



# COMFORT & STYLE

OUR GLOBAL PORTFOLIO  
OF HOSPITALITY PROJECTS



**PARSONS  
BRINCKERHOFF**



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# HOSPITALITY KNOW-HOW

WE HAVE LONG CHAMPIONED SUCCESS IN THE HOTELS INDUSTRY, HELPING CLIENTS STAND OUT FROM THE CROWD WITH UNPARALLELED COMFORT, CONVENIENCE AND QUALITY.

WSP | Parsons Brinckerhoff knows hospitality. Over the past three decades, our experts have delivered more than 500 projects across 80 countries, gaining in-depth experience in every part of this global industry, from heritage hotels to vast entertainment complexes, from budget-conscious facilities to luxury beach resorts.

With a sensitive design approach and unrivalled engineering nous, our global teams are perfectly placed to facilitate excellence in this competitive field. We work with leading hotel brands, signature architects, property developers and management companies to create exceptional, sustainable and cost-effective buildings that will generate value for their owners far into the future.

But, above all, we know it is the guests who matter most. Whether we're designing a top-floor swimming pool for an iconic urban high-rise, or building services for a remote mountain hideaway, our sights remain firmly on the end user. Because that's how to create places they'll never want to leave.



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# MEMORABLE STAYS

THE BEST HOTELS REMAIN WITH PEOPLE LONG AFTER THEY'VE CHECKED OUT.



Guests are at the heart of successful hospitality. Whatever the budget and wherever the location, hotels and resorts thrive when their customers leave inspired by their experience and eager to return.

In a competitive market, that's not always easy. Providing maximum comfort, convenience and entertainment, all in a safe and stylish environment, is a major undertaking for intimate island retreats, city-centre hotels and mega casinos alike.

At WSP | Parsons Brinckerhoff, we understand the need to wow visitors with enhanced views and awe-inspiring features, from triple-height swimming pools to indoor waterfalls. But we also know that fundamentals matter. And that means having the right systems in place to keep your guests comfortable day and night, all year round.

## MARINA BAY SANDS

### STUNNING SKY PARK TOPS A CASCADE OF TOWERS

#### MARINA BAY, SINGAPORE

The Marina Bay Sands Integrated Resort is one of Singapore's premier entertainment destinations. Located on the Marina Bay waterfront, the luxury resort features three cascading hotel towers topped by a one-hectare sky park; extensive convention and exhibition space; and high-end shopping and dining outlets. Other facilities include two state-of-the-art theatres, a casino and a museum with a unique roof designed to channel rainwater through the central atrium of the building as a waterfall.

We were responsible for the design, coordination and site supervision of all mechanical, electrical and plumbing services systems in a fast-track programme that took the project from preliminary design to opening in four years. Our engineers supported this tight timeline by working in close partnership with the owners, architects and full project team, responding to changes and providing solutions so as to minimise abortive works and delays. We also successfully initiated early planning, and close liaison with utility companies and government departments.

Our work involved the application of cutting-edge sustainable and energy-efficient systems, including the use of a district cooling system, heat recovery from exhaust air, air purification, rainwater collection for non-potable use, and life-safety and smoke control for occupant safety.

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<b>Client</b>	Las Vegas Sands Corporation
<b>Architect</b>	Safdie Architects, Aedas
<b>Our services</b>	Building services, fire, vertical transportation
<b>Project status</b>	Completed in 2010

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# LUXURY IN MACAO, CHINA



## THE PARISIAN MACAO A FLAVOUR OF FRANCE FOR COTAI'S FUN-SEEKERS

The Parisian Macao, an integrated resort connected to The Venetian Macao and Four Seasons Macao, is set to add more than 3,000 hotel rooms and suites to the Cotai Strip when complete in late 2016. The complex will feature an Eiffel Tower replica, plus a shopping mall, massive casino floor and theatre.

We are providing mechanical, electrical and plumbing engineering to this ambitious project, with responsibility for building services design, mechanical and electrical systems, project control, site supervision and vertical transport, including elevators and escalators.

Notable features include an energy-efficient chilled water system, fed by the main chiller plant at the Venetian Macao, and smoke purge systems to maximise air quality in areas including gaming floors, guestroom corridors, the shopping arcade and car-park.

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<b>Client</b>	Venetian Cotai Limited
<b>Architect</b>	Gensler
<b>Our services</b>	Building services, project control, site supervision, vertical transportation
<b>Project status</b>	Due for completion in 2016

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## SANDS COTAI CENTRAL HOTEL COMPLEX

### FOUR WORLD-BEATING HOTELS IN ONE INTEGRATED RESORT

This luxury hotel and entertainment complex in thriving Macao incorporates several of the world's top hotel brands, plus casinos, a theatre and vast retail and dining space. The stunning accommodation includes the Sheraton Macao Hotel, with almost 4,000 guestrooms and suites, the 1,200-room Holiday Inn Macao, and the 600-room Conrad Macao.

Our responsibilities included the design, coordination and site supervision of all mechanical, electrical and plumbing systems. On a separate contract, we served as building services consultant for the fourth tower, namely the St. Regis Macao Hotel, Cotai Strip, which consists of 400 hotel rooms plus 280 serviced apartment suites.

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<b>Client</b>	Las Vegas Sands Corporation
<b>Architect</b>	Aedas
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2012 (Sheraton-Conrad-Holiday Inn), 2015 (St. Regis)

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# LUXURY IN MACAO, CHINA



## THE VENETIAN MACAO

### GONDOLA RIDES ALONG THE CANALS IN SOUTHERN CHINA

The Venetian Macao is the largest integrated resort in the Asia-Pacific region and provides a world-class venue for entertainment, leisure, convention and business activities. Key features of the complex include a 3,000-suite hotel tower, 55,000 square metres of gambling space and a replica of Venice's St Mark's Square, complete with three indoor canals and a team of gondoliers. The development also houses a theatre, convention centre and ballroom.

We provided building services engineering for this mammoth project, which uses one of the largest chiller plant facilities in Asia, with double the cooling capacity of Hong Kong International Airport. Additional systems include a 66-kilovolt substation, an underground liquefied petroleum gas plant, and a vertical transportation network comprising 117 elevators, 56 escalators and two spiral escalators.

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<b>Client</b>	Las Vegas Sands Corporation
<b>Architect</b>	Aedas, HKS
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2007

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## FOUR SEASONS HOTEL, MACAO

### TAKE IN THE VIEWS FROM THIS ELEGANT TOWER

Situated on the Cotai strip of Macao, the Four Seasons Hotel is part of a 120,800m<sup>2</sup> complex consisting of hotel guestroom, duty-free retail, the Paiza Club Casino, and serviced apartments. The complex also comprises of ballrooms and multifunction/meeting rooms. The hotel is a 19-storey hotel tower offering 360 guestrooms, including 84 suites, as well as its renowned spa centre and five outdoor swimming pools.

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<b>Client</b>	Las Vegas Sands Corporation
<b>Architect</b>	Steelman Partners
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2008

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## INTERCONTINENTAL DANANG SUN PENINSULA RESORT

BACK TO THE 1920S, BUT WITH  
ALL MOD CONS  
DANANG, VIETNAM

The Intercontinental Resort & Spa, just north of Danang in central Vietnam, sits in a secluded cove in the hills of the famous Son Tra Peninsula, bordered by natural forest and its own private beach. Accommodation includes luxury rooms, suites and five beachfront villas with private pools. The resort also boasts world-class restaurants, swimming pools, a health and fitness centre and spa, plus conference and banqueting facilities.

We provided a comprehensive range of building services to the project, including mechanical, electrical and hydraulics design, as well as communications, vertical transportation, security and fire services. The theme of the resort is 1920s

Vietnam, but with all modern conveniences, and it is designed to strict Intercontinental Hotels Group engineering requirements. This made tight coordination with the architect and client essential.

We also incorporated sustainable design features, including a system to treat and store wastewater that can later be reused for irrigation, and efficient heat pumps to produce hot water and keep energy consumption down.

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<b>Client</b>	Sun Group
<b>Architect</b>	Bensley Design Studios
<b>Our services</b>	Building services, vertical transportation, communications, security, fire safety, fire protection
<b>Project status</b>	Completed in 2012

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**PARK HYATT HOTEL,  
AUCKLAND**  
BRINGING A NEW LEVEL OF  
LUXURY ACCOMMODATION  
TO NEW ZEALAND  
AUCKLAND, NEW ZEALAND

A new Park Hyatt hotel on Auckland's waterfront will bring a new level of luxury accommodation to New Zealand. The six-storey building will have a total floor area of 25,000m<sup>2</sup>, with 190 rooms, three food and beverage outlets, event spaces, a spa, fitness centre and 25-metre swimming pool.

The Park Hyatt is the first project in New Zealand for our client, Fu Wah, who is seeking to deliver to international best practice in the hotel/residential sector. We are supporting the required luxury standard of finish on this project by delivering a high level of detailed

design resolution, in addition to the level of sophistication and automation associated with the building services systems. Through the provision of a fully integrated services design package, we are able to offer a 'one-stop shop' to this leading project that will ensure coordination and integration of complex systems.

- 
- Client** Fu Wah NZ Ltd
  - Architect** Ar+d in conjunction with Bossley Architects
  - Our services** Building services, fire, acoustics, audio visual, specialist lighting, vertical transportation
  - Project status** Due for completion in April 2018
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Image courtesy of ar+d



Image courtesy of SOM

**FOUR SEASONS HOTEL,  
BAHRAIN BAY**  
THIS ICONIC URBAN RESORT  
BLENDS INNOVATION AND  
RELAXATION  
MANAMA, BAHRAIN

The Four Seasons Hotel, Bahrain Bay is the latest addition to the global network of hotels which are at the forefront of the hospitality industry. The 470,000ft<sup>2</sup>, five-star hotel is located on a fully-landscaped, man-made island in the Arabian Gulf, accessed by a single bridge. With its striking design it will become an iconic landmark for the Kingdom of Bahrain, as well as setting new standards in comfort, luxury and style.

We provided mechanical and electrical design services for the hotel. All hotel guestrooms, which are housed in a 300m-tall tower structure, are served by mechanical and electrical equipment located mostly in spaces within the two tower piers. The top four levels at the top of the tower, which includes two restaurants, kitchens, gentlemen's lounge/bar and conference rooms,

are served by mechanical and electrical services located at the same elevations as the spaces they are serving. The entire building complex is connected to a district cooling (chilled water) system off-site.

The design of mechanical and electrical systems fully complemented the monumental character of the building exterior and prevented any equipment, such as louvres or fans, to be visible by the guests. The same approach was also applied to the building interior. Based on extensive efforts of coordination, the mechanical and electrical systems were designed to meet the highest standard of comfort while satisfying interior design intent.

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- Client** Skidmore, Owings & Merrill LLP
  - Architect** Skidmore, Owings & Merrill LLP
  - Our services** Building services
  - Project status** Completed in 2015
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## SHANGRI-LA HOTEL AT THE SHARD

A UNIQUE EXPERIENCE IN EVERY ROOM OF WESTERN EUROPE'S HIGHEST HOTEL  
LONDON, UK

Shangri-La, Asia Pacific's most prestigious luxury hotel group, made its European debut with the launch of its new five-star hotel within The Shard, the 306m-high tower that is already an international symbol for London. The hotel occupies levels 34 to 52, making it Western Europe's tallest. It has 202 rooms with breathtaking city views, an international restaurant, gym, pool and impressive business facilities.

We have been providing multidisciplinary engineering design consultancy to Shangri-La Hotels and Resorts since the 1990s, and played a prominent role on this landmark project. We were appointed to deliver mechanical, electrical and plumbing services and structural engineering design for the hotel fit-out. At the conceptual stage, we carried out a thorough review of the base building's fire strategy, heating, ventilation, air conditioning, plumbing, drainage, fire and electrical systems and lift provisions to make sure they would meet the client's requirements.

The pyramid shape of the base building means no single guestroom is the same and interior design is unique to each, significantly complicating building services design, coordination and installation. We nonetheless found ways to maximise hotel efficiency, designing an intelligent guestroom control system to achieve long-term energy savings. The system has display and remote control functions to manage room conditions to suit different occupancy modes, controls black-out blinds and provides user override control on external solar blinds.

Our structural work for the Shangri-La included the design of a glazed lift shaft in the lobby, and advice on the support of large glass artworks and chandeliers in the ground floor entrance.

We also acted as structural engineer for The Shard base building, working closely with the architect Renzo Piano, client Sellar Property and contractor Mace to deliver the European Union's tallest tower rapidly and safely.

