Designed for holistic health
Acute & general hospitals
Designing world-class general hospitals

General hospitals are on the frontline of public healthcare services. Every day these critical facilities – and the people who staff them – respond to a wide range of medical emergencies and conditions, providing vital, often life-saving, care to a rising number of patients.

The diverse and complex needs of the people who visit these buildings present a number of design challenges. Staff need access to specialist medical resources fast, while care rooms must be able to adapt to rapidly changing requirements. Importantly, vulnerable patients need protection from the risk of infection.

At WSP we are dedicated to helping our clients provide the best possible care to all patients. Through our many years’ experience across the medical spectrum, we understand this means more than tending to broken bones or treating disease – it means considering patients’ wider welfare too.

Our aim as a key project consultant is to create care environments that promote patient wellbeing as well as supporting the work of hospital staff. In British Columbia, a scheme to create the province’s largest ever healthcare centre typifies our approach. This facility provides patients with suites that are flooded with natural light and offer ample space to visitors, helping to create a warm and positive care setting.

We also understand the need to create efficient, low energy buildings. Demands on health services are increasing due to growing and ageing populations around the world. Resources are stretched and efficient buildings can ease the pressure. Glasgow, for example, saw the delivery of one of Europe’s largest hospitals. It uses a range of energy-efficient features to help reduce the building’s running and whole life cycle costs.

From large-scale, new build hospitals to upgrades of existing facilities, we always place the wellbeing of patients and care staff at the heart of our designs. It is our people-centred approach that has won us the privilege of working on some of the most advanced hospitals in the world.
Clean, safe environments
Hospital patients include those in the most delicate and critical conditions. Every possible precaution must be taken to reduce the risk of further medical complications. This means providing a clean, orderly and safe care environment that minimises the chances of hospital-acquired infections.

Our specialist engineers integrate infection control into the design concept from the outset, creating floor layouts, building services and ventilation systems that prevent cross-contamination between rooms, wards, staff facilities and operating theatres. We go into meticulous detail to ‘design out’ germ traps, reduce airborne pathogens and stop the spread of disease.

We also offer a balance between the need to secure patients’ safety against intruders, while ensuring care staff can move fluidly around a facility. Time is a critical factor when it comes to delivering effective care and an easily navigable hospital, with good vertical and horizontal connections between different zones, is essential to reducing staff fatigue and stress.

Positive experiences
Those admitted for hospital treatment are often at a critical moment in their lives. Our aim is to make the experience as positive as possible and create a warm, welcoming setting to reassure patients that they are in a supportive environment.

First and foremost, we think of patients as people. What kind of environment makes people thrive? A growing body of evidence suggests that access to natural light, fresh air and greenery aids the healing process. Contact and closeness to loved ones is another key contributor to patients’ overall wellbeing, as well as reduced noise levels, especially at night.

We approach all our designs with this holistic idea of patient welfare in mind and create quiet and private rooms with space to accommodate visitors, where possible. We maximise the use of natural light and natural ventilation, and create landscaped external areas for interesting views. Some of our hospitals even have gardens specially adapted for the critically ill, ensuring that even the most vulnerable patients can access nature – and its benefits.

High performance buildings
Growing populations and ageing societies are placing ever greater pressure on hospitals, meaning effective management of medical resources is increasingly important too.

Our clients rely on us to deliver buildings in a cost-effective way by minimising waste, managing tight build schedules and adding value where possible. Clients need facilities that are efficient to operate and maintain, designed with long-term costs in mind.

Our expert teams create building systems that minimise energy and water consumption taking advantage of the latest techniques, such as chilled beam technologies, for cooling and ventilation. Many of our hospitals have become environmental showcases, winning prestigious awards for their efficient energy use and low impact on the environment.
Hospital care in the 21st century is about taking a holistic approach to patients’ welfare, as well as accommodating ever advancing medical technologies. We create care facilities that are uplifting for patients and carers, making the best use of available space, natural light and fresh air to provide a welcoming and healing environment.

At Ng Teng Fong General Hospital, for example, we consulted with clinical staff and patients to gain an insight into the kind of space that would best facilitate the healing process. The result is a hospital that makes full use of green space, featuring terraced gardens at every level of its main towers, and making outdoor space available for patients to enjoy.

Our designs are also informed by the latest and best science about how to promote patient welfare. At Surrey Memorial Hospital over 80% of acute care rooms are single-patient and include a ‘family zone’, enabling visitors to stay close to their loved ones. Privacy, quiet and family contact have all been proven to aid the healing process.

