

It is being built adjacent to the western boundary of the main station formed by a 300 m-long collection of Victorian terraced masonry buildings known as MacMillan House.

Going underground

Running parallel to MacMillan House are two streets on different levels. The lower, known as the Departures Road, provided access to the old, rather nondescript western entrance. Three metres higher and separated from it by a restored Brunel iron railing is bustling Eastbourne Terrace, with its buses, taxis and shops.

A 260 m-long, 26 m-deep box was dug out under the middle section of these two roads to house the station, which has seven levels.

At the bottom is the link to the Bakerloo tube line on level 7, the Elizabeth line platforms are on level 5 with the station concourse at level 4. Lifts and escalators link the concourse to the pedestrianised public space on level 2. The highest level is Eastbourne Terrace while services and 'back of house' facilities

‘The metro station cleverly integrates the old and the new to create a grand entrance and stronger presence on the western side of the Grade I listed, 1853 built original’

The light and airy station concourse (top), and (bottom) the platform level



are on levels 6 and 3 respectively with no public access.

A 90 m-long void has effectively been created by the circulation areas between levels and uniquely for a UK underground station, from Eastbourne Terrace the public can peer 14 m down into the concourse.

Access to the main station from both the concourse and public realm is through MacMillan House via the old Clock Arch and a new Crossrail Arch, with a taxi-rank located on the eastern side of the terminus.

Poised majestically above all of this is the 130 m long, 25 m wide steel and glass canopy that runs over the station.

Creating a great space

Architects Weston Williamson + Partners provided the architectural element of the design consortium comprising Scott Wilson (now AECOM) and urban realm specialists Gillespie, and from 2012 was the delivery architect for main contractor Costain Skanska working with WSP.

The practice was responsible for designing the terminus' modern 'canal side' entrance on the east side, opening in 2012.

"When we first got involved with the new station in October 2009 there was already an older design on the table but we thought we could look at it in a different way," explains founding partner Rob Naybour.

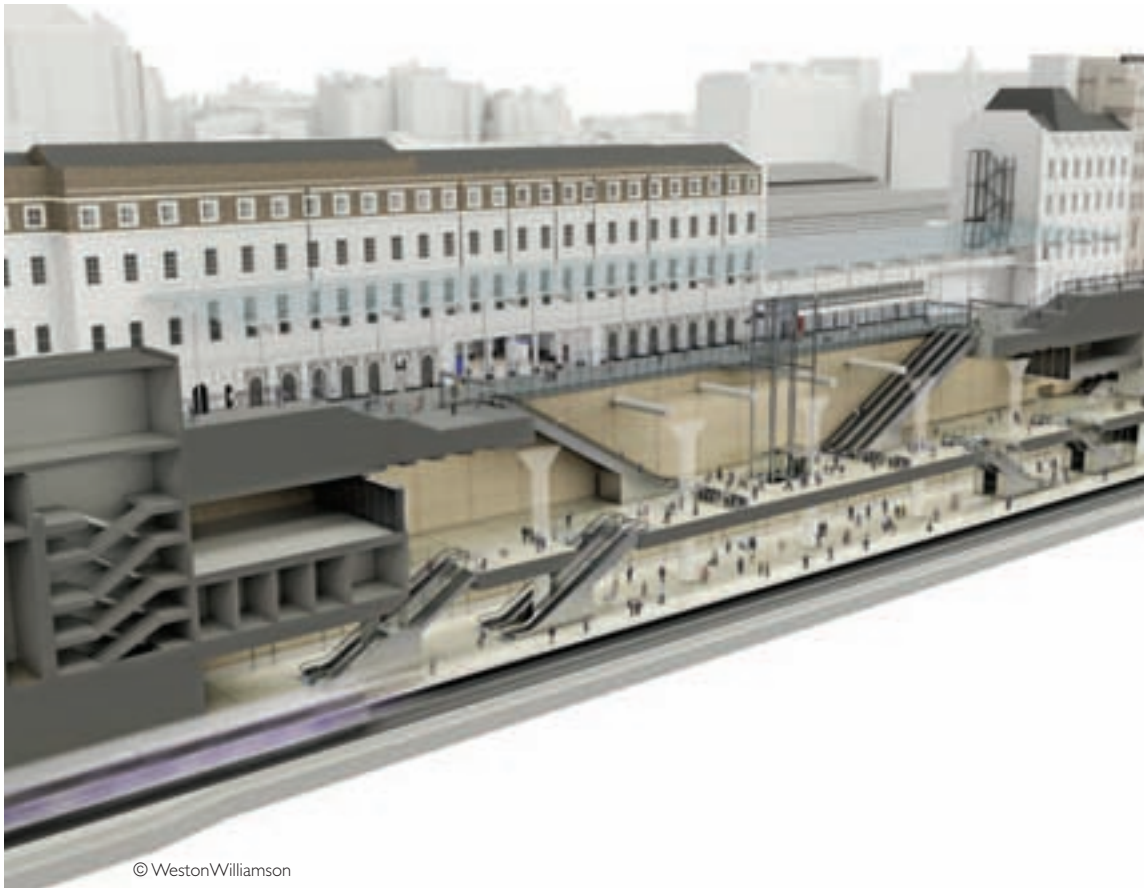


"There's no doubt the Brunel station is fantastic, but the original entrance on the western side was always weak, the station had no presence in the locality and was difficult to find."

Weston Williamson's idea was to make the Crossrail station very much part of the existing Grade 1 station while creating something distinctive, forming a grand entrance to both the new Elizabeth Line and the main station.

"I think we're giving this side of Paddington the entrance it deserves but has never had and creating a 'great space' that responds to Brunel's own great interior," says Naybour.

The new station is actually built on the same 10 ft grid the



'I think we're giving this side of Paddington the entrance it deserves but has never had and creating a great space that responds to Brunel's own great interior'

This illustration (left) shows the relationship between Macmillan House, the platform, concourse and public space levels

celebrated Victorian engineer used to construct the original. Make no mistake though, in the spirit of Brunel, this is an unashamedly modern building, very light and airy, with large openings to the fresh air.

Naybour says: "The architecture of the station is actually very simple, straightforward and elegant but has a sense of presence and drama because of its scale and the spatial interconnection with the various levels."

He adds: "The public space provides passenger circulation, links to buses and a sheltered space for people and makes the attractive buildings of MacMillan House accessible and part of the station instead of a piece of disconnected streetscape."

Clearly defined

The structure of the glass canopy, roughly covering the same area as half a football field, comprises a mixture of painted steel beams and mirrored stainless steel purlins supported by a series of painted steel columns along its length. Although larger spans could have been used as an alternative, the columns help define the space and keep everything to the right scale.

The canopy extends out from halfway up MacMillan House across public space and station concourse and projects over the

pavement on Eastbourne Terrace, clearly defining the station from the outside. Undoubtedly one of the most striking elements of the canopy is the gigantic cloudscape painted on it by New York artist Spencer Finch.

Naybour comments on the effectiveness of the artwork in the setting: "People will see the interplay between the cloud art and the outside weather, creating many different effects, and at night there will be another range of effects."

"Additionally, the shadows created by the cloud art make interesting patterns on the floor beneath and the highly reflective purlins work really well with the art, too."