- Client** Shangri-La Hotels & Resorts
- Architect** Renzo Piano
- Our services** Building services and structural engineering
- Project status** Completed in 2014



## FOUR SEASONS RESORT AT WALT DISNEY WORLD® FIVE-STAR FAMILY LUXURY ORLANDO, FLORIDA, USA

Four Seasons is the first non-Disney branded hotel to be located within the Walt Disney World Resort in Orlando. The 443-bedroom, 640,000ft<sup>2</sup> property offers the ultimate in family luxury, with five-star amenities including restaurants, lobby lounge bars, a ballroom, function and meeting facilities, a spa and fitness centre in addition to back-of-house and administrative functions.

We provided mechanical, electrical and plumbing services, fire protection, communication and low voltage engineering services.

Our design services include plans for a future Four Seasons Resorts Residence Club which will comprise approximately 25 four-storey, private residence-type buildings. Each building will consist of two 1,800ft<sup>2</sup> bedroom units, three 2,300ft<sup>2</sup> units and four 3,000ft<sup>2</sup> units for a total gross floor area of approximately 100,000ft<sup>2</sup>.

- Client** Four Seasons Hotels and Resorts Ltd; Silverstein Properties
- Architect** HKS
- Our services** Building services, fire protection, communication
- Project status** Completed in 2014

## HYATT REGENCY TRINIDAD

A BREATHTAKING CARIBBEAN  
GATEWAY TO THE CITY'S  
WATERFRONT

PORT OF SPAIN, TRINIDAD

The Hyatt Regency Trinidad is a four-star hotel integrated into the lively International Waterfront Centre, with world-class business facilities and direct access to an expansive convention centre, 428 rooms, a spa and an impressive rooftop infinity swimming pool.

The hotel was part of a large redevelopment project that we were commissioned to manage, which included two office blocks complete with parking facilities. The redevelopment aimed at transforming a prime location in the heart of downtown Port of Spain, into a gateway to the country, promoting the city's values and attractions.

On the Hyatt Regency Hotel, our role went beyond that of project managers, managing the delivery of the contract by the design-builder, to being the owner's advocate. We carried out the initial commercial and planning studies and analyses, prepared the design-build request for proposals and reviewed the health, safety and environmental procedures. We were also responsible for budget review and control as well as quality control and assurance through to pre-opening which included the commissioning of the building. We were directly involved in the negotiation of the hotel operating agreement and the pre-opening technical services agreements between the client and Hyatt Hotels.

The site itself was located on reclaimed land which made the development challenging, added to which was its proximity to a ten metre seawall and a sizable underground gas main. At the time, there were local material and labour constraints and the schedule and budget were tight. Thanks to our risk mitigation strategy and drawing on our extensive management experience, we were able to deliver the project within set targets.

We were awarded a further mandate to manage and act as the owner's representative for the pre-opening hotel operating agreement between the Client and Hyatt Hotels, which included the planning and implementation of administrative tools and procedures, human resources planning, recruiting and training, marketing, and preparation of annual operating plan.



<b>Client</b>	Urban Development Corporation of Trinidad & Tobago Ltd. (UDeCOTT)
<b>Architect</b>	TVS International
<b>Our services</b>	Project management, owner advocacy, development management, design review, analysis and recommendation, commissioning services
<b>Project status</b>	Completed in 2008

## PARK HYATT AT ONE57, ROOMS WITH VIEWS IN ONE OF MANHATTAN'S TALLEST RESIDENTIAL BUILDINGS NEW YORK, USA

One57 is one of Manhattan's tallest residential buildings and one of the most desirable addresses in New York City. The 1,004ft tower includes luxurious condominiums and the new flagship Park Hyatt Hotel, which occupies the first 18 storeys of the building. The hotel's 210 guest rooms, including 92 luxury suites, are among the most spacious in New York.

The structural design had to accommodate the many requirements of the building users, with the best possible layouts for apartments and for the hotel, including a triple-height swimming pool at the top of the hotel.

We incorporated the latest innovations in high-rise structural engineering to successfully meet numerous challenges. Our design had to manage the requirements of the L-shaped site and the upper stories were set back in keeping with Manhattan zoning laws that limited the area of buildings at higher levels. The most advanced high-performance concrete was specified for the shear walls and columns to support the tower's slenderness and unique shape. A liquid damping system was used to mitigate lateral movement.

<b>Client</b>	Extell Development Company
<b>Architect</b>	Christian de Portzamparc; SLCE Architects
<b>Our services</b>	Structural engineering
<b>Project status</b>	Completed in 2012



# REWARDING INVESTMENTS

LUXURY AND VALUE SHOULD GO HAND IN HAND,  
FOR HOTEL OWNERS AS WELL AS GUESTS.



From family days in the sun to thrilling casino wins, or simply the best night's sleep you can remember, hotels are places for priceless experiences. But owners and operators are well aware of the costs entailed in creating them. Finding value for money in construction and beyond is key for all players in the high-pressure world of hospitality.

At WSP | Parsons Brinckerhoff, we are experts in efficiency. With tight coordination and cutting-edge software, we manage ambitious deadlines and challenging sites to make sure our clients see great results fast, without compromising guest comfort.

And we use the latest advances to optimise performance for decades to come. Whether we're creating extra space with thinner floors or reducing energy bills with state-of-the-art building services, we know how to get the most out of assets – because investments should generate returns, even in paradise.



## GALAXY MACAU

### MEETING MARKET NEEDS ON THE BOOMING COTAI STRIP MACAO, CHINA

The Galaxy mega resort is a significant addition to the rapidly-expanding Cotai Strip, one of the world's largest gambling hubs. It is Galaxy Entertainment Group's flagship development and an important focal point for entertainment, leisure and shopping in Macao.

The first phase of development, completed in 2011, consists of three five-star hotels, entertainment and gaming facilities, food and beverage outlets and a high-end shopping area across a 224,000m site. It also includes the world's largest skytop wave pool, two outdoor heated pools and an indoor pool for each hotel, plus a private pool/jacuzzi for each of its luxury villas. Phase 2 opened in 2015 and includes a casino, retail, two luxury hotels with a total of 1,300 deluxe guest rooms and suites, food and beverage, several swimming pools, a spa and a man-made lazy river.

We were responsible for the design of all building services associated with the development of both phases and supervised their installation, overseeing every aspect of mechanical, electrical, plumbing and fire services systems from concept design to final commissioning.

The greatest challenge was the development size and complexity of the projects combined with ambitious timescales and frequent design changes to respond to market demands. The design had to be flexible to meet any changes to the retail units and to the arrangement of gaming tables and VIP rooms. Planning of services infrastructure was another major challenge for the casino areas, which operate non-stop, meaning that any maintenance or system modification had to be done in the back-of-house areas without affecting the casino operation. Few manufacturers were able to meet the demands of more than ten thousand HD CCTV surveillance cameras combined with high-speed, super-quality and vast-volume signal transfer. Our team worked with some of the leading manufacturers to develop an optimum solution for the owner in terms of cost and quality.

A fire engineering approach was adopted to provide an optimal solution for dealing with the large compartment and safe evacuation of occupants in such a mega development.

The Phase 2 development also obtained LEED® Gold certification. As the LEED consultant we provided significant guidance and education to the design team, construction management teams, builders, trade contractors and the client's project and operation teams. This is the first mega development in Macao to obtain the Gold award.

<b>Client</b>	Galaxy Resort & Casino
<b>Architect</b>	Simon Kwan & Associates Ltd. (Phase 1), Wong & Ouyang (HK) Ltd. (Phase 2)
<b>Our services</b>	Building services, fire, LEED certification, sustainability design
<b>Project status</b>	Completed in 2011 (Phase 1), 2015 (Phase 2)



## GRAND HYATT INCHEON HOTEL (WEST TOWER)

A PROJECT DELIVERED ON TIME, DESPITE A SIGNIFICANT DESIGN CHANGE

INCHEON, KOREA

In 2015 the Hyatt Regency hotel adjacent to Incheon International airport rebranded as the Grand Hyatt Incheon Hotel, following the construction of a new wing, the West Tower. This US\$235 million extension added 522 new guest rooms to the hotel, bringing the total number of rooms, suites and residences to 1,022. In addition the West Tower features a 1,250m<sup>2</sup> ballroom, a café, lounge, two swimming pools and a play area for children.

As construction manager, we had significant responsibility for meeting the client's critical, fixed deadline. We were also chosen to provide LEED consulting services to the architect. The project is targeting LEED Gold certification. In addition, we served as the design manager during the design phase, coordinating everything among all the project team members.

A significant challenge was a major design change late in the process, which threatened to delay the hotel opening. In order to upgrade the hotel to a Grand Hyatt, which has higher-end bathroom finishes, the client requested a redesign of the bathroom layout in each room to add a separate shower room. This required the dismantling of the waterline pipes, 60% of which had already been constructed and configured to previous specifications, and cutting into the slab

to accommodate the new bathroom layout. This would normally be done using steel bars, but due to our time constraints, we used an alternative carbon fabric method to help stay on schedule. We were able to coordinate these changes with all stakeholders, thus mitigating negative impacts to the projects budget and schedule.

To mitigate aircraft noise from the nearby airport, we worked with the architect, Gensler, early in the design stage, to develop a successful plan. We conducted a noise simulation test to determine the necessary curtain wall thickness to abate the noise. Tests showed that this should be 57mm thick, instead of the normal 24mm for a conventional outer wall for the building.

We were also responsible for safety during construction, and held weekly meetings with the general contractor and project safety manager to discuss work activities and how the processes and procedures should be improved or modified to meet safety expectations and goals. We are proud that there were no construction accidents during the project.

- Client** KAL Hotel Network Co Ltd (KHN) – a subsidiary of Korean Air Lines / Hyatt Hotels and Resorts
- Architect** Gensler
- Our services** Construction management, environmental consulting (LEED Gold)
- Project status** Completed in 2015

## MELBOURNE CONVENTION AND EXHIBITION CENTRE AND HILTON SOUTH WHARF HOTEL

GREEN PIONEER SETS NEW BENCHMARK FOR WATER RECYCLING

MELBOURNE, AUSTRALIA

The iconic Melbourne Convention and Exhibition Centre is the biggest of its kind in the southern hemisphere and an indisputable leader in environmentally sustainable design. The development includes the 18-storey, five-star Hilton Hotel, with 364 rooms and deluxe suites, as well as a direct factory retail outlet (South Wharf) connected to the Convention Centre.

The Convention and Exhibition Centre – the first project to receive a 6 Star Green Star Pilot rating from the Green Building Council of Australia – includes a 5,000-seat plenary hall which can be subdivided into three self-contained theatres, plus 32 meeting rooms and a grand ballroom. The Plenary Hall features an innovative and low-energy underfloor displacement ventilation system, which maximises flexibility while maintaining high levels of comfort inside. The pre-function space adjacent to the Plenary Hall includes energy-saving air displacement systems, along with significantly greater ventilation rates than industry standards thereby offering a space with better than average indoor comfort conditions

We provided an integrated service to this landmark green development, including all building services, as well as structural, sustainability consultancy and architectural lighting. We also provided all engineering services and specialist environmental services for the South Wharf Retail and Hilton Hotel, with involvement from the bid phase (PPP Development) through to final delivery.

The project features a black water treatment plant. Other green attributes include the largest use of FSC certified timber in Australia, solar panels for hot water provision and building sensors that detect natural light and adjust lighting levels to conserve energy.

- Client** Brookfield Multiplex/Plenary Group Consortium
- Architects** Bates Smart, Daryl Jackson, Perrot Lyon Mathieson (original build), NH Architecture, Woods Bagot (upgrades)
- Our services** Structural, building services, vertical transportation, fire safety and protection, audio-visual, sustainability and lighting
- Project status** Completed in 2009





Lighting designer 'Bates Smart'

## THE CROWN ENTERTAINMENT COMPLEX

SUPPORTING THE LONG-TERM EXPANSION OF AUSTRALASIA'S LARGEST CASINO  
MELBOURNE, AUSTRALIA

The Crown Entertainment Complex is the largest single building to be constructed in Australia. It includes the largest casino in Australasia, in addition to high-end retail, cafés, restaurants, accommodation, cinemas, live shows and music venues all under one huge roof.

We have been working with Crown in Australia for nearly 19 years and has delivered on 450 projects since our first involvement in the design and development of the complex in 1993. The complex opened its doors to the public in 1997.

These include the Crown Casino itself, where the key challenge was to create a 'World's Best' facility over a 5-hectare site with an extensive range of building types, uses and flexibility of purpose, ahead of knowing what the final space, occupancy and associated technical details would be.

Linked to the Entertainment complex via an air bridge is the Crown Promenade Hotel and Conference Centre. This luxury hotel required the highest standards of engineering services to ensure the quality of accommodation established by Crown in the main Crown Complex and Crown Towers Hotel.