Creating space with the flexibility to adapt to new uses or clinical techniques is also important. Designing building systems with one eye on the future, we create buildings with inbuilt longevity. Our floor plans and systems can readily adapt to a sudden change of use, for example, a disaster scenario.
Enhancing patient care through mould-breaking design

Singapore’s healthcare hub of Ng Teng Fong General Hospital (NTFGH) and Jurong Community Hospital offers patients a continuum of support from acute to step-down care that breaks the mould of traditional hospital design.

Patient-centred space planning informed every aspect of the scheme to create these next-generation hospitals for the densely populated areas to the east of the city-state. The 16-storey NTFGH provides Accident and Emergency (A&E), an intensive care unit (ICU) and a high dependency unit (HDU), in addition to general hospital services. Its neighbour, the 12-storey Jurong Community Hospital, readies patients to return home, providing a range of community and therapeutic services.

In total, the two hospitals cover a floor area of 169,000m² and accommodate 986 beds of which 700 are located in NTFGH, with the remaining 286 in Jurong Community Hospital.

The aim of our client was to create a truly integrated healthcare facility that used resources with maximum efficiency across different clinical departments and the two hospitals. Importantly, this approach called for a highly sophisticated bed management system to minimise transfer times for patients.

As MEP consultant for the two structures, our primary role was to create designs and systems that permitted this integrated approach to healthcare, while reinforcing hospital security and reducing the risks of cross-contamination. The emergency department has a separate unit with isolation rooms which ensure contagious illnesses are contained. Related facilities such as operating theatres and intensive care units, as well as each hospital ward, have also been equipped with isolation facilities. Key to the integrated acute care approach was the co-location of vital clinical departments. On level 4 of NTFGH are the 28-bed ICU and 42-bed HDU, these units are connected to A&E on level 1 and the NTFGH’s 16 operating theatres on level 3, by a pair of specially designed, and fully equipped, trauma lifts. A 15-bed isolation ward is situated next to A&E to allow for immediate patient transfer, helping to halt the spread of infection.

In a break with design convention, every bed in the general care areas is positioned next to a window thanks to these wards’ innovative herringbone or fan shape. Patients benefit from a positive, healing environment full of natural light with improved air flow, which also helps mitigate the risk of hospital-acquired infections and offers a pleasant work environment for staff.

Bringing nature and green space into the care environment was another guiding design concept for NTFGH, and terraced gardens feature at every level of the hospital’s main towers. Stable acute care patients are provided with intensive care-ready outdoor areas, ensuring that even critical patients can enjoy some sunshine and fresh air.

In addition to offering advanced healthcare facilities in a green and positive environment, NTFGH is also a highly energy-efficient building. In 2013, the development received a Green Mark Award (Platinum) from Singapore’s Building Construction Authority, its highest certification for an environmentally responsible building.
King’s College Hospital
Critical Care Unit
Keeping surgeons in action with a roof-top plant room

Location: London, UK
Client: King’s College Hospital NHS Foundation Trust
Architect: BMJ Architects
Services: Mechanical, Electrical and Plumbing, Vertical Transportation, Green Building Design, Façade Engineering, Public Health
Project Status: Due for completion in 2018

King’s College Hospital, one of London’s largest and busiest teaching hospitals, is known around the world for the first-rate care it provides to the critically ill. Patients travel from far afield to access the hospital’s services in areas including liver disease, transplantation, neurosciences and haematology.

Maintaining that reputation means having the facilities to match, and in 2010 King’s developed a business case to expand its critical care unit (CCU) with a new 60-bed, state-of-the-art facility located above an existing surgical block. That project is now under way – and set to cement the institution’s position as the UK’s leading provider of critical care.

WSP are providing a range of services to this technically complex scheme, including MEP design, façade engineering and vertical transport consultancy. Joining the team part way into the design process, we were asked to review the MEP proposals and buildability requirements, and to establish a construction sequence for integrating the new building services with the existing facilities below.

A key requirement was for the theatre block to remain fully functional throughout construction, calling for considerable ingenuity in the arrangement of temporary services and design of the new building and plant rooms.

A steel superstructure – comprising 7m-high single-span roof trusses – will ‘over-sail’ the existing building footprint, allowing the new floors to be suspended below. This will also create space for a new plant room within the roof structure, set to include an air handling plant, primary and secondary chilled water, hot water and heating pumping systems, new cold-water storage tanks and electrical distribution switchgear, among other equipment. During construction, a carefully planned transition programme will connect the existing services to the new facilities, while keeping the operating theatres up and running.

The facility is designed to operate efficiently while providing exceptional comfort for occupants. High performance building fabric with low air leakage rates is combined with energy-efficient heating and cooling and maximised natural light. The design reflects the client’s ambition for BREEAM Excellent, with measures to reduce water consumption by 25% and minimise noise and light pollution, for example, as well as use of materials with low environmental impacts.