The canopy has also been specifically designed and engineered to achieve maximum blast resistance, which was a

Crossrail Paddington fast facts

- Planning consent: 2011
- Length of station: 260 m
- Canopy is 25 m wide, 130 m long
- Depth from street to platforms: 22 m
- Main Paddington terminus built in 1853
- Elizabeth Line trains due in 2018
- 13 pairs of escalators installed

Looking down onto the
concourse from the public
space area



test for the design team. Naybour explains: “This is technologically challenging, so we worked with the engineers to meet stringent safety standards.”

They liaised closely with specialist Austrian glass manufacturer Wagner Biro, one of only a handful of companies in the world capable of providing the glass products needed. To ensure it worked, a small mock up of the engineered canopy design was built and fully blast-tested in Cumbria.

Despite the large amounts of glass involved, solar gain is not a problem as air freely circulates under the canopy thanks to the 8 m-high gap along the whole length of the street-facing side and is open to the air at each end.

In terms of sustainability, the station’s energy usage is actually relatively low, being an unheated space with all-LED lighting and natural light, although the carbon footprint of its construction is hefty. Despite this, Paddington is set to meet Crossrail’s target of achieving a BREEAM Very Good rating for the construction of all of its central stations.

Internal finishes and intuitive design

“Internally the finishes are based on a relatively restrained pallet of materials and colours,” says project architect Raffaella Rospo. “We selected simple, natural materials with a natural patina, brick, bronze, concrete, and we’ve let the engineering speak, with lots of exposed brick and concrete on show.”

All materials used are compliant with stringent Section 12 underground station fire regulations.

Flooring is in granite and terrazzo in light and dark colours, while solid granite blocks serve as seats and protect glass features from cleaning and maintenance vehicles.

The pillars on the platform and concourse are graced with real bronze cladding around the bottom of concrete support pillars and at the platform ends, reminiscent of bronze features in 1920s tube stations and the terminus.

Another notable decorative feature on the platforms and concourse are the elegant ‘lily pad’ lights, housed in circular, scooped recesses in concrete soffits.

Links between public levels are primarily via escalators. Five link the public space to the concourse and, from there, four equally spaced escalators connect to the platforms. A pair of mid-platform escalators link to the Bakerloo line platforms and a potential future link to the Circle Line is included.

Rospo says: “The whole essence of the station starts as you

step off the train. Natural light comes from the escalators and as you move up you’re in the concourse and then the public space. It’s so obvious and intuitive where you have to go, you don’t really need signs.”

Alternatively there are lifts in an eye-catching glass and steel tower at the heart of the facility. Rospo says: “It’s important to bring the lifts into the heart of the station because accessibility and mobility are crucial aspects of station design and should be a key part of the station experience.”

Tunnel vents in the urban realm

On the street in front of the station are two 40 m long buildings housing railway tunnel vents.

As Rospo points out: “Normally vents are hidden but as the new line is aligned with the street there was no nowhere to hide them. Although their positioning narrows the pedestrian thoroughfares, they’re relatively small compared to the canopy and don’t impact disproportionately on the streetscape.

“A key part of the design challenge was slotting them into the urban realm. After liaising with English Heritage we designed sculptural, relatively restrained architectural buildings.”

The design and palette echo the main station and features glass-reinforced concrete, stone, and grey and bronze-coloured anodised aluminium cladding.

Transforming Paddington

Concluding, Rob Naybour says: “This project is a team effort. Although we’re steering the design it’s important to work with the engineers and other disciplines to temper the vision by what’s feasible and can save money. For example, £40m has been saved by keeping the box construction and interface with the Grade 1 terminus to minimum.

“Ultimately, we’re all delivering a project that transforms Paddington’s transport facilities, improves the locality and creates a vibrant new public space.

“We look forward to seeing it put to good use.”

Project details

Client: Crossrail

Design architect: Weston Williamson + Partners

Design consultant: Scott Wilson (URS)

Urban realm design: Gillespie

Delivery architect: Weston Williamson + Partners

Main contractor: Costain Skanska (JV)

Project management and MEP: WSP

Structural and facade engineering: Ramboll UK

Main canopy glass and steel: Wagner Biro

Steelwork contractor: SAS

Doorways: Assa Abloy

Calming the commute

Nille Juul-Sorenson from Arup looks at how intelligent railway station design can help to make commuters' lives easier.

A recent European survey conducted by Ford has revealed that the most stressful part of a working day is likely to occur first thing in the morning. Forget meeting with the boss or delivering a presentation, many people find getting to work even more stressful than their jobs.

Longer commutes are the result of a rapidly growing urban population. But when you also factor in delays, congestion and the unpredictable British weather you have the ideal recipe for a fraught experience.

Although it's true that a number of these factors are out of our hands, for those traveling by rail many of the frustrations felt by commuters are the by-product of poor station design. The most significant factors can be, and are being, resolved through passenger-sensitive station design.

Claustrophobia

This highly stressful condition is believed to affect around 10 per cent of the UK population. Descending into confined spaces underground can cause feelings of claustrophobia, while artificial lighting can make navigating a metro network even tougher. When we design a house or an office building, daylight is a primary consideration, but this is rarely factored into the design of our transport systems.

Introducing a whole new lighting scheme would be a big step in making commuters' journeys more acceptable. New York City's Fulton Center, a subway station and shopping centre, and Copenhagen's Cityringen, provide prime examples of how this can be achieved. Both use a combination of skylights and reflective materials to direct sunlight into the stations below. In Copenhagen these systems enable natural light to permeate 20 m below ground level.



Ticket barriers

Even when you make it through the gates first time, the experience of moving through any ticketed area or barrier makes you acutely aware that you're transitioning to a different, monitored environment – which is stressful in itself.

In the near future, we'll see technology resolve this problem, with systems automatically registering and charging passengers as they board trains. This will reduce station congestion, and make for a passenger experience of smooth continuity from the station to the train.

Unintentional encounters

Whether it's spotting the least crowded carriage or avoiding a boisterous group on their way to a party, poor visibility can lead to commuters unintentionally entering uncomfortable situations.

Stations in Copenhagen's Cityringen have been designed to help commuters avoid such problems. Passengers descending escalators will be able to view the whole platform, enabling them to decide which carriage they'd like to be in, or whether to wait for the next train.

Wayfinding

Navigating through a station, even a well known one, can be confusing and stressful. Ironically, a barrage of signage

can actually exacerbate this, and is often unhelpful for foreign visitors. Station designers are waking up to the idea of using intuitive design to create stations that clearly channel passengers towards the platform using less aggressive techniques, such as lighting and block colours.

Rubbish and dirt

If people see rubbish, they are more likely to litter – crowd behaviour in action. One way that to avoid the accumulation of dirt is through introducing easy-to-clean materials into stations, or ones that disguise common sources of grime. During the planning stages for Copenhagen, the foods that people commonly consumed in the stations were studied. With hot dogs and chocolate milk being popular choices, a wall coating that could be easily be wiped clean of them was selected and specified.

According to the Office of Rail and Road, London's Waterloo station alone recorded almost 100 million entries and exits in the last year and this number is growing all the time. Major design changes to stations of this scale and investment in infrastructure on this level can be costly in both time and money, but, when we consider that over 1.3 billion people a year travel on London's underground alone, the widespread and long-term benefits of station improvements in urban regions across the nation are more than value for money.

Through intuition and careful consideration, drawing on inspiration from existing programmes across the globe, we can combat this day-to-day stress by redesigning our commute.