We were responsible for the upgrade of the central chiller plant, one of the largest chiller plants to be installed in a commercial building in the Southern Hemisphere. This has not only ensured the future growth of the casino, but has also increased the energy efficiency of the existing plant and significantly improved occupant comfort within the building.

The most recent major project is the Crown West End Redevelopment project, to expand the gaming, dining and entertainment facilities on level 1 of the western end of the Melbourne complex and the wholesale upgrade to the services to the ground floor main gaming area. These constitute one of the largest single projects to be undertaken by Crown Melbourne Ltd since the Entertainment Complex opened.

<b>Client</b>	Crown Melbourne Ltd
<b>Architect</b>	Original Build: Bates Smart, Daryl Jackson, Perrot Lyon Mathieson NH Architecture, HBO+EMTB
<b>Our services</b>	Building services, vertical transportation, fire, architectural lighting
<b>Project status</b>	Ongoing



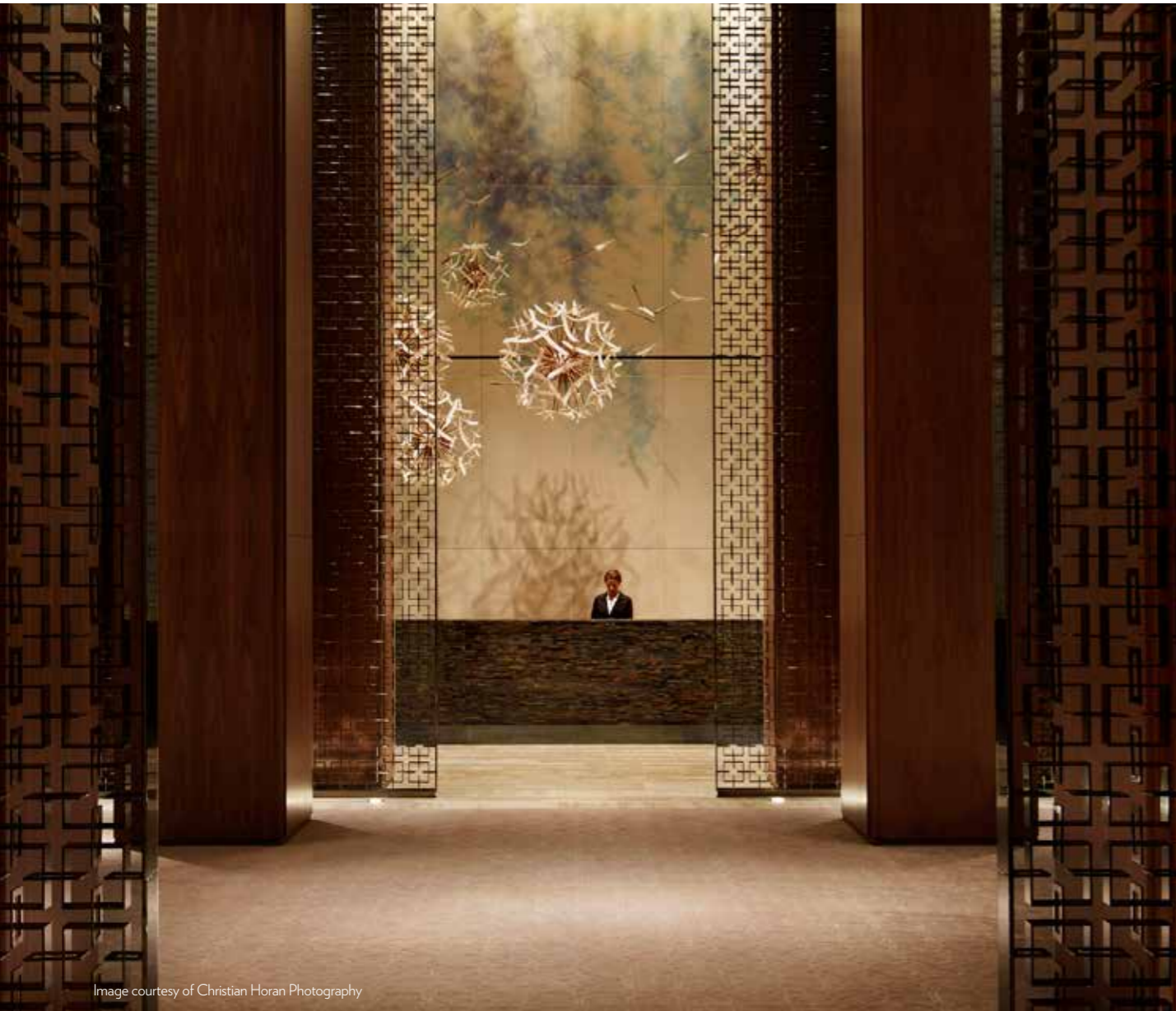


Image courtesy of Christian Horan Photography

## FOUR SEASONS HOTEL AND RESIDENCES TORONTO

ENERGY-SAVING DESIGNS FOR A TORONTO LANDMARK  
TORONTO, ONTARIO, CANADA

The Four Seasons Hotel and Residences is a Toronto landmark, soaring 55 storeys in the heart of Yorkville, downtown Toronto's up-market shopping and restaurant quarter. This award-winning, luxury development has 259 hotel rooms and 210 private condominiums, a two-storey spa, restaurant, café and event spaces.

Our full building services design for the hotel includes a centralised chiller plant for the hotel with an independent heat pump system for the residences, and a combined centralised boiler plant serving both the hotel and residences. We incorporated energy-saving features such as intelligent thermostats for guestrooms, heat recovery on air handling units, high-efficiency LED and cold cathode lighting in selected areas, and low-flow plumbing fixtures in back-of-house areas. All meeting and function rooms are equipped with integrated audio and video projection systems, and the security system features IP-based integrated card access and a CCTV system.

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**Client** Four Seasons Hotels and Resorts; Menkes Developments  
**Architect** architectsAlliance  
**Our services** Building services  
**Project status** Completed in 2012

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## RADISSON BLU ST MARTIN

TROUBLESHOOTING IN PARADISE, WITH SWIFT SOLUTIONS

ST MARTIN, FRENCH WEST INDIES

The luxurious Radisson Blu Resort on the Caribbean island of St Martin was recently purchased by RIU Hotels and resorts and renamed RIU Palace. The property opened under the Radisson flag in December 2008 and was converted to the upscale Radisson Blu brand in 2010. In an exquisite seafront location, the 252-room resort includes several restaurants, bars and swimming pools, plus a spa, marina and conference centre.

We were brought in to audit the hotel's heating, ventilation and air conditioning systems one year after refurbishment following discovery of significant problems in early operation. As a result of our findings, we were retained by owner Carlson to provide technical advisory support through an insurance expertise procedure that reviewed responsibilities through the prior design-build activities.

The severity of the problems forced the hotel to close to undergo major repairs. We were commissioned to improve hot water production, in order to meet with by-laws and operational standards, and to re-engineer the main high- and low-voltage system in order to increase and secure the level of availability.

The remote location of the resort, combined with difficulty sourcing local contractors in an island micro-market concerned by the project's perceived woes, complicated the procurement of remedial works.

Despite this challenging environment, we delivered complete design documents in record time. Our team then supervised the works, which were conducted in less than a year to minimise hotel shutdown.

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**Client** Carlson  
**Our services** Building services  
**Project status** Completed in 2011

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**CITIZEN M GLASGOW**  
**MODULAR CONSTRUCTION AND**  
**SMART FIRE ENGINEERING HELP**  
**EXTINGUISH COSTS**  
 GLASGOW, UK

The citizenM hotel group focuses on providing affordable luxury to customers, delivering stylish design and a vibrant atmosphere at great value. Its hotels are built around bedroom 'pods', manufactured off-site before being stacked together to form the complete structure. The eight-storey, 198-room Glasgow hotel features six floors of modular bedroom units over communal hotel space and shops on the ground and first floors.

We provided civil, structural, mechanical and electrical engineering services to the project, as well as fire engineering design. We identified a team experienced in both modular off-site construction and the hotel sector to ensure the best service to the client, who demanded a rapid construction process to hit operational deadlines.

The hotel opened on time and on budget, despite challenges arising from the confined urban location, cramped underground services and difficult ground conditions. Our 3D modelling of the entire structure, to allow upfront visualisation and clash detection, helped this process, as did positive and open communication within the design team.

Our fire engineering work included a detailed structural analysis of the steel frame and pod design to rationalise fire protection of the steel elements, creating significant savings in construction costs without compromising occupant safety. As well as specific work on the Glasgow hotel, we provided fire-engineering support for the development of citizenM's standard designs.

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<b>Client</b>	citizenM
<b>Architect</b>	Keppie
<b>Our services</b>	Civil, structural, mechanical, electrical, fire
<b>Project status</b>	Completed in 2010

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**HILTON MANCHESTER**  
**DEANSGATE, BEETHAM**  
**TOWER**  
**A SLENDER STRUCTURE**  
**PACKED WITH VALUE**  
 MANCHESTER, UK

The 170m-high Beetham Tower is an iconic landmark in the centre of Manchester and the city's tallest structure. Slender and predominantly glazed, the 48-storey building houses the Hilton Manchester Deansgate hotel in its lower 23 floors. Residential apartments occupy the upper sections.

Working closely with the architect, our structural engineers made possible the slimline design, which incorporates a 4m cantilever at level 23, providing an interesting line to the façade and delineating the upper residential portion of the building. Next to the main tower, a five-storey steel-framed podium contains the hotel ballroom plus restaurants, bars and plant room.

Our emphasis on efficient design made full use of the space and delivered maximum value to the developer. For example, thin post-tensioned slabs were used on the residential floors, boosting the number of storeys in the tower, while a combined heat and power plant helped defeat the energy efficiency challenges of the fully glazed façade. Innovative fire engineering resulted in a 50% reduction in the number of escape cores in the main building and our structural designers positioned every element so as to provide maximum contribution to the building's lateral restraint.

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<b>Client</b>	Beetham Organisation
<b>Architect</b>	Simpson Haugh and Partners
<b>Our services</b>	Geotechnical, structural, building services, fire, environmental consultancy
<b>Project status</b>	Completed in 2006

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## THE ROYAL ATLANTIS RESORT AND RESIDENCES

A SECOND ATLANTIS RESORT FOR DUBAI  
DUBAI, UAE

Located on the crescent of The Palm and adjacent to the existing Atlantis, The Royal Atlantis Resort will stand 46 storeys tall and feature spectacular views of the ocean, The Palm itself and the Dubai city skyline.

The project will include an approximate total investment of US\$1.4 billion in the resort expansion and amenities; 780 new guest rooms and suites; 232 luxury residences; exciting restaurants and entertainment experiences, as well as new retail offerings; and a swimming pool 90 metres above The Palm, offering unrivalled Dubai city views.

We are providing a broad range of engineering and environmental consultancy services. We have been involved in the earlier concept and schematic design stages of the project, and this subsequent appointment involves design development, construction documentation and tender support.

The design of the building's complex structure requires an innovative engineering approach that utilises a hybrid of concrete, steel, and post tension concrete construction techniques.

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<b>Client</b>	Kerzner International
<b>Architect</b>	KPF; interior design: GA Design (the resort), SM Design (the residences)
<b>Our services</b>	Structural, building services, vertical transportation, security, ICT, communications, utilities, parking, geotechnical, waste management, façade engineering, access and sustainability
<b>Project status</b>	Ongoing

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## HOTEL LA TOUR A MODERN CLASSIC HOTEL DESIGN IN BIRMINGHAM CITY CENTRE BIRMINGHAM, UK

Hotel La Tour is a 4-star hotel in Birmingham city centre. The hotel boasts highest quality and luxury finishes with 174 bedrooms, 450m<sup>2</sup> of conferencing facilities, a restaurant, bar and gym. The £24 million development was opened in March 2012 and was the first of a new UK chain. The hotel extends to eight storeys above ground with one level semi-basement.

This was the first development to get underway in the city's Eastside district and is in close proximity to the existing business and retail districts and to the proposed site for the HS2 rail terminal.

The centre piece at Hotel La Tour Birmingham is an ultra-high-strength concrete helical staircase achieved by a special silica-fume mix to achieve slender and elegant sections. We specified this Danish-manufactured staircase in response to the client's desire for a stand-out feature. It is believed to be the first of its kind in a commercial building in the UK.

The structural engineering solutions we provided played a vital role in delivering this successful landmark building. There were extremely tight design and construction programmes, with just 16 months on site, so an optimised concrete frame solution utilising in-situ, post-tensioned and off-site precast concrete was developed

The site itself was a key driver, requiring optimum use of a small, triangular sloping shape, surrounded by busy traffic. Solidity and good acoustics were also paramount. Sustainability was important to the client and the good thermal mass, combined with a gas-heated VRF air conditioning system have kept running costs down. The clever use of structural form earned us the Institution of Structural Engineers (IStructE) Midland counties award for the 'Leisure and Sport' category in 2013.