25% less water used than a comparable building
When Fraser Health Authority decided to commission a new eight-storey critical care tower for Surrey Memorial Hospital, its vision for British Columbia’s largest ever healthcare project was clear. The public health authority wanted to create a beacon of innovation where services were designed around the needs of patients and their families, further boosting the standards of excellence at Canada’s second largest emergency department.

The tower’s guiding design concept of a welcoming, people-centred place informed every aspect of this extension to the existing Surrey Memorial Hospital. It was also important that the new critical care facility could accommodate the sheer weight of demand for services. When Surrey Memorial Hospital was built in 1959, it served a city populace of around 50,000. By around 2013, this figure had ballooned to more than 474,000, with the number growing by around 9,000 every year.

A design that offered spacious, easy-to-navigate floor plans with generous use of natural light was devised that nevertheless increased the existing hospital’s capacity. The layout created an additional 150 beds, expanding the hospital’s capacity by 30%, up from 450 to a total of 650 beds, and accommodating an additional 650 clinical staff and 300 support staff.

The new tower has doubled the capacity of the neonatal intensive care unit (NICU) for babies, which also houses a new neonatal and paediatric pharmacy – the first of its kind in Canada. Expanded stroke and intensive care units, as well as other specialist units have also been created. The capacities of the Intensive Care Unit and High Acuity Unit have been boosted to 25 beds in each case, up from 15 and 10 beds respectively.

Importantly, over 80% of the tower rooms are single-patient for privacy and improved infection prevention and control. Each room includes a ‘family zone’ with a sofa bed or recliner, enabling visitors to stay close to their loved ones. Around 20% of patient rooms are special infection control rooms with their own air flow to prevent the spread of infection.

From the outset of the scheme, we consulted clinical staff to feed frontline experience into our plans. This close collaboration resulted in innovations such as the installation of special plumbing hook ups for renal dialysis in patient rooms on floors 5, 6 and 7. Patients are able to receive dialysis at their bedside rather than being transported to a separate renal unit. We also designed a highly accessible heliport for air ambulance admissions, minimising transfer times to the emergency department.

A key complexity of this scheme was the construction of the new tower next to, and to some extent inside, a fully functioning hospital. This required us to work with the project team to fast-track the building process and keep disruption to an absolute minimum.

The client wanted to create a resource efficient building that minimised running costs. Our response was to incorporate a range of sustainable design initiatives throughout the building and the construction process. For example, we utilised durable natural materials, including wood and masonry. We selected materials that emit low amounts of volatile organic compounds (VOC) and designed state-of-the-art, energy-efficient technologies.

These initiatives saw the critical care tower achieve a Leadership in Energy & Environmental Design (LEED) Gold certification that recognises best-in-class building practices. Furthermore, the Association of Consulting Engineering Companies British Columbia (ACEC-BC) presented us with an Award of Merit in Buildings for our contribution in creating Surrey’s new, cutting-edge facility.
University Hospital, Linköping
Clever foundations defy weak bedrock to support major extension

Location: Linköping, Sweden
Client: Östergötland County Council
Architect: White Architects
Services: Construction Management, Geotechnical and Ground Engineering, Fire Engineering
Project status: Phase 1 completed in 2015; phases 2 and 3 due for completion in 2018

A major, three-part redevelopment is transforming this hospital in the Swedish city of Linköping into a modern, green and flexible facility, capable of adapting to emerging technologies in the decades ahead.

The first phase, which completed in 2015, has added around 66,000m² to the hospital’s east and west wings in an energy-efficient expansion designed to keep power consumption below 60 kWh per square metre and minimise the lifecycle cost of key systems and products. The building is lined up for a silver rating under Sweden’s Miljöbyggnad environmental classification system.

WSP provided geotechnical services for the extension, which faced significant groundwork challenges. The main building sits in a depression, posing difficulties for foundation design when it came to the additional space. These were exacerbated by the discovery of weak bedrock part way into construction. Faced with this hurdle, our world-class engineering team pulled out all the stops to find a piling solution that would keep the building stable and get the redevelopment back on track.

Another key challenge was managing the works in a way that would keep the hospital up and running throughout construction while minimising the impact of noise and vibration. The crowded site called for careful coordination with other teams, ensuring access for drilling and blasting when needed for instance.

Our engineers are also working on the project’s second phase, which is set to transform the hospital’s 1970s main block into a more comfortable – and safe – place for patients and visitors. Private rooms will replace open wards, for example, while fire evacuation routes will be brought in line with modern standards.

Power consumption per square metre below

60 kWh
Sanford Fargo Medical Center