Nille Juul-Sorenson is global business leader for architecture at Arup

'Introducing a whole new lighting scheme would be a big step in making commuters' journeys more acceptable'

Nille Juul-Sorenson



An insider's guide to station fencing

With significant numbers of new railway stations planned and many others due for redevelopment or modernisation, Peter Jackson of Jacksons Fencing explains how gates and fences can enhance security.



Rail usage in Britain has increased to record levels over the past decade, highlighting the requirement for a renewed focus on physical security as part of railway station architecture.

Large crowds on platforms raise concerns about passenger safety and station operators need to segregate pedestrians from the track and also from walkways and roads running parallel to the platform.

Stringent perimeter security and access control measures should be adopted to prevent rail passengers or trespassers from taking any shortcuts to the main platform.

There are numerous factors to consider in the design and installation of new or replacement security fencing and gates in and around the UK's 2,550 railway stations. The primary requirements are to maintain the highest levels of passenger and staff safety and operational efficiency, from arrival at the station to boarding a train.

This dictates a wider requirement for fencing and gates to provide secure parking and bicycle storage facilities; ease the flow of passengers transiting through the station; and to enable rapid evacuation and access for emergency services in the event of a major incident. Other security considerations at stations include:

- protecting the station, its assets, car park and bicycle storage out of operating hours;
- securing and controlling access to a non-public area;
- preventing fare evasion, personal attack, vandalism, anti-social behaviour and attempted suicide;
- separating pedestrian and vehicular traffic;
- security and access to car parking;
- safety barriers to reduce the chance of crush, pushing pedestrians onto the rails;
- securing and controlling access to buildings and platforms.

Fencing can also help provide security solutions for the trackside and associated infrastructure. For example, by controlling access to pedestrian track crossings and preventing disruption due to theft, vandalism and accidents. It can also prevent unauthorised access by people and large animals; protect depots, signalling equipment, communications, power and fuel supplies; and mitigate unwanted noise.

The selection of an appropriate fencing system will depend on location, potential threats and impact if the site was compromised. The fabric of the fence, its mechanical fixings, posts and foundations all work in combination to establish the security performance of a fence. Equally, the factors which will reduce designed performance will include inadequate fixings, foundations and poor maintenance. The following are examples of some of the fence types available.

Vertical steel bar fencing

Vertical steel railing (known as vertical bar) fencing systems are typically constructed using round or square section hollow steel pales, running through hollow section steel rails in a welded design. They are less visually intimidating, inherently stronger and offer greater visibility and resistance to being pried apart.

Pales can be enhanced with a choice of finials either for decorative purposes or to provide a deterrent to climbing, while the option to include a variety of security toppings to deter or prevent fence climbing make it a particularly popular choice. It's important to select vertical steel railing systems featuring fully welded pale-to-rail construction and fully concealed post-to-panel fixings that provide a strong mechanical bond and maintain structural and security integrity. A number of LPS 1175 - rated vertical steel railing fencing systems are available.

Timber acoustic fencing

Probably the most cost-effective and flexible solution that can be adapted to suit most ground conditions and contours. Timber is our chosen material and combines high acoustic properties within a natural facade and can deliver a 32dB reduction in noise in laboratory conditions. A small number of noise barrier properties are certified by LPCB to LPS 1175 Security Rating 3 (SR3).

Timber and steel combination

Where perimeter security measures require a 'softer' image, novel security fencing systems employing timber or timber and steel combinations are available. These are designed with flat surfaces on the attack face to prevent attempts to scale over, and are constructed from materials which offer good resistance to

cutting. Combination fencing systems are available with security toppings and offer a high degree of privacy. A limited number of timber and steel combination systems are available at LPS 1175 SR ratings.

'358' mesh panels

Generically referred to as either '358' or 'prison mesh', this type of welded mesh panel fencing has found favour in higher security applications as its aperture offers good resistance to climbing and significantly improved resistance over welded mesh on rolls to cutting through its fabric. However, due to large quantities of inferior versions of this material being imported, caution should be applied to ensure that the gauge of wire used in its construction and quality of welds is consistent with the British Standard BS1722 Part 14 or Secured by Design-approved specification.

Bow top

Bow top fencing provides an aesthetically pleasing, versatile and durable demarcation fence. Constructed with a pale-through-rail construction with no visible joins, it's immensely strong but the tubular design is lighter than traditional solid steel.

Peter Jackson is managing director at Jacksons Fencing

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Transforming transport washrooms

New washroom technology can improve hygiene and user experience while reducing water and energy consumption. Cistermiser's David Meacock explains.

Washrooms are top priority when designing customer-facing areas for transport infrastructure. A clean, hygienic and inviting washroom can make a positive impact and set the standards of cleanliness for the whole building.

Visitors dread long queues and dirty, clogged or overflowing amenities that are neither hygienic nor welcoming. Such issues can create an awful experience for customers, a horrible mess for the cleaning staff, and a costly problem for management.

A careful choice of the fixtures, fittings and the technology installed in a washroom are key to addressing these matters.

Cistern concerns

Flush toilets with cisterns take a while to refill, which can be problematic for a facility used by large groups. Cisterns with six or three-litre capacity refill quicker but the smaller volume of water may not clear the waste, leading to blockages.

And it's not just toilets. Some urinals also use cisterns, although many of these have been replaced by waterless models which used chemicals rather than flush waste away. Unfortunately, these are not likely to solve the issue; the cartridges they use can also quickly clog and at best can only cope with a given flow-rate.

A more complete solution can be found by simply using direct-flushing systems (connected straight into the mains) that offer instant flushing and ensures waste is removed.

Infrared

Infrared (IR) sensors are increasingly being specified instead of the more traditional manually-operated taps and toilet-flushing handles.

Toilets can be vastly improved by fitting IR sensors and flush valves. The sensor reduces contact between user and washroom, either to a simple 'wave action' to flush, or a 'walkaway' option whereby the toilet automatically flushes once the user is finished. Hand-washing facilities can also be fitted with sensor taps or spouts to turn water on or off automatically.

These simple installations can vastly improve the visitor experience, and provide a cleaner and easy to use facility.

Cutting costs

The other area of particular concern to the building's management team is likely to be managing water and energy use. Washrooms can account for 75 per cent of water consumption if toilets are not fitted with partial flush controls. Specifying waterless urinals is one solution, but their cartridges



can quickly clog and at best can only cope with a given flow-rate. Moreover, water would still be needed for cleaning such urinals, along with hefty doses of chemical treatments.

On the other hand, urinal flush control products are relatively easy to install and deliver significant water savings. A cheaper examples for urinal cisterns are hydraulic control valves fitted to the in-pipe. The valve is activated by water pressure and remains closed until a tap is turned on. When the water pressure drops, the valve opens and the cistern-refill cycle continues.

Combining urinal flush control valves with IR technology – which automatically detects a visitor's presence – can reduce water use by as much as 80 per cent.

IR sensors are also able to cut energy usage by controlling the lights, ventilation and the water supply. This type of washroom control system can improve a building's BREEAM score in the categories related to water, energy, heating and ventilation (notably HEA06, HEA07, ENERGY07 and WAT03).

Tech-tied future

The management of washroom facilities is expected to take a further major step forward through the introduction of the next generation of telemetry and wireless technology.

These devices will provide full visibility of water demand and usage levels and be remotely controlled via the Internet.

David Meacock is technical director for washroom specialist Cistermiser



Zaha's Italian odyssey

The oyster-shaped profile of Salerno Maritime Terminal is a striking sculptural presence on the Amalfi Coast, made all the more significant because it is the late Dame Zaha Hadid's swan song. Stephen Cousins reports.