The success of the project can be seen in this luxury hotel which has become highly rated and a leading hotel and restaurant in Birmingham.

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<b>Client:</b>	Hotel La Tour
<b>Architect:</b>	pHp architects
<b>Our services:</b>	Structural, geotechnical, mechanical, electrical, drainage, public health, fire, acoustics
<b>Project status:</b>	Completed in 2012

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## JACOB K. JAVITS CONVENTION CENTER

RENOVATION OF ONE OF THE  
LARGEST CONVENTION  
CENTRES IN THE U.S.

NEW YORK, USA

Jacob K. Javits Convention Center, or Javits Center, is a large convention centre located on Eleventh Avenue between 34th and 38th streets on the west side of Manhattan in New York. As the 18th largest convention centre in the US, it hosts dozens of trade shows and conferences each year. The building was recently expanded in a major renovation project with a redesign aimed at upgrading organisation and efficiency, as well as occupant comfort.

We were retained to provide mechanical, electrical and plumbing systems design for the renovation.

Our work was based on numerous studies and the examination of envelope efficiencies and mechanical, electrical and plumbing system improvements. The goal was to achieve an approximate 25% improvement in energy consumption and LEED Silver certification.

All the major building mechanical, electrical and plumbing systems were upgraded and improved, including 100 roof-top air handling units serving the exhibition halls. The units sit on a completely new green roof with striking views of the adjacent high-rise buildings.

The new systems we designed have improved the indoor air quality, reduced ambient noise and significantly saved on energy consumption.

We continue to provide design services including mechanical, electrical, plumbing and fire protection for numerous miscellaneous projects as part of the general development of the convention centre. These include:

- HVAC upgrades to the show managers' offices, concourses and mezzanine of the Crystal Palace
- Whole infrastructure assessment
- Upgrade and modernisation of Level 1 and 2 meeting rooms
- Utility and master planning for the overall site and northern site expansion
- Environment and infrastructure advice for energy and resource use
- Sustainable design opportunities advice for green approaches for energy and resource conservation




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<b>Client</b>	Empire State Development Corporation
<b>Architect</b>	FXFOWLE Epstein
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2013

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## 30 PARK PLACE

### SUPER-SLIM FOUR SEASONS HOTEL AND RESIDENCES

#### NEW YORK, USA

30 Park Place will be a Four Seasons hotel, featuring a restaurant and private residences in Tribeca, Manhattan. The property will include a 189-key hotel, over 15 per cent of which will be suites, crowned by a 3,500ft<sup>2</sup> Royal Suite. Hotel amenities will include a fitness room, swimming pool and a children's playroom. Above the hotel will be 157 residences, ranging from one to six bedrooms.



Our structural solution is designed to facilitate the different uses of the building, which has a slenderness ratio of 1:10.5. There are several floor set-backs at different locations up the height of the building which, along with the architectural layouts, are accommodated through the use of column transfers achieved by using a thicker slab and 'walking columns'. The typical residential floor slabs are nine inches thick, supported by exterior columns and core walls, giving architectural freedom to change the layouts without any structure interruptions.

The structure is a reinforced cast-in-place concrete construction. The building is supported on columns and shear walls formed around the elevator shafts, staircases and along a few divider partitions between the hotel and residential units.

The building is served by a single electric chiller plant that serves both the residences and the hotel. Utility steam is used directly and indirectly and revenue grade submeters are being used to invoice the hotel and residence for their energy consumption. The hotel and residences are heated and cooled with ceiling concealed fan coil units and ventilation air is provided to both the hotel guestrooms and the residential units. The fan coil units exhaust and supply systems serving each residence and hotel guestroom and are controlled using custom sequences that optimize comfort and energy consumption. Due to the use of these controls, shaft sizes are reduced to a minimum improving building efficiency and capital cost. The building is pending LEED Gold certification.

At the upper floors the shear walls are formed around the elevator shafts and staircases only. At the mechanical floor, a belt wall was created engaging all the perimeter columns to the central core via outrigger walls (two in each direction, total of eight outrigger walls) to stabilise and stiffen up the building.

<b>Client</b>	Silverstein Properties
<b>Architect</b>	Robert A.M. Stern Architects / SLCE Architects
<b>Our services</b>	Structural engineering and building services
<b>Project status</b>	Due for completion in 2016

## VIETINBANK

### NEW LANDMARK FOR HANOI

#### HANOI, VIETNAM

A striking pair of triangular landmark towers anchor the VietinBank Business Center – a 300,000m<sup>2</sup> mixed-use development in Hanoi designed in collaboration with Foster + Partners. The 68-storey, 365m office tower will be home to VietinBank, one of Vietnam's largest banking groups. The second, 48-storey, 225m tower will house a five-star hotel, spa and serviced apartments. The towers are linked by an eight-storey podium building, which contains shops, cafés and restaurants and is topped by roof buildings.

We are the structural designer for the entire project. Each tower has a similar triangular configuration.

For the office tower, concrete cores at the three corners of the triangular plan are linked by steel bracing wrapping the full-height central atrium, and by steel perimeter transfer trusses over four-storey sky gardens, creating dramatic 50m column-free exterior vistas.

The concrete hotel tower has a full-height atrium along one side, known as the 'green spine', created by exposed space trusses spanning 32m horizontally to support its expansive face of windows.

<b>Client</b>	VietinBank
<b>Architect</b>	Foster + Partners (Design); Vinaconex (Architect of Record)
<b>Our services</b>	Structural engineering
<b>Project status</b>	Due for completion in 2018



Image courtesy of Foster+Partners

## MOSCONE CONVENTION CENTER

STAYING OPEN FOR BUSINESS  
DURING ENERGY-EFFICIENT  
EXPANSION

SAN FRANCISCO, USA

The Moscone Convention Center is the largest convention and exhibition complex in San Francisco, California. It has been extended a number of times since its construction in 1981, and is currently being expanded again.

The current project will add 317,000ft<sup>2</sup> to the existing building, including a new ballroom, meeting rooms, kitchen and support spaces. A total of 520,000ft<sup>2</sup> of contiguous exhibit space will also be added by connecting the below-grade portions of the North and South buildings. The construction will occur over multiple phases, while maintaining continuous operation and revenue throughout the expansion.

We are providing the mechanical, electrical and plumbing systems for the expansion, bringing to the project the full benefit of our flexible approach and understanding of the user experience.

We analysed the existing mechanical, electrical and plumbing utilities and systems to deliver a design that leverages available system capacity to optimise the project budget. The project is on track to meet the LEED Platinum goal, and is proud to export reclaimed water to its neighbours, in support of its Net Zero Water objective.

We are designing the building to track energy and water performance, providing valuable feedback to the building operators, as well as a performance report card to convention planners. This allows them to compare with prior years and similar conventions and will support behavioural changes that will improve the building operations and user experience.

Previously we engaged on a two year, \$56M renovation of the existing interior and building systems within the North, South and Esplanade buildings. This involved an upgrade of public spaces, lobbies, meeting rooms, ballrooms and public cloakrooms. It also included replacement of cooling towers and air handling units, a building management system (BMS) and fire alarm upgrades.

The high-performance systems we designed were instrumental in the project's achievement in receiving a LEED-EB Gold certification in October 2012.

In addition we were engaged on an Energy Efficiency Upgrade project for the centre with Jones Lang LaSalle. This was modelled on the Empire State Building energy efficiency upgrade, which delivered 38% energy savings and a three-year payback.

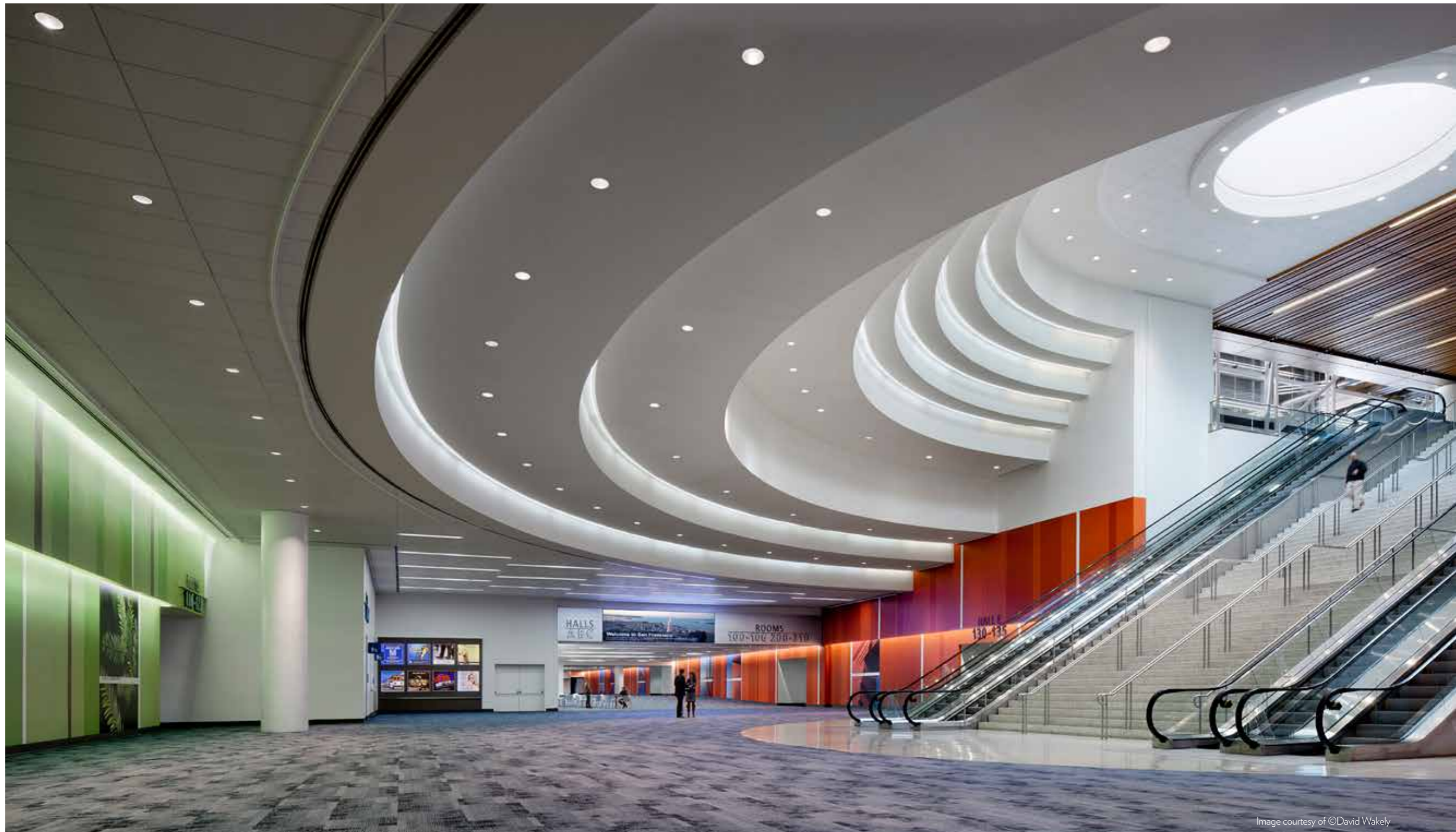


Image courtesy of ©David Wakely

<b>Client</b>	Renovation: HOK Expansion: SOM
<b>Architect</b>	Renovation: HOK Expansion: SOM
<b>Our services</b>	Building services, fire protection, energy efficiency upgrade
<b>Project status</b>	Renovation: Completed in 2013 Expansion: Completion due in 2018

# INVENTIVE SOLUTIONS

THE RELAXATION CAN BEGIN WHEN THE PROBLEM SOLVING ENDS.



Building top-notch hotels in dramatic locations is no easy task. Our clients face challenges from steep mountain terrain and poor quality soil to extreme climates and flood-prone plains – all on top of the demanding aesthetics of a first-rate facility.

But such obstacles are often a hotel's greatest assets too. Stunning views, far-flung locations and adventurous activities draw in visitors and give them experiences to remember and share.

That's why WSP | Parsons Brinckerhoff is dedicated to finding the right solution for every project, making use of the latest available techniques. Our global team of engineers has the experience, ingenuity and resolve to crack the hardest of sites and toughest of briefs, allowing guests to enjoy their surroundings comfortably and safely, in every corner of the world.

## RAFFLES PRASLIN, SEYCHELLES

### SELF-SUFFICIENT LUXURY ON A REMOTE ISLAND PARADISE PRASLIN, SEYCHELLES

Raffles Praslin is a luxury hotel and residential development in secluded Takamaka Bay on the island of Praslin. The award-winning resort has 86 hillside villas, five luxury residential villas, staff accommodation and a main hotel building incorporating restaurants, bar, business centre, administration offices and back-of-house facilities. It also features a spa with 13 treatment pavilions, pool with bar and restaurant and a kids club.

We were appointed to design and coordinate the complete suite of building services including mechanical, electrical, plumbing and stormwater engineering, plus ICT. Our team had responsibility for design, tender and implementation, as well as coordination with other consultants.

A major challenge was the remote location of the resort, which has to be self-sufficient with regards to water and power. Our wet services design included a seawater desalination plant to provide potable water for the whole complex, as well as a sewerage treatment plant, facilities for hot water generation, storage and distribution, plus soil and waste drainage. As part of our electrical design we incorporated diesel generators to provide all the power for the resort, while a cutting-edge air conditioning system provides efficient, reliable and energy-saving cooling to all areas.

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<b>Client</b>	Kingdom Hotel Investments
<b>Architect</b>	WATG, Macbeth Architects + Designers
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2011

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## SHANGRI-LA HOTEL, GUILIN

### MODERN FLOOD PROTECTION MEETS MING-DYNASTY DESIGN GUILIN, CHINA

The Shangri-La Hotel in Guilin is an international five-star hotel located on the banks of the picturesque Li River. The 449-room, eight-storey building also has 17 luxury suites, a food and beverage area and health club, plus indoor and outdoor swimming pools, meeting and conference facilities and a grand ballroom. We provided building services engineering from concept through to completion.

A key design requirement came from the high tide levels recorded for the Li River in recent years, necessitating flood-prevention measures to provide a safe environment for guests and staff. We devoted considerable effort to concealing and integrating the drainage system into the buildings to avoid compromising the architecture. This follows the style of Guangxi region, with the pitched roof and carved pattern windows characteristic of the Ming and Qing dynasties.

Our team also conducted a life cycle analysis of all mechanical, electrical and plumbing systems before selection to achieve the most cost-effective approach. An integrated steam boiler, electrical chiller and absorption chiller system were installed to utilise waste heat and provide a reliable system for air conditioning and heating.

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<b>Client</b>	Shangri-La Hotels and Resorts
<b>Architect</b>	Wong Tung International Ltd.
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2010

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**CAESARS WINDSOR**  
 MAJOR EXPANSION FOR  
 GREATER VISITOR APPEAL  
 WINDSOR, ONTARIO, CANADA

Caesars Windsor is located on the riverfront at Windsor, Ontario, overlooking the Detroit skyline near the Canadian end of the Detroit-Windsor Tunnel. The casino draws around 6 million visitors each year from Ontario, Michigan, Ohio, Illinois and elsewhere in the Midwest United States.

Having been involved in the design of the first phase of the casino, which opened in 1998, we went on to provide structural engineering services for a \$300M expansion programme in 2007-2008 to attract more visitors with a more resort-style appeal.

The 900,000ft<sup>2</sup> project included the Augustus Tower, a new 27-floor hotel with three levels below grade housing mechanical and electrical services and parking. This tower consists of cast-in-place concrete structures stabilised by concrete cores. The north end of the building has 7m cantilevers and is supported by a post-tensioned beam grid system.

The project also added a two-storey, 90,000ft<sup>2</sup> entertainment centre containing ballrooms, banquet halls and conference rooms. Steel trusses over the entertainment centre span 61 metres and are designed to meet the acoustical requirements in the theatre and support the ballrooms above. The building is constructed on rafts, which are anchored to the ground to resist uplift forces. Renovations were also completed to the entrance and the rotunda area of the existing hotel.

<b>Client</b>	Ontario Lottery and Gaming Corporation
<b>Architect</b>	WZMH Architects Inc.
<b>Our services</b>	Structural engineering
<b>Project status</b>	Completed in 2009

**DISTRICT GRIFFINTOWN  
 – BLOCK 10**

BREATHTAKING VIEWS FROM  
 A TOP-FLOOR POOL  
 MONTREAL, QUEBEC, CANADA

District Griffintown – Block 10 stands at the heart of Griffintown, the stylish new neighbourhood currently under construction in Montreal. This residential complex comprises an 18-floor hotel, restaurants and retail with a further 20 floors of apartments. It displays some impressive technical achievements including a huge ‘floating’ concrete structure above the built-up lowlands of the St Lawrence River.

Other interesting features include an ‘urban chalet’ and top-floor pool with spectacular views over the Old Port of Montreal. The ground floor allows direct access to the Lachine Canal Lineaire Park.

As structural engineer, we worked with the client and architects from the earliest project stages, conducting feasibility studies, construction cost management, conceptual design and design workshops, and we remained involved during construction and commissioning. Our innovative solutions, particularly in terms of seismic technology, helped meet all challenges posed by the mixed-use space and architectural vision.

<b>Client</b>	Devimco Immobilier/Groupe Germain
<b>Architect</b>	Lemay Associates
<b>Our services</b>	Structural engineering
<b>Project status</b>	Completed in 2013



## SHAHDAG RESORT GRAND HOTELS

TACKLING SUPREME HEIGHTS,  
PLUNGING TEMPERATURES AND  
A SPECIFICATIONS CLASH  
GUSAR, AZERBAIJAN

The Shahdag Mountain resort complex opened in 2012 as Azerbaijan's first and largest ski resort in the Greater Caucasus range near Shahdag National Park. In addition to state-of-the-art skiing, the resort offers a golf course and access to numerous mountain sports and activities.

We provided mechanical, electrical, plumbing, fire design and ELV services to the complex's Palace hotel and the first of its Five Star hotels. Our work also included traffic engineering and acoustics reviews for both buildings, in a role spanning concept design through to completion.

We took the building services design from concept to tender in six months, coordinating with an international design team as well as the Baku-based client. Services were then redesigned, tendered and built in less than two years.

The project's major challenge was its remote location: a mountainous region 1,640m above sea level, where temperatures range from 29°C to -20°C. In addition, its hotels are built to Four Seasons and Marriot specifications, which relate to American and British standards rather than local criteria. All fire designs also had to comply with NFPA standards. A compromise had to be found and our team played a key role in producing a utilities infrastructure report to gain local authority approval.

The outcome for the client is two world-class hotels, which, despite the far-flung location and harsh environment, were built on time and budget.

<b>Client</b>	Pasha Inshaat LLC
<b>Architect</b>	ReardonSmith Architects, DSA Architects
<b>Our services</b>	Building services, fire design, ELV services, acoustics, traffic
<b>Project status</b>	Palace Hotel completed in 2013, Five Star Hotel completed in 2014



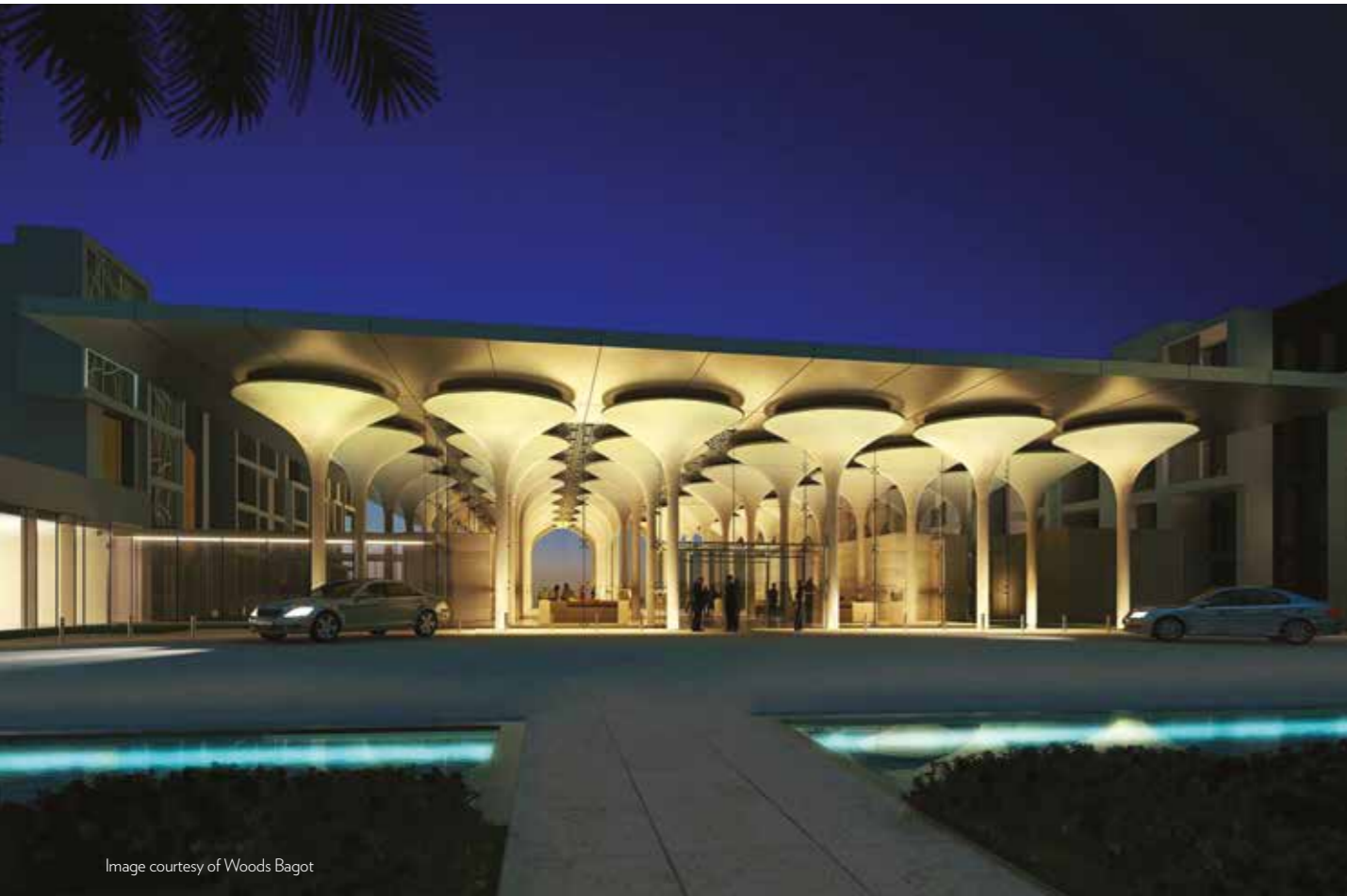


Image courtesy of Woods Bagot

## SARAYA BANDAR JISSAH MOUNTAIN-EDGE DINING THANKS TO SOME GEOTECHNICAL GENIUS MUSCAT, OMAN

Our team completed the ground investigation design for the beach and mountainside hotel structures, with a solution comprising rock planar sliding assessments, rock anchor design and foundation design. We also carried out geotechnical design and analysis to enable the positioning of the showcase cliff-edge restaurant, which offers spectacular views out over the sea.

Saraya Bandar Jissah is an integrated residential and leisure development to the south east of Muscat on Oman's coast. It includes two hotels, five residential zones, a recreational centre and park.

We were engaged in a multidisciplinary design role for the resort's new five-star boutique hotel, to be operated by Dubai's Jumeirah Group. Our work for the 106-room project covered structures, building services, roads and utilities, waste management, vertical transportation and geotechnical services.

One of the hotel's central features – and biggest engineering challenges – is its terraced, mountainside location, which is key to providing a unique experience for guests. Structured on three levels flowing down to the beach, the design is based around a traditional Omani village, in harmony with its natural surroundings.

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<b>Client</b>	DSA Architects/Saraya Bandar Jissah
<b>Architect</b>	DSA Architects
<b>Our services</b>	Structures, building services, roads & highways design, utilities, waste management, vertical transportation, geotechnical, fire, life safety
<b>Project status</b>	Completion due in 2017

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## KEMPINSKI HOTEL, THE WAVE BEACHSIDE LOCATION CALLS FOR INNOVATIVE FOUNDATIONS MUSCAT, OMAN

The geometric, concrete and steel ballroom structure is dense and heavy, with wide openings at the bottom. The façade is supported at the base by a difficult configuration of diagonal concrete elements, requiring complex calculations of the load paths to carry the weight of this unique building.

Kempinski Hotel, The Wave is a forthcoming, five-star luxury beachfront complex which will form part of the first integrated resort and residential development in the greater Muscat region. Along with 309 rooms and suites and 68 serviced apartments, the hotel will offer fine dining options, meeting facilities and swimming pools, plus a spa, gym, ballroom, kids club and bowling facility.

We are providing multidisciplinary engineering design and consultancy for the project, including structural engineering, mechanical, electrical and plumbing, fire engineering, drainage and a range of specialist services.