Image © Helene Binet

Hugged by a lush green valley and lapped by the calm, sun-spangled waters of the Mediterranean, the Port of Salerno, south west of Naples, is a fitting location for the first building to be completed following the passing of the late Dame Zaha Hadid.

Salerno Maritime Terminal stands on a public quay that reaches out into Salerno's harbour and exhibits much of the geometric complexity and flamboyance unique to the Iraqi-born British architect's oeuvre.

The building resembles a giant oyster washed up on the beach, its undulating concrete shell protecting 'softer' elements within, including a series of sinuous curving ramps that direct passengers to and from cruise liners and ferries moored alongside.

The roof is effectively an extra facade on the building, visible from many locations in the city and the surrounding hills, covered with an intricate pattern of ceramic tiles, a mix of greys and blues designed to mimic traditional artisan tiles on

historic buildings in the area. The surface twinkles in the midday sun, like the iridescent film on an oyster shell, and helps insulate the interior from frequent high temperatures in the summer.

The project was always close to Hadid's heart, from her initial sketch and design for the competition between 1999 and 2000, through to the later stages of construction. Paola Cattarin, project architect at ZHA, explains: "Back when we started, the London main office was much smaller and we were pretty much in one open space with Zaha sitting in the middle so she could follow every single step very closely. She visited Salerno when we won the competition and was always very closely involved."

The new terminal will greatly improve accessibility for visitors to the region's renowned cultural attractions, coastline and countryside, increasing the capacity for ferry and cruise ship arrivals by around 500,000 passengers a year and creating up to 2,000 new jobs in the city's hospitality, services and retail

‘The project was always close to Hadid’s heart, from her initial sketch and design through to the later stages of construction’



© Helene Binet



© Helene Binet



© Helene Binet

sectors. The location is in easy reach of the nearby destinations of Capri, Paestum and Pompeii.

Creative with concrete

The project continues Hadid’s fascination with the sculptural capabilities of concrete, explored in projects such as Innsbruck’s Bergisel Ski Jump (2002), Cincinnati’s Rosenthal Center for Contemporary Art (2003) and, more recently, the Aquatics Centre at the London 2012 Olympics.

The structure is effectively divided into two ‘shells,’ upper and lower, constructed in fair-faced concrete, a technology developed in the 1960s that is still very common in Italy.

The wavy roof creates a self-supporting structural dome

effect, making it possible to reduce the thickness of the concrete roof slab, as well as the number of points of support below, to free up space inside the terminal.

Concrete is very energy intensive to produce, but its environmental impact was mitigated by sourcing materials locally. The fact it functions as both structure and final finish for the walls eliminated the need to add an extra cladding layer.

Other sustainable features in the building include a natural ventilation system, designed to exploit the facility’s exposed windy location in the centre of the harbour. The external glass facades are relatively small in size and sheltered from the sun thanks to a combination of roof cantilevers and simple louvres that reduce solar gain.



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The terminal is laid out over two levels that accommodate three primary interlocking components: a terminal for international ferries and cruise ships; a terminal for the local and regional ferries; and administration offices for national border controls and shipping lines.

The concrete quayside gently rises in a series of stepped ripples as passengers approach the terminal from the city. The approach morphs into a sloping path of ramps within the building that guide passengers up through passport, baggage and security areas to the main embarking level for ships and ferries.

Local and regional ferry commuters move through the terminal quickly, arriving on ground level and ascending

on ramps to reach the upper level and vessel entrance. Passengers travelling on international voyages are guided through check-in, passport, security and customs controls to ships.

Cattarin comments: “A maritime terminal operates a lot like an airport, with mostly continuous trajectories and people moving from one side of the building to the other to reach the ships. We wanted the architecture to provide the main orientation, using the softer effect of ramps inside the oyster structure to guide passengers.”

Many interior spaces flow into each other and are organised around focal points, such as the restaurant and the waiting lounge.



***‘Zaha... was
always pushing
us to be the very
best we could be’***

Paola Cattarin, ZHA

Security concerns

According to Cattarin, designing maritime terminals forces architects to take into account some extreme restraints and requirements as a result of increasing security controls and the growing number and size of cruise vessels that have boosted passenger volumes.

“When designing a maritime terminal, the challenge is to conceal these efforts and integrate functionality with the structure and the overall architectural intent,” says Cattarin. “A number of revisions related to increasing security levels and controls had to be integrated.”

Transparent glass elements were introduced to provide seclusion and separation required by law and simultaneously maintain levels of transparency and visibility throughout the length of the building.

The fact the terminal is overlooked by the surrounding hills provided an ideal opportunity for the roof design, explains Cattarin: “The terminal has an incredible position, visible from many locations in the city, making it a key focal point.

We realised the roof would effectively function as an extra facade for the building and spent a great deal of time investigating its appearance in terms of its shape, materials and cladding.”

The pattern of grey and blue tiles are laid out to appear more intense in colour over steeper areas of the roof, and in deep depressions, and lighter where the roof is more flat. The product is a locally-produced industrial ceramic designed to mimic traditional artisan tiles installed on the roofs of major historic buildings in the area, such as churches and public buildings. It also functions as a very resilient and highly insulative layer, protecting passengers from the extreme heat conditions of the Med.

Choppy waters

Salerno Maritime Terminal is an integral element of an urban plan for the city, conceived in 1993 to bring about social, economic and environmental regeneration. The project was begun under mayor Vincenzo De Luca, now governor of the



Image © Helene Binet

Campania Region, and continued under the current mayor, Vincenzo Napoli.

The project wasn't all plain sailing, ZHA won the international competition to design the terminal back in 2000, and took responsibility for site supervision and contract administration, but practical and economic challenges meant the building took over 15 years to reach completion.

Cattarin comments: "The main contractor started work in 2005, but was unable to complete so we had to go to a second tender. Being a public work, the process was quite complex and meant putting the project on hold for at least two years. The subsequent sporadic availability of funding meant we went through a process of stops and starts before achieving completion."

Fortunately for ZHA, the client – the Town Council of Salerno – was so keen on Hadid's ideas that no significant compromises to the architectural design were required.

As a result, the finished building is unmistakably Zaha and an instantly recognisable destination on the Amalfi Coast. It is

also a work that the architect, though sadly departed, would be proud of, says Cattarin: "Although Zaha could not attend the opening, she was with us every step of the way through the long history of construction. I hope from the bottom of my heart that she would be happy with the finished building, but as we all know, she was notoriously difficult to please and would have probably found lots of faults.

"That was the thing with Zaha, she was always pushing us to be the very best we could be."

Project details

Client: Comune di Salerno

Architects: Zaha Hadid Architects (ZHA)

Structural engineers: Ingeco, Ove Arup & Partners

M&E engineers: Macchiaroli and Partners

Lighting: Equation Lighting Design

Costing: Building Consulting

Maritime/transport engineering: Ove Arup & Partners

The changing face of passenger terminal entrances

Jonathan Nobbs of Assa Abloy Entrance Systems explores how intelligently applied and well-designed automated entrances can help to improve the movement of people through ever-busier transport hubs.



Public transport usage is booming. Last year, bus and coach travel in many areas of Great Britain recorded unprecedented volumes and more than 1.6 billion rail journeys were taken.

In spite of this pressure, the drive for ever greater operational efficiency remains; cost control, timetable efficiency and energy consumption are all under the microscope. The modern transport interchange is therefore a different proposition to its predecessors in terms of architecture.