The proximity of the development to the sea and poor soil conditions, coupled with the high cost of piling in the region, called for innovative foundation solutions, tailored to the specific ground conditions of each building. These included dynamic compaction of the soil topped by raft foundations for beachside structures and stone columns to support buildings further from the sea.

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<b>Client</b>	Oman Brunei Investment Company
<b>Architect</b>	Woods Bagot
<b>Our services</b>	Structural, building services, façade, vertical transportation, waste management, swimming pools and water features, LEED consultancy, construction supervision
<b>Project status</b>	Completion due in 2016

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## BULGARI HOTEL & RESIDENCES DUBAI

THIS EXCLUSIVE RESORT WILL PROVIDE JUMEIRA BAY ISLAND WITH STATE-OF-THE-ART HOSPITALITY

JUMEIRA BAY ISLAND, DUBAI

We have been appointed by Meraas, a Dubai-based holding company, as the lead consultant on the most exclusive development in Dubai – Bulgari Resort and Residences.

The Bulgari Resort and Residences will be an exclusive island development constructed on reclaimed land off the Jumeira neighbourhood coastline. The island is sculpted in the shape of a titanic seahorse and will be joined to the mainland by a single carriageway bridge.

The Bulgari Resort Dubai at Jumeira Bay Island, the fifth Bulgari Hotels and Resorts property in the world, will comprise 101 rooms and suites in the main hotel buildings, as well as 20 hotel villas and a full range of luxury hotel facilities.

Moreover, the project comprises 165 apartments, eight penthouses and 15 mansions, and common areas such as private landscaped gardens,

swimming pools and gymnasiums. Residents can also enjoy a host of dining and sporting options on site, including the 50-berth Marina and Bulgari Yacht Club, and benefit from the unmatched service standard of the adjacent Bulgari Resort.

We are playing a lead role on the project, providing a wide range of consultancy services. Since the project is an exclusive, and the development is the first of its kind in the Middle East, it required global expertise to deliver a sophisticated design with a unique ambiance and unprecedented levels of comfort, in addition to excitement and glamour.

- Client** Meraas LLC
- Architect** BBG – BBGM
- Our services** Geotechnical, acoustics, building services design, fire & life safety, integrated design management, roads & highways design, security consulting, structures design, transport integrated system (TIS), utilities design, vertical transportation

**Project status** Completion due in 2017



## ROSEWOOD ABU DHABI COMPLEX POWER DISTRIBUTION TO MEET MULTIPLE NEEDS ABU DHABI, UAE

Rosewood Abu Dhabi is a landmark luxury waterfront development on the emirate's fast-evolving Al Maryah Island. The 34-storey hotel contains 189 guestrooms and suites, around 140 serviced apartments, a spa, fitness centre and pool, plus high-end shops and an array of signature restaurants.

We designed the mechanical, electrical and plumbing and fire and life safety services for the hotel and also carried out the supervision of these services during the construction phase.

The Rosewood's mixed-use nature complicated the distribution of power and water. Our metering strategy had to take into account the need to separate the utilities supplies for the hotel, apartments, shopping and restaurant facilities, necessitating the installation of three separate risers.

A further challenge was handling over 80 design changes requested by the client during the construction phase, further complicated by the fact that the architect's design office was based in San Francisco, USA.

- Client** Rosewood Hotels & Resorts/ Mubadala
- Architect** Handel Architects
- Our services** Building services, fire and life safety
- Project status** Completed in 2013

## ANFA PLACE PROTECTING CLIFF TOP VIEWS WITH CLEVER VENTILATION CASABLANCA, MOROCCO

Anfa Place is a mixed-use development to the west of Casablanca, close to the city's affluent residential district of Anfa. Located in a magnificent setting on the Atlantic coast, the low-rise development creates an elegant new waterfront community, with high-end hotels such as the Four Seasons Hotel Casablanca and Pestana Casablanca hotel, residences, offices, shopping mall and underground car parking.

As well as civil and structural engineering, our team was engaged to provide building services design for the property, and our strategies were shaped by the challenging aesthetic and functional requirements of the signature architect. The development height was restricted to a maximum of 25 metres to protect the view from the cliff top behind the site, while the roof was designed as a public amenity place, restricting its use. Our solutions also had to suit a coastal and seismic environment.

Working closely with the project architects, we integrated the engineering plant into the building with minimal loss of usable built area while meeting the stringent aesthetic and acoustic brief. To minimise the building height we designed the car park ventilation system to use mechanical extract and natural make-up air, avoiding the need for cumbersome and obstructive ductwork.

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- Client** Inveravante
  - Architect** Foster + Partners
  - Our services** Mechanical, electrical, geotechnical, civil, structural, acoustics, fire
  - Project status** Completed in 2012
- 



## BULGARI HOTEL LONDON FIVE-STAR ENGINEERING FOR A TOUGH URBAN SITE LONDON, UK

The Bulgari Hotel London is a world-class development comprising a luxury hotel and apartments on the edge of Hyde Park in swish Knightsbridge. The property has a six-storey basement, the location for a column-free ballroom and swimming pool, and an 11-storey superstructure.

We acted as structural engineer on the hotel, which was built on a compact and highly constrained spot in a complex urban environment. Its design optimises the site's potential, tackling significant constraints below ground caused by the adjacent buildings, streets and infrastructure.

Key structural engineering strategies contributing to this effort included the use of embedded walls, plunge columns and top down techniques to construct the deep basement, extensive 3D modelling of the both the sub- and super-structures and reduction of structural floor depths to maximise floor to ceiling heights. A compact and robust main core also allows the best net-to-gross area ratio.

The building's green credentials were enhanced by use of post-tensioned slabs, cement replacement, geothermal piles and diaphragm walls, helping the Bulgari Hotel win the Concrete Society's 2011 Sustainability Award.

- 
- Client** Prime Development
  - Architect** David Walker Architects, Squire and Partners
  - Our services** Structural engineering
  - Project status** Completed in 2012
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## CITYCENTER

### ENERGY EFFICIENT COOLING IN NEVADA'S DESERT CLIMATE LAS VEGAS, USA

Spanning 76 acres, the vast CityCenter development has reshaped the Las Vegas skyline. The complex includes hotels, casinos, luxury apartments and shops, plus a convention centre and theatre.

We were responsible for the building services infrastructure in significant portions of the development, including the central plant and Block A hotel and casino complex. We also provided mechanical, electrical and plumbing engineering, telecommunications and security services for Block C, which hosts the Mandarin Oriental among other hotels, retail and entertainment facilities.

Despite the services required to maintain a comfortable environment in Nevada's desert climate, the complex is striking for its energy efficiency. The systems put in place by our teams were instrumental in winning CityCenter a LEED Gold rating.

To minimise emissions from the vast site, we designed a fully automated central plant to ensure efficient cooling and heating. Waste heat from an 8MW co-generation plant is used to fulfil a significant portion of the domestic hot water requirements of hotels, restaurants, spas and pools, while a heat exchanger enables pre and free cooling of chilled water. Energy-efficient lighting and low-flow plumbing fixtures are used throughout, while intelligent guestroom controls turn off lights, dial down air conditioning and close curtains when rooms are unoccupied.

We also tackled the common problem of tobacco smoke on the gaming floor, making CityCenter the first casino to use displacement ventilation to boost air quality. Air is supplied at floor level via systems incorporated into gaming table and slot machine bases, and the smoke is lifted by the buoyancy of the air and carried away. Since this was a new concept, our team rigorously tested and validated the approach, even constructing a life-size mock-up for research.

<b>Client</b>	MGM Resorts International and Infinity World Development Corp.
<b>Architects</b>	Pelli Clarke Pelli Architects, Foster + Partners, Jahn, Studio Libeskind, Kohn Pederson Fox, HKS, Adamson Associates Architects, Gensler
<b>Our services</b>	Building services, fire protection, telecommunications, security
<b>Project status</b>	Completed in 2009

## THE RENAISSANCE HOTEL AT WARSAW CHOPIN AIRPORT

### MECHANICAL DESIGNS FOR AN AIRPORT HOTEL WARSAW, POLAND

The Renaissance Hotel is a five-star luxury hotel to be developed within the Warsaw Chopin airport opposite the new Terminal T-2. The gently curved building has an aerodynamic shape with two functional areas – the hotel and conference facilities – interlinked by an internal circulation system consisting of a hall and foyer space at ground level. Constructed above an existing underground car park, the eight-storey building will feature 225 guest rooms, five conference rooms, a ballroom, swimming pool, spa, fitness centre and restaurants. When complete it will accommodate up to 400 guests.

We provided full scope of mechanical services design on all stages of the development, taking into account the investor's and the architect's requirements and the international standards of Marriott Hotels, owners of the Renaissance brand. The general design guidance was to create "a unique space, offering a warm, comfortable and welcoming space to the highest level of quality". Some of the mechanical solutions designed to ensure these standards include individual temperature control in the hotel rooms, acoustic suppressors on ventilation stacks to minimise noise between rooms, automatic temperature control in the pool area and underfloor heating. In addition, the fire ventilation system solutions comply with client requirements that exceed Polish building law design standards for medium to high buildings. Since the building exceeds six storeys, we designed additional smoke extraction facilities for fire ventilation, at a rate of eight air changes per hour (ac/h) in corridors and public areas bigger than 35m<sup>2</sup>.

<b>Client</b>	P.P. "Porty Lotnicze"
<b>Architect</b>	JEMS Architekci
<b>Our services</b>	Mechanical engineering
<b>Project status</b>	Under construction



Image courtesy of JEMS Architekci



# LEGACY AND VISION

PROGRESS MEANS PROTECTING THE PAST AS WELL AS THE FUTURE.



For communities, leisure is a serious business. A new resort or a refurbished hotel can bring immense value to an area and its economy, but blending the latest improvements with local history and landscape requires thoughtful and sustainable development.

At WSP | Parsons Brinckerhoff, we understand that sensitivity is a must, whether to the unique heritage of a century-old hotel or the fragile environment of a new beach resort. We tailor our skills and experience to suit the specific character and setting of every project, while maintaining the consistently high standards our clients are known for.

Through efficient design and pioneering technology, we also find ways to conserve precious water and energy, helping set sustainable benchmarks for contemporary hospitality and preserving resources for generations to come.



## THE PENINSULA PARIS

### RESTORING A HISTORIC HOTEL TO ITS FORMER GLORY

PARIS, FRANCE

The Peninsula Paris is a historic luxury hotel located on Avenue Kléber in an unparalleled location between the Arc de Triomphe and the Eiffel Tower. It opened as the sumptuous Hotel Majestic in 1908, and in 1936 the French government acquired the building to serve as an International Conference Centre for the Foreign Office. It's at this address that the Paris Agreement ending the Vietnam War in 1973 was signed as well as the Paris Agreements on Cambodia in 1991, and Kléber agreements signed after the northern rebellion in Ivory Coast in 2003. In 2008 the French government sold the building to the Qatari Diar firm, and following an extensive restoration that returned to its former glory, it reopened on August 1, 2014 as The Peninsula Paris, the famous hotel chain's first property in Europe.

We were retained by Peninsula's operator, The Hong Kong and Shanghai Hotels Limited, to act as local technical advisor and to provide the peer review for the mechanical and electrical design. In analysing the detailed design and tender package our priority was to ensure the building systems supported the exceptional standards of quality, comfort and design that are synonymous with the Peninsula brand. We were able to add value to the process through our previous experience as M&E design engineers for Peninsula hotels in Hong Kong and our ability to understand and work with the various construction cultures involved in this extremely complex refurbishment.

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<b>Client:</b>	The Hong Kong and Shanghai Hotels Limited
<b>Architect</b>	Richard Martinet
<b>Our services</b>	Building services
<b>Project status</b>	Completed in 2014

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## SHANGRI-LA HOTEL, YANGZHOU

DRIVING DOWN WATER DEMAND  
ON THE BANKS OF THE YANGTZE  
YANGZHOU, CHINA

The Shangri-La Hotel is the first international luxury hotel in the eastern Chinese city of Yangzhou. Located in the central economic development area, the 371-room, five-star hotel has a variety of restaurants, bars and meeting spaces, including a grand ballroom. Additional facilities include a Horizon Club executive lounge and a fitness centre with indoor swimming pool.

Yangzhou is a leader in environmental protection, having made significant efforts to restore the Yangtze River and built itself into a centre of solar technology development.

We provided building services engineering consultancy services to the development up to completion. We also acted as LEED consultant, ensuring that design and construction met international environmental standards and helping the project achieve a silver rating under the US Green Building Council's certification system.

As part of an integrated design process, we carried out extensive energy modelling as well as value engineering so that we could advise the design team on cost-effective strategies to improve the building's energy performance. For example, demand for potable water was greatly reduced through the installation of a greywater system to treat and reuse laundry wastewater for toilet flushing. Our team also conducted a life-cycle analysis of all mechanical, electrical and plumbing systems before selection.

This project built on our long-standing relationship with the Shangri-La brand, which spans more than two decades. In total we have completed around 20 Shangri-La hotels and resorts around the world, with many more under construction. The relationship is built on our record of consistently high standards and cost-effective solutions that respect the distinctive character of each individual project.

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<b>Client</b>	Shangri-La Hotels and Resorts
<b>Architect</b>	KKS International Co., Ltd
<b>Our services</b>	Building services, LEED consultancy
<b>Project status</b>	Completed in 2013

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## HOTEL VERDE GUIDING GUESTS TO GREENER BEHAVIOUR IN AFRICA'S ECO EXEMPLAR CAPE TOWN, SOUTH AFRICA

Hotel Verde, hailed as 'Africa's greenest hotel', is located 400 metres from Cape Town International Airport. The four-star hotel, with 145 bedrooms, conference facilities, restaurant and fitness centre, showcases some of the most advanced eco-friendly technologies, construction methods, procurement practices and operational approaches in Africa. It is 100% carbon neutral and the world's only hotel to boast a double platinum LEED rating.

We provided design management, supervision and cost control for all electronic services in the hotel. Our work covered areas including the Building Management System (BMS), CCTV, access control, transmission infrastructure and front-of-house lighting.

The client's ambition was to create a unique visitor experience, in which guests contribute to the building's sustainable operation. Key to this is its eco-conscious BMS, which interacts with the property's various energy-consuming systems and critical elements. An important step was creating the interface with each room's air conditioning system and providing financial incentives for guests to use it efficiently.

Our engineers also devised a feature whereby interactive televisions linked to the property management system welcome guests on arrival, before switching to the most efficient standby mode for periods when they are not in use.

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<b>Client</b>	Mario and Annemarie Delicio
<b>Architect</b>	Heinrich Gerstner Harding Architects
<b>Our services</b>	Electronics
<b>Project Status</b>	Completed in 2013

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## HOTEL GUAICAMACUTO

### A FOUR-STAR HOTEL BROUGHT BACK TO LIFE

CARABALLEDA, VENEZUELA

Hotel Guaicamacuto will be a four-star hotel in the new Bahia Caralleda redevelopment project in Venezuela. This former Hotel Macuto-Sheraton Hotel in La Guaira, Vargas State, Venezuela is undergoing a complete renovation.

The hotel was originally constructed in 1955 but was abandoned following the 1999 Vargas State landslide. The project included demolishing the building down to its structural elements and remodelling into a four-star calibre hotel. We redesigned the building core to meet current building codes, a new state-of-the-art conferencing centre with a 1,000 person grand ballroom, and the design of a new mechanical, electrical, plumbing, and fire protection infrastructure.

The hotel features numerous on site restaurants, a spa, a fitness centre, and multiple swimming pools, complete with an above ground parking structure. In addition, a portion of the guestroom tower has been designed to be easily converted to house 8 presidential suites, configured to host international conferences.

We provided mechanical, electrical, plumbing, fire protection, telecommunications, and security design services. This included the design of an energy efficient chilled water system with variable speed chillers, variable speed pumps and high efficiency air handling systems with energy recovery for the conferencing centre, guestroom towers and amenity spaces.

<b>Client</b>	Landscape Vision Corporation
<b>Architect</b>	Gensler
<b>Our services</b>	Building services, fire protection, telecommunications, security design
<b>Project status</b>	Due for completion in 2016

## ACCOR HOTEL GROUP ACCOMMODATING TWO HOTEL BRANDS IN A SINGLE TOWER MELBOURNE, AUSTRALIA

The Accor Hotel Group is building a new, 40-floor hotel in Melbourne CBD, which will house approximately 450 rooms split between the 3-star Ibis brand on the lower levels and 4-star Novotel brand on the upper floors within the single tower.

We were involved initially to review and comment on the architectural feasibility/concept proposal for the hotel. Due to the constricted nature of the 850m<sup>2</sup> development site, we worked closely with the project architect to establish services plant and vertical infrastructure requirements while maximising the usable area for the hotel. We were instrumental in discussions between the developer and the hotel operator in establishing a unique design framework for the project, with common building services engineering design based on Accor guidelines for their 3-star and 4-star hotels. We also provided environmental consultancy for the planning framework for the project to ensure that the development complied not only with the Accor sustainability guidelines for sustainable development but also with strict local council requirements.

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<b>Client</b>	Well Smart Group
<b>Architect</b>	K2LD Architects
<b>Our services</b>	Building services, vertical transportation, fire, environmental consultancy
<b>Project status</b>	Completion due in 2018

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Image courtesy of K2LD Architects



Image courtesy of Greenland Group

## PRIMUS HOTEL ART DECO GLAMOUR MEETS 21ST CENTURY LUXURY SYDNEY, AUSTRALIA

In December 2015, one of Sydney's finest examples of art deco glamour opened its doors as five-star Primus Hotel Sydney. Perfectly positioned in the heart of the city, this heritage-sensitive refit of the former Sydney Water Board headquarters has breathed new life into an iconic 1930s building.

The project involved the refurbishment of the 14,000m<sup>2</sup> listed building constructed in 1939, restoring the heritage features to their former glory while repurposing the space as a contemporary design hotel, with rooftop restaurant, bar and pool.

Previous office space was converted into 172 hotel rooms and suites over six floors featuring lavish interiors which blend historic details with contemporary furnishings and fittings. While the accommodation throughout has its roots in the stunning, art deco heritage values of the hotel, it is underpinned by modern design philosophy throughout, from the lobby bar, restaurant and conference and event spaces to the rooftop pool.

We delivered a full complement of engineering and environmental services on the project. Following delivery of the D&C package we were retained by Greenland to provide construction administration support through to handover to ensure the client brief was followed through to completion.

Our fire engineering team, through a pragmatic design approach, successfully implemented a reduction in the fire resistance levels of the structure, and increased car parking numbers through enhanced provision of detection services which presented significant benefits to the client.

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<b>Client</b>	Greenland Group
<b>Architect</b>	Woods Bagot
<b>Our services</b>	Mechanical, electrical, fire protection, hydraulic, environmental, audio visual, acoustics, vertical transportation
<b>Project status</b>	Completed in 2015

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## THE HILTON FIJI BEACH RESORT AND SPA

### MODERN LUXURY IN HARMONY WITH ITS ISLAND SURROUNDINGS

#### DENARAU ISLAND, FIJI

Comfort and guest experience were central to the client's vision too, and we made sure the services design remained in harmony with the hotel's surroundings while incorporating modern automation and control technology, and enabling effective ICT delivery to the site.

- Client** Lausanne Project Management
- Architect** Group GSA
- Our services** Mechanical, electrical, communication, audio-visual, specialist lighting design
- Project status** Completed in 2008

The Hilton Fiji Beach Resort is set along 1.5km of waterfront on Fiji's Denarau Island. The five-star resort has beachfront accommodation, extensive conference and boardroom facilities, swimming pools and health spa, plus restaurants, shops and a theatre.

We were initially engaged to help review the electrical and communications services design for the first stage of villa construction, a role that expanded to include electrical, communications, lighting and audio visual for the next villa stages, as well as mechanical services design for meeting rooms, central facilities, bistro and chapel.

A key requirement was to produce designs in keeping with the island environment, in particular taking into account marine considerations and local construction methods. We also reviewed product selection against environmental suitability and local support, bearing in mind the operational and maintenance needs of a remote island resort.



## ACCOR-FAIRMONT LE CHATEAU FRONTENAC

### ICONIC GRAND HOTEL, SYMPATHETICALLY MODERNISED

#### QUEBEC CITY, QUEBEC, CANADA

The Fairmont Le Chateau Frontenac is one of the world's grand iconic hotels and is recognised as the most photographed hotel in the world. It is a designated National Historic Site of Canada that was originally constructed during the late 19th and early 20th century.

We have an in-depth knowledge of this hotel, having been involved in many projects, including the complete renovation of the building, since 1987. Recent projects include the renewal of the food and beverage facilities and a major electrical conversion.

In 2012, the hotel started a major refurbishment project that included the main lobby, its 611 guest rooms and all the food & beverage facilities and restaurants. We were retained to programme and design the renewal of the food and beverage facilities. This included all the production kitchens, material handling, catering kitchens, bars, dining rooms and the world famous Champlain Dining Room. In doing so, we were tasked with developing a completely new integrated food services production system that serviced the diverse requirements and areas of the hotel, all the while maintaining the highest possible culinary standards.

At the same time, the Hydro-Quebec power line supplying the hotel and a number of other significant buildings in the area was standardising its voltage to 25 kV. Since the hotel's power input was 12.4 kV and the electrical systems were outdated, all the electrical equipment had to be replaced with a compatible system. As the prime consultant on the project, we supported our client throughout to ensure a successful installation without compromising the character of the historic building.

In 2015 we inspected the plumbing, ventilation, cooling and electricity systems. This led to a number of rehabilitation projects, including improving the basement drainage system, upgrading the fire alarm system, replacing two complete ventilation systems and modernising the mechanical and control system for ten elevators. We also carried out the plans and specifications for the replacement of an exit to meet new international regulations.

In 2016 we are preparing the plans and specifications to upgrade the cooling tower, heat pumps system and to replace a 800 kW emergency generator.

- Client** Ivanhoe Cambridge
- Architect** Rockwell Group, Jean Dallaire architect and Brigad architect
- Our services** Kitchen, catering and food & beverage design services, electrical, mechanical, project management
- Project status** Electrical conversion of 12 kV to 25 kV completed in 2012; replacement of 600 volt main entrance completed in 2015; Kitchens completed in 2014



## LE GERMAIN HOTEL

ELEGANCE, COMFORT AND  
QUALITY WITH ECO-FRIENDLY  
TECHNOLOGIES

CALGARY, ALBERTA, CANADA

Le Germain Hotel Calgary is a contemporary, luxurious 24-storey development comprised of twin 14-storey towers, one housing a boutique-style hotel and the other providing office accommodation, bridged by a spa and seven storeys of luxury condominiums under a curved steel roof.

As lead consultant we provided structural engineering design for the project. The location and unique form presented a number of design challenges, beginning with the building height and roof shape, which had to be designed so as not to overshadow a nearby pedestrian street, in compliance with local regulations.

The two towers stand on a four-storey underground car park. A diaphragm wall was used for the foundations to prevent seepage from groundwater throughout the life of the building, and this, together with the low load-bearing capacity of the clay rock beneath the foundations led us to opt for a reinforced concrete slab of almost one metre thick to support the buildings.

The various building uses (apartments, hotels, offices) have different structural requirements. Transfer pillars were installed to respond to these needs, particularly on the 14th floor which spans the building's two towers.

The unique building form meant we had to undertake lateral analysis to assure the building's resistance of the building to wind and seismic events, using the most advanced technical processes to achieve an economic design.

In keeping with the client's commitment to sustainability, the hotel has a highly energy-efficient geothermic heating and cooling system. This required close coordination with the architects and mechanical engineers to allow for the energy to be captured and distributed from the pipework in the foundations to the floors above.

Throughout the process we supported our client in dealing with the relevant authorities to explain the unique aspects of the design of this building.

**Client:** Greenville Germain Calgary LP

**Architect** Lemay & Michaud Architecture Design / BKDI Architecture (Calgary)

**Our services** Structural engineering

**Project status** Completed in 2010



## DUBAI PEARL

LIVE, WORK AND PLAY IN ONE FUTURE READY HIGH-RISE DESTINATION

DUBAI, UAE

Dubai Pearl is an exciting, iconic mixed-use high-rise development, prominently located in Dubai Media City, along Sheikh Zayed Road and overlooking Palm Jumeirah. Comprising hotels, residential, offices and retail, this visionary project includes four towers each 70 stories high, which are connected at the roof level by an innovative four-level 'sky palace'.

The towers on their own are very slender, and their connection with the sky palace provide the strength and stiffness to withstand wind and seismic forces expected during the lifecycle of the project. The towers are connected by a central podium that covers the footprint of the plot and is planned to house themed hotels.

Dubai Pearl will include a mix of six innovative 5-Star hotels containing diverse food and beverage concepts, conferencing & banqueting facility including ballrooms and multifunction space, gyms and lifestyle spas.

As Engineer of Record, our local and international high-rise team ensured that the design was safe and buildable in accordance with international standards, local best practices and authority requirements.