Train, bus and coach terminals are constantly evolving, too, modernising to meet public demand and trends. In the 21st century the movement towards bright and inviting stations is gathering pace. Corresponding closely to this change, the way pedestrians move into, through and out of a transport hub has also evolved.

Challenges faced by designers are complex, with more solutions to choose from than ever – but how best to manage

the increase in physical footfall while ensuring safe and secure passage for all? Is it possible to combat inclement weather while future-proofing the design? How does a station best cater for the needs of the mobility impaired?

Research

Research and feasibility studies now play an integral part in the architectural development of facilities. So, what does a modern transport centre need from its doors? Where a stable, safe and secure internal environment is required for waiting passengers, the role of the specifier cannot be overstated.

With a diverse mix of external and internal door systems required, the need to balance smooth, fast and weather-resistant external entrances with easily navigable and attractive internal doors for shopping concessions and booking offices must be met. Carefully specified door systems improve passenger flow into the main building, and then optimise the experience inside.

Contemporary stations draw almost exclusively on automated door systems for the building envelope, with manual push/pull door use diminishing. Automation optimises the passage of travellers with trailing baggage, removing unnecessary obstacles during transit. The choice between automatic sliding, swing and revolving door systems is a more nuanced decision, however, with numerous profiles for each door type available.

Referencing typical passenger demographics early in the design process is useful. Special consideration should be paid to stations where large numbers of families and mobility-impaired travellers are anticipated. Analysis of architectural data, assumed or from comparable stations, provides a model for the typical visitor requirements. A clear picture is vital to successful specification.

Automatic sliding doors are most common, and while it is tempting to lean towards a fully-glazed facade for aesthetic purposes, we have evidence to suggest slimmer frames must be carefully considered before application in external entrances.

The more robust supporting aluminium frames are better suited to resisting impact and stack pressures. The differing conditions doors are subjected to should be considered by specifiers carefully.

Mapping passenger flow

Auditing footfall is critical to ensure doors can cope with traffic. The key considerations are not simply limited to passenger volume and frequency; demographic and behaviour must be mapped and understood, at both peak and quiet times.

Mobility impaired access is key for modern facilities. Entrances should be designed to EN:16005 standards, encompassing the Disability Discrimination Act, with the needs of less mobile passengers met fully. Activation devices can help enormously, but with so many and varied options available, consultation with a specialist is encouraged.

Mitigating draught tunnels

Sustainable design starts at the external entrances. Careful attention must be paid to preserve the interior environment, but there are no stock solutions. The needs of a rural station in the commuter belt are entirely different to those of an inner city interchange.

Traditionally, bus interchanges of the past – notorious for creating draught tunnels – show the progress made in recent years, with newer facilities effectively designing-out the problem.

Success is in part down to better placement of the door systems, with secondary internal doors used to create draught

lobbies. Analysis of environmental variables should take account of wind direction and typical stack pressure.

Sustainable Design

Doors that are open unnecessarily haemorrhage conditioned air. Up to 80 per cent of avoidable energy loss for any facility comes through doors when they're open. Expediting the return to fully closed is therefore, sensible.

Intelligent bidirectional sensors, which assess the movement of bypasses before triggering door opening, ensure entrances are only open when they are required. A recent analysis performed by our engineers for a retail customer demonstrated an annual saving of over two tonnes of CO₂ from a single store, simply by filtering foot traffic that is just passing by from the activation process.

Thermally-broken options enhance energy performance further, by optimising the U-value when in the closed position.

In summary, successful transport centre entrance design requires careful consideration of location, usage and security concerns to determine the optimal mix before investigating the many options available.

Jonathan Nobbs is head of marketing UK for Assa Abloy Entrance Systems

'Automation optimises the passage of travellers with trailing baggage, removing unnecessary obstacles during transit'

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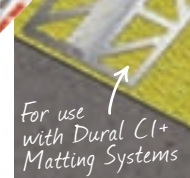
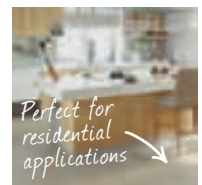
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Welcoming the world

Dundee's grand new railway station includes a 120-bed hotel and is destined to be an impressive gateway to the city and its historic waterfront. Ray Philpott reports.



The city of Dundee is entering a bold new phase in its history, creatively reinventing itself and embracing its 21st century, post-industrial status.

At its heart is the five mile-long central waterfront area along the River Tay, once purely home to its heavy industry and docklands, and now being reborn as a cultural, commercial and residential centre, alongside continued dock and industrial activity in the east.

In 2001 the Dundee Partnership, chaired by Dundee City Council, developed a master plan to turn this underused asset into a high-quality urban quarter for Scotland's fourth largest city.

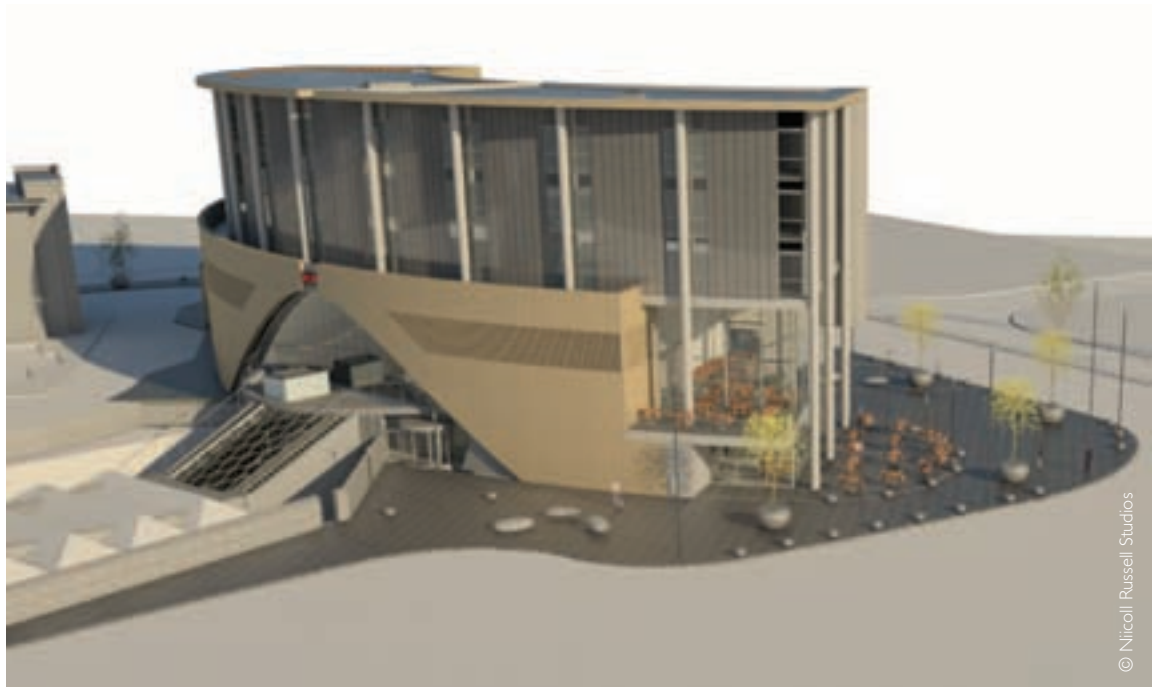
Its long-term vision includes a mix of residential, retail, hospitality, hotels, business offices, leisure amenities and

tourist attractions in the central zone, the £513m focal point of the development covering 5.5 hectares. Marinas, green spaces, homes, industry and technology feature in four other zones. Roads and infrastructure have been largely established and construction is progressing apace.

Star tourist attractions like the historic three-masted sailing ship RRS Discovery, which carried Scott of the Antarctic and Earnest Shackleton, and the new Victoria and Albert Museum (V&A) due to open in 2018, are expected to attract visitors from across the UK and abroad.

However, in the 1960s, Dundee's waterfront and station were effectively cut off from the rest of the city by heavy-handed, vehicle-focused road building and parking developments, particularly around the Tay road bridge.

‘The station will be the first in UK built with an integrated hotel since the early 20th century’



To reconnect the city with its riverside, dramatic changes have been made to the isolating roads and car parks and, significantly, the 1960s station building which was demolished to make way for a new ‘statement’ station, acting as a high-profile gateway between the city and its waterfront.

Gateway challenge

Rising to the gateway challenge, architects Nicoll Russell Studios, working closely with project managers Jacobs, designed a striking crescent-shaped station building and 120-room hotel fronted by a proportionate and appropriately landscaped public plaza. The building also boasts a ground and first floor cafe offering views of the waterside and attractions, some offices and street level retail units.

Built over the top of four tracks, the station complex’s imposing height and presence, combined with two attractive, glazed arches at either end of its concourse, give it the strong presence needed. It is both an eye-catching gateway to the waterfront and a substantial railway station that reflects the status of the city.

Partner Willie Watt takes up the story. “Dundee is a busy commuter station and is served by the arterial East Coast Main Line, yet the 1960s station was suburban in scale and style and didn’t fit in with the waterfront vision.

“The new building had to be very different and in proportion to the scale of waterfront development. It’s intended to be an imposing development”, he says, “visible from the railway, the new waterfront road network and from the west as you drive in to Dundee, acting as gateway to the city from that direction too. You can clearly see the glazed arch

ahead when travelling in any direction.”

Watt adds: “This is a deliberately modern station building with a cafe, a ground-floor retail space on the plaza and an office unit. We wanted the concourse to have a strong presence for people and be very clearly part of the railway, a celebration of rail travel. The railway heritage is firmly captured through the arched design, which is also reflected in the shape of building behind.”

The main concourse entrance faces the plaza where buses can be caught, while two west-facing entrances also connect to taxis and car parking facilities which include a small car park and a large multi-storey one five minutes walk from the station. However, the station complex is designed to encourage travel on public transport and reduce car usage.

On the lower level, which is accessed by escalators, the Victorian platforms and their associated fixtures and buildings have been retained. The city once had three attractive Victorian stations but the buildings were swept away in the 1960s redevelopments.

While Dundee station is undeniably contemporary, when it opens next year it will be the first city station in the UK to be built with an integrated hotel since the early 20th century.

“Mixed use stations like this are not common in Scotland. To a great extent, the hotel actually dictates the scale of the building. Without it the station would probably have been an architecturally smaller building,” explains Watt. “It has its own separate, fully glazed feature entrance at the northern gable end of the curved structure, although the main station entrance is designed to be more predominant.”

The other major substantially glazed element of the building is the cafe on the ground floor offering views over



Fast facts

Planning

permission gained:
2010

Work began on site:
October 2015

Due for completion:
late 2017

Total cost of
waterfront project:
£1 bn

Rail services include:
Scotrail, Caledonian
Sleeper, Virgin East-
coast, CrossCountry

to the Discovery and the V&A and right along the Tay. Customers will be able to see from the mouth of the estuary all the way to Perth.

“It will benefit from the footfall from the station and visitors to the attractions, but its superb vistas, and great location we like to think it will become a destination in its own right,” claims Watt.

The plaza effectively creates a public space in front of a large civic building and the architects have been working closely with Dundee City Council to ensure everything is co-ordinated between the building and the public realm around it.

“It has high-quality paving and soft landscaping arranged in an urban style with seating, easy access to bus stops and all the ingredients you would expect in a large open space. It will be a lively space, but the key thing will be its functionality,” says the architect.

“Dundee City Council is doing an incredibly good job at managing the overall waterfront development and selling the city – it’s a great catalyst for positive change, and they are indeed making it happen.”

Architectural mass

Graham Steel, senior associate with the practice, explains the thinking behind the structure and materials used inside and outside the building.

“We’ve tried to create architectural mass by using materials that make it read as a solid building. There’s solid granite all around the base of the building, which has a robustness that grounds it and reflects the materials used in the public realms.

Above the granite line there’s terracotta cladding, and on the western side aluminium there is cladding on a cassette system.”

He continues: “The arch is a piece of statement design. Due to the curve of the building, the interior ceiling is fluid, shapely and very 3D,” explains Steel. “It’s constructed from a concealed frame with a tensile material stretched over it, creating a smooth texture and a sleek and sculptural look. We’re creatively and elegantly illuminating it from the ground to make it glow at night and capture its sculptural nature.”

With large amounts of single glazing at both ends, the arch lets in lots of light to the concourse which is glazed into the cafe, ticket hall and retail unit. On ground level it’s glazed on all four sides, and the arch sits above that.

Steel comments: “It was important to control daylight coming in especially from the west. We modelled that in detail using BIM to get the LED lighting correct and to avoid glare. Solar gain kept to a minimum because of north east-facing glazing and the arch on the western side has more shading to control the light.

“A number of different types of glazing have been specified, depending where the glass is and what its functional requirements are. On the floor terrazzo-style tiles meet Network Rail’s specifications and branding for the station.”

Deep piling was necessary in ground reclaimed from sea by the Victorians. The steel structure then arches above the piling while a steel ‘bridge’ ties the bottom of that arch together. Above and around that is a more traditional steel and cladding structure.

Modern methods of construction ensured a quick building process and facilitated pre-manufactured hotel ‘room pods’.

Balance

Ultimately, Willie Watt and his colleagues are very pleased with the overall outcome and the way the project has progressed.

“We’ve developed a very good relationship with the lead consultants Jacobs, and it’s been a great team effort,” he says.

“The big challenge for us has been to strike the right

balance, to design a gateway that’s right for a re-emergent Dundee. It would have been very easy to underplay or overplay that, but to my mind, we’ve struck that balance just about right.

“This new station suits the city because, while it successfully manages to be striking and civic, it achieves that without being grandiose.”



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Project details

Client: Dundee City Council

Architect: Nicoll Russell Studios

Main contractor: Balfour Beatty

Project manager: Jacobs

Structural and civil engineering: Jacobs

Quantity surveyor: Jacobs

Terracotta cladding: Moeding Alphaton

Aluminium tile cladding: Senses

Roofing: Sarnafil

Curtain walling: Shuco FW50+ SG System

Structural glazing: Hansen Thermospan

Tensile concourse ceiling: Serge Ferrari ‘Batyline’ System

Sliding doors: Besam

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Versatile glass: take the safe option

Glass is an invaluable and flexible design element in modern transport hubs, but also has to meet increasingly rigorous safety and security standards, says Sto's Rob Freegard.

In today's increasingly fluid world, the demand for easy and convenient travel continues to grow, which has seen increased funding allocated to new transport hubs such as rail and underground stations, and airports.

Consequently, architects and designers invest considerable effort into creating impressive transport projects that are distinctive and memorable.