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<b>Client</b>	Pearl Dubai FZ LLC
<b>Architects</b>	Schweger Associated Architects
<b>Our services</b>	Structures design
<b>Project status</b>	Ongoing

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## BROOKLANDS HOTEL REVIVING 1920'S GLAMOUR ON A HISTORIC RACING CIRCUIT SURREY, UK

The five-star Brooklands hotel and spa complex is located on the site of the historic Brooklands motor racing circuit in Surrey and is part of the DaimlerChrysler new Mercedes-Benz Heritage and Technology Centre.

The 120-room hotel is designed to suit its unique setting and location, with materials and form inspired by the site's pioneering history, and reflecting the glamour and excitement of the racing circuit in the 1920s and 1930s.

We provided a fully integrated engineering service for the project, located on the site of a former airfield which subsequently became the famous Brooklands circuit. Pile foundation was required to support the building over soft alluvial soil, and we used buried retention tanks made from glass-reinforced plastic to mitigate flooding of the site.

The structure is a concrete frame building, and in order to provide long span between supports to suit the hotel arrangement, we used non-grouted, pre-stressed concrete floors to minimise floor slab thickness.

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<b>Client</b>	Hillwood Hotels
<b>Architect</b>	Careyjones Chapmantolcher
<b>Our services</b>	Building services, civil, structural, transportation, acoustics, environmental
<b>Project status</b>	Completed in 2010

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## THE PLAZA, NEW YORK

### 165-TON TRUSSES – AND SOME WELL-PLACED WINDOWS – MAKE SPACE FOR HISTORY

NEW YORK, USA

Manhattan's luxury Plaza Hotel, which overlooks Central Park, is a designated National Historic Landmark. The French Renaissance chateau-style building opened to the public in 1907. More than a century later, in 2005, it closed its doors for an extensive renovation, which converted the 800-room property into a mix of luxury private residences, hotel rooms and high-end retail space. A new penthouse floor was added at the top of the building and a spa and garden created above the historic Palm Court.

We acted as structural engineer on the fast-tracked project, which moved from initial design work to completion in a little over three and a half years, finishing in December 2007, on schedule and within budget.

The scheme's primary challenge was to preserve the historic elements, both internal and external, of this piece of New York heritage. We rigorously researched the hotel's original design, using old photos, sketches, blueprints and drawings. Nonetheless, incomplete building records meant our design had to evolve continuously to respond to unforeseen conditions on the ground.

A key achievement was installation of 165-ton Vierendeel trusses over the Palm Court to support the new levels above without the need for additional columns in the landmark court itself. Getting the trusses into the building presented its own unique challenge. Crawler cranes were used to slide the top and bottom chords through the Plaza's windows on 59th Street, where they were picked up by suspended cables and delivered to the courtyard.

We also carried out painstaking restoration of the magnificent stained-glass ceiling over the Palm Court, reviving the historic glamour of this landmark space.

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<b>Client</b>	Elad Properties
<b>Architect</b>	Costas Kondylis & Partners
<b>Our services</b>	Structural engineering
<b>Project status</b>	Completed in 2007

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## WALDORF ASTORIA

### GOLD COAST SPLENDOR IN A HIGH-RISE

CHICAGO, USA

The Waldorf Astoria is a luxury five-star hotel located in the Gold Coast area of Chicago. Its design emulates the grand hotels of Paris in the 1920s, complete with colonnades, spires and a cobbled motor court. The hotel has 188 guest rooms with 51 condominiums above. The hotel was originally developed as The Elysian and was named Conde Nast's top hotel in the United States in 2011.

Wind and its dynamic effects governed the structural design of this 700-foot-tall building. Our structural engineers used a wind tunnel to study options for different combinations of structural stiffness and damping to develop a cost effective structural solution that incorporates a tuned liquid damper at the top of the building. This approach to controlling perceptible motion in tall, slender buildings offers low cost, low maintenance and high performance over a broad range of wind conditions.

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<b>Client</b>	Elysian Development Group – Chicago, LLC
<b>Architect</b>	Lucien Lagrange Architects
<b>Our services</b>	Structural engineering
<b>Project status</b>	Completed in 2009

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## FAIRMONT CHATEAU LAKE LOUISE

### REPAIRS THAT PAY FOR THEMSELVES AT A YEAR-ROUND MOUNTAIN RESORT

LAKE LOUISE, ALBERTA, CANADA

Located in Canada's Banff National Park, a UNESCO World Heritage Site, the Fairmont Chateau Lake Louise is surrounded by extraordinary natural beauty. Founded more than a century ago as a home away from home for mountain enthusiasts, the 487-room luxury resort looks out on glorious peaks, the Victoria Glacier and Lake Louise itself. It offers outdoor activities all year round, including skiing, hiking and canoeing.

The 10-storey hotel was built in four phases, with the first sections – Painter Wing and Barrot Wing – completed in 1913 and 1925 respectively, followed by the Glacier Wing over 60 years later in 1987 and the latest, Mount Temple Wing in 2004. In that same year, the resort ownership started a maintenance project focused on the exterior insulation and finishing system (EIFS) applied over the original mass masonry walls on the two original hotel wings in the early 1980s. We were commissioned to evaluate the EIFS, produce specifications for recommended wall repairs, tender the work and review it during construction.

Our team provided a maintenance plan, and has been prioritising and phasing the work as required for over a decade to help meet client budgets and cater to the hotel's very short construction season. During the build itself, we worked closely with the hotel to keep disruption to guests to a minimum.

In addition, we evaluated, designed and reviewed the sloped metal roof replacement above the Painter Wing.

We were also retained to help design and install a permanent access system for the building to ease maintenance access and save on costs. The system paid for itself after a single season of use.

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**Client** Fairmont Hotels and Resorts

**Our services** Restoration, structural engineering

**Project status** Ongoing

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# OUR SERVICES

## OUR WIDE-RANGING EXPERTISE ENSURES A SPECIALISED SERVICE FOR EVERY CLIENT.

We deliver landmark structures and highly efficient systems, as well as a broad range of essential technical services – just some of which are highlighted on these pages.

At WSP | Parsons Brinckerhoff, we understand that every hospitality project presents a range of unique challenges, and that no two hotels are ever the same. We can draw on our global network of experts to provide a bespoke team tailored to the demands of every project, from the earliest planning stages to a successful completion and faultless operation throughout the life of the building.

So whether our clients need a fully integrated multidisciplinary service or expert consultancy in a very specialised field, we can help.



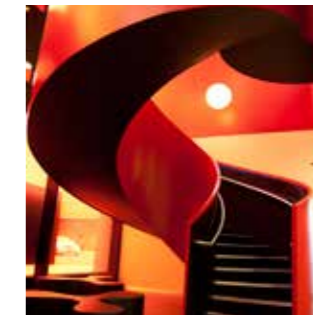
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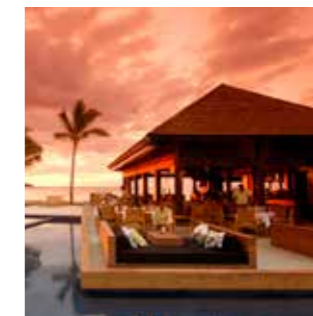
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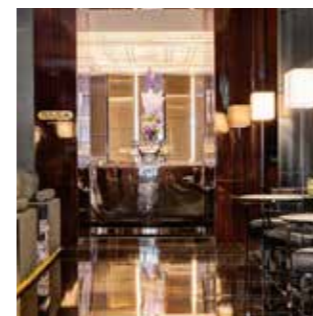
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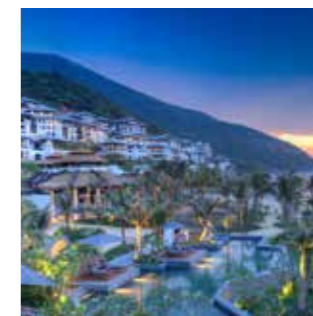
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# ABOUT US

WSP | PARSONS BRINCKERHOFF IS ONE OF THE WORLD'S LEADING ENGINEERING AND DESIGN CONSULTANCIES.

We provide services to transform the built environment and restore the natural environment. Our expertise ranges from environmental remediation to urban planning, from engineering iconic buildings to designing sustainable transport networks, and from developing the energy sources of the future to enabling new ways of extracting essential resources.

We bring together the expertise of 34,000 staff in 500 offices across 40 countries, with wide-ranging backgrounds and complementary skills. We are united by the pride we take in our work and our passion for solving clients' problems.

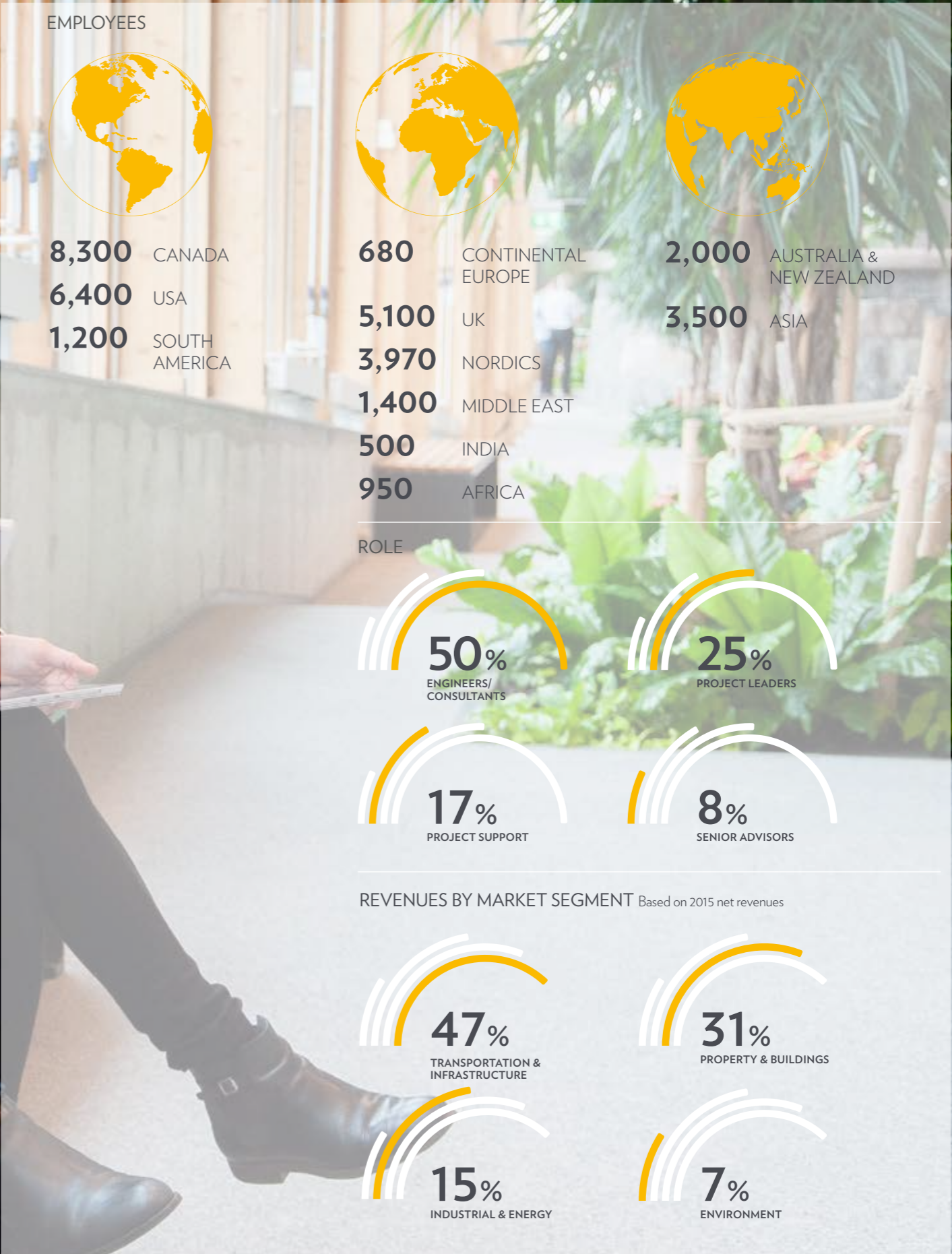
Our unique combination of specialist and integrated skills, backed by our global reach, enables us to offer not only the latest thinking and most innovative technologies but also the most responsive client service, whatever and wherever the challenge.



**34,000**  
employees

**500**  
offices

**40**  
countries



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## ABOUT WSP | PARSONS BRINCKERHOFF

WSP | Parsons Brinckerhoff is one of the world's leading professional services firms, working with governments, businesses, architects and planners and providing integrated solutions across many disciplines. We provide services to transform the built environment and restore the natural environment, and our expertise ranges from environmental remediation to urban planning, from engineering iconic buildings to designing sustainable transport networks, and from developing the energy sources of the future to enabling new ways of extracting essential resources. We employ 34,000 engineers, technicians, scientists, architects, planners, surveyors and environmental experts, based in more than 500 offices across 40 countries.



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