Unfortunately, today's increasingly uncertain world means that building designers have to factor in the risk of terrorist attacks, and this has influenced the way that our rail stations and airports are designed. So, it might seem strange that glass is proving to be increasingly popular in this type of infrastructure architecture.

Glass offers many advantages. It's functional, versatile and it creates clean lines and well-defined spaces which can help manage the passenger flow through a transport hub. It can also flood a building with natural light, and be used both externally and internally to allow a design scheme to flow effortlessly into and out of a building.

As you'd expect, modern glass facades used in such public areas are subject to increased performance requirements, and one of the main areas where there may be a risk of an explosion occurring.

In this scenario, one of the biggest dangers comes from the debris hurled through the air, and often over long distances. Today's security and safety glass products are designed to minimise this danger by creating as little debris as possible and so reducing the risk of injury.

Secret

The secret lies in the specially toughened glass panels used. Possessing their own inherent strength, these panels are fixed to carrier boards by a special adhesive. Although the glass itself may shatter, it's designed to remain firmly fixed to the carrier board as far as possible, and so minimise flying debris.

The combined glass panel and carrier board structure is also manufactured so that it can flex and accommodate both the first explosive wave of positive pressure and then the following wave of negative pressure that can be just as destructive. It's worth noting the best carrier board is itself typically made from 96 per cent recycled glass, underlining the environmentally friendly nature of glass as a construction material.

The level of safety is further increased by the grid substructure to which the glass is fitted. Choosing the most appropriate grid and fixing system is essential for maximum



safety, and a reputable glass manufacturer will be able to provide guidance here.

They will advise on the best substructure to allow the panels to flex and accommodate pressure change and so further minimise flying debris. Some manufacturers will also assist with such issues as wind loading calculations, standard design details, and onsite installation support, so it pays to choose your security glass supplier very carefully.

Rigorous testing

When specifying a glass system, safety is obviously a primary concern. Any glass used in construction must have undergone a rigorous testing regime, including extensive impact and blast testing to ensure, that is suitable for use in public locations such as rail stations. A standard BBA certification is a good starting point, as it confirms that the system in question has been properly assessed with regard to such things as mechanical resistance, durability and behaviour in a fire, but testing needs to go much further than this.

In an explosion there is always a risk that the blast wave itself will cause injury or damage within the immediately adjacent

'Today's security and safety glass products are designed to minimise this danger by creating as little debris as possible'

area. The testing of glass for this type of application revolves around assessing its potential to create flying debris which may cause injury to anyone beyond that immediate area. This is typically done by subjecting it to various blast sizes at distances of 6 m to 25 m away. This allows the different types of explosions to be simulated, and their likely effect beyond that to be calculated.



The glazing system also needs to pass many other tests with flying colours, including impacts by both hard and soft bodies. Pneumatic tyres, solid steel balls and canvas bags filled with lead shot are used for this purpose being dropped onto, or swung into, the glass from carefully specified distances. As well as ensuring that the glass meets a number of relevant British Standard requirements, this type of testing also provides reassurance that the glass can withstand the normal day-to-day treatment it will experience in the average railway station, airport or shopping centre.

Unlimited scope

While focusing on safety and security, it's important to also remember that today's glass materials can offer virtually unlimited design scope. Every glass system is a bespoke solution, so almost any design can be interpreted in glass, no matter whether it includes large surfaces, dramatic curved walls or unusual sizes and shapes.

Glass panels are available in the majority of RAL colours (with some manufacturers also offering custom options) and it's possible to incorporate cut-outs or individual logos and designs onto the glass, so the creative possibilities on offer are virtually endless.

Rob Freegard is business development manager for glass specialists Sto Ltd



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Traffic in the spotlight

The changing nature of traffic hubs has placed more emphasis on choosing effective and appropriate area lighting solutions for transport infrastructure. Nicola Marques Butler of CU Phosco Lighting explains how to overcome the challenges.

Lighting for transport infrastructure is perhaps the most demanding of applications within area lighting. There are many different design standards for each application, with requirements for luminance, illuminance, uniformities, glare requirements and light pollution that need to be optimised in every scheme.

Each application and site has different operational and safety demands related to the different traffic types. Potential traffic scenarios include: cars and pedestrians in car parks; buses, cyclists, pedestrians, cars and lorries on road networks; trains and pedestrians on rail platforms; and planes, operational vehicles and pedestrian workers using airport apron lighting.

On most sites, these different environments sit side by side lit by the same equipment from the same mounting positions.

In selecting and optimising lighting in each of these situations, consideration must be given to the impact of the proposed lighting on the surrounding properties and, increasingly, on the effects of the lighting on the environment and local, light-sensitive fauna or flora. In this situation, a product with a G6 glare rating, which is 'dark sky-friendly' with no upward light, is required.

The right light

The important common approach is to decide what quality of light to provide and where and when to use it. Rapidly changing technology and the frequent introduction of new LED luminaires and floodlights onto the market means there are no set rules in lighting design anymore.

However, a professional luminaire manufacturing company or lighting designer can provide assistance by carrying out site surveys and handling design and commissioning.

Finding the best possible product can help achieve the optimum lighting design for the area and maximise overall efficiency and effectiveness of the lighting. It is also important to reduce carbon emissions and achieve cost savings, and as Dave Johnson, highways manager with Transport for London, says, "provide the right light, in the right place, at the right time."

Luminaires with flexible and intelligent lighting controls operated from a central point ensure light levels are appropriate to the ambient levels. Using multistep dimming options mean that the driver can be programmed to up to five steps, generating substantial energy savings by providing the precise amount of light at the right time.



These drivers are able to calculate the virtual clock time by analysing the operation duration from the previous three days and adjust the times of the five light level steps accordingly. Combining Central Management Systems (CMS) technology with LED lighting also offers flexibility in lighting control in terms of profiling, flexible lighting levels during public events or planned works, providing a safer light solution for users at the same time as reducing energy use.

Flexibility

When looking for a lighting system, flexibility is vital because all projects are different and finding products with multiple optical distributions as well as a range of elevation angles helps to design a bespoke scheme that can meet even the most challenging situation.

That's why the knowledge and experience of a professional designer is necessary, as you cannot design lighting from a



brochure. With the advances in LED most lighting designers' aim is to reduce the cost of illuminating and maintaining light sources by converting them to more efficient LED products.

The recent installation of LED lighting on the apron at Heathrow has saved over 55 per cent in energy compared to the sodium lighting that was replaced.

Due to high use and access restrictions around transport hubs that prevent maintenance and repair works being done, any lighting solution needs to offer robust design with low maintenance requirements in order to minimise work on site.

Exceptional thermal management of the LEDs is essential for enabling the luminaire or floodlight to work at high ambient temperatures whilst still having a low lumen depreciation and maximising its life.

Flooded market

In a market where emerging companies with no traditions in lighting can introduce new stock daily, it is advisable to look for third-party tested and certified products from reputable lighting companies. Untested equipment cannot be expected to be reliable, even if the importer promises a 20-year warranty.

That is also a reason why choosing a local manufacturer can be beneficial, especially if a quick reaction to changes on site or in a particular project is called for. This can potentially improve efficiencies and minimises any delays to the schedule.

Nicola Marques Butler is the marketing manager of CU Phosco Lighting

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Marshalls expands rail product portfolio

Founded in the 1890s, Marshalls is the UK's leading supplier of hard landscaping products, and offers a wide variety of street furniture and counter-terror PAS68 products, as well as a large rail product portfolio.

Marshalls is a member of the Rail Alliance, as well as an approved supplier to the UK rail industry and is registered with Link-Up – many of the company's specialist products have been designed in collaboration with partners from the rail industry, such as Network Rail, to help improve the passenger experience.

When it comes to creating first class landscapes, Marshalls understand the fundamentals to achieving high quality, inspirational and sustainable rail spaces, as well as the ability to provide a full service rail product offer for the station interface, platform and concourse.

Marshalls' products have been specifically designed to improve the safety and aesthetics of the station platform and include paving, tactile paving, platform coping, water management solutions and coordinated street furniture.



New additions to the already extensive rail product portfolio include PC10/PC30/PC40 Underground Coping Units, A100 Overground Coping Units (both single and combined) and complimentary Oversail blocks. These durable, and aesthetically pleasing products not only have excellent skid resistance, but the combined coping unit is easier and quicker to install than the traditional two part system. Marshalls' St George paving is ideal for use both internally and outdoors on stations platforms, and has a durable surface finish for easier cleaning and maintenance.

Marshalls understands that Rail plays a key part in building the supporting infrastructure that Britain will require for a sustainable future. In the expansion of the rail network it is essential to create high quality and inspirational spaces from the station interface to the platform edge which promote well-being and enhance the passenger journey experience.

Continued product development enhances the passenger experience by adding value to station build and modernisation. Since the launch of Marshalls' 'Railsapes', the company has continued to develop innovative rail products which have helped to shape the face of Britain's railway stations.

Marshalls' wealth of experience in the rail sector comes from being involved in a number of large, high-profile refurbishments in recent years, including London Kings Cross, Liverpool Lime Street and London Bridge railway stations.

For more information, please visit the website.

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Stannah lift products star in spectacular new entrance to Leeds Station

Opened on 3rd January 2016, the new southern entrance to Leeds Station features four Stannah escalators and two passenger lifts.

Following multiple escalator and lift installations at the Midlands hub of Birmingham New Street and Grand Central for Network Rail and Mace, Stannah were again the chosen supplier and installer of all vertical transport within the southern entrance building (known as the LSSE scheme), this time working with main contractor Carillion to fulfil the brief. The work was completed by the Stannah Escalator & Moving Walkway Department and Stannah Major Projects team in just twelve weeks.

Funded by the West Yorkshire Combined Authority, Leeds Council, the Department for Transport and Network Rail, the new extension provides an attractive new accessible entrance and additional concourse built in the River Aire. The building was created to diminish congestion at this busy commuter station into and out of West Yorkshire and the North of England, making it an

attractive route for tourists again. Up to 20,000 passengers (or 20 per cent of current footfall) are estimated to benefit from using the new entrance, shortening commute times and providing easy access from the south of Leeds.

The four escalators provide continuous vertical transportation for ambulant people. Those travellers with heavy luggage, child buggies or wheelchair-users are well provided for with two bespoke 13-person traction passenger lifts located just inside the entrance.

The tight restraints on the site meant some of the features of the lift equipment had to be modified to achieve the design and vision without compromising safety.

The escalators are to NR specification with some additional features bespoke to the Leeds station project. These features were based on the tight restraints of the site and the designers risk assessment required to mitigate those risks.

This included special software so that all the machines operate to a special design philosophy when stopped in an emergency situation, including



installing an additional stop button on each machine during mid travel. Bespoke manufacture of the machines at 35 degrees instead of the standard NR specification of 30 degrees, and the reduction of the speed of the machines from the standard NR .65m/s to .05m/s all result in safe, efficient travel within the constraints of an unusual and stunning building design. With no room for housing external controllers these became an integral part of the escalators.

The lifts had restricted space so machine room-less traction equipment was installed to enable the largest capacity possible within the tight footprint of the new building.

The new pedestrian entrance will be of great benefit to people living and working south of the river, and will open up new travel opportunities providing a further stimulus to redevelopment and expansion of the city centre, and will support the continued regeneration of the southern quarter of the city.

Stannah continues to add to their portfolio of high-profile rail projects, helping Network Rail achieve their target of 'Step-free access' across the rail network.

The North West England and North Wales Stannah service branch, part of Stannah's nationwide branch network, will be maintaining the lifts and escalators to ensure the safe flow of people and goods through this new entrance.



01264 339090 www.stannahlifts.co.uk

30 year old Taxiway Gates

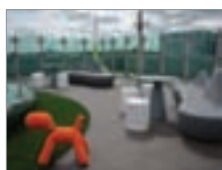


Frontier Pitts are especially renowned for the manufacture and installation of British Engineered Large Automated Security Gates. These Taxiway Gates have been operating at an International British Airport for over 30 years. Frontier Pitts has many years experience working on sites such as Airports, Utility and Nuclear sites. They design,

manufacture and install the security gate systems to suit the sites specific requirements. Once installed, Frontier Pitts can maintain the automated system to ensure that it is working efficiently and safely for years to come. For more information please visit the Sliding Tracked Gate product page on the company website.

01293 422 800 www.frontierpitts.com

Levato Mono at Bristol Airport



Levato Mono porcelain paver system from The Deck Tile Co has been installed on the new roof terrace at Bristol Airport East Terminal extension. Circa 400m² of the system was specified in order to conquer a number of challenges; covering EPDM membrane laid with multiple falls; to hide services and drainage gulleys but still have accessibility for

future maintenance; cutting around the numerous stainless steel posts and glazed partition with accuracy for the shroud detail. The finish the architect specified was Teknotimber Dark oak – offering the client an attractive, flexible and well designed raised flooring solution and with incredible technical properties.

0118 391 4120 www.thedektileco.co.uk

Walkway installed at John Lennon Airport



As part of a major redevelopment to the premium car park at Liverpool's John Lennon Airport, Twinfix have installed a 3m wide walkway that enables continuous under-cover access from the car park into the airport building. The 35m long mono-pitched structure is manufactured from aluminium powder coated dark grey. Aluminium

is an ideal choice in this application as it won't rust if it gets the odd knock from a suitcase, neither will it require painting again, so an annual wash down means it will keep its good looks for years. Twinfix Multi-Link-Panels glazed with 25mm clear multiwall polycarbonate were used for the roof.

01925 811311 www.twinfix.co.uk

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OMK Design Limited



OMK was formed in 1964 by Rodney Kinsman RDI. It is a design lead company specialising in public area seating. As the market leaders, the company has now supplied over 200 airports, railways and ferry terminals worldwide and have the experience and product range to provide a seating solution for any project. OMK's constantly evolving product range has received over 30 international design

awards. As a testament to their quality they are all independently tested by to withstand the most rigorous use and carry a 25 year structural guarantee. For more information please contact the company directly.

GTL at Jomo Kenyatta International Airport



Gate Technologies Ltd (GTL) has provided a turnkey service for the design, supply and installation of all technological equipment including BHS (departures and arrivals), FIDS, screening machines, lounge seating and office furniture at Jomo Kenyatta International Airport Terminal

2, Nairobi. Although the building is semi-permanent, the equipment installed is first quality and fully compliant with international standards. Counters at check-in and elsewhere are from the GTL standard range which feature stainless steel side panels, glass fronts, natural granite tops and with interiors customised to suit the individual project in hand. GTL is a UK company that has over 20 years steadily established a presence in the design, supply, installation and maintenance of specialist equipment for airport terminals.

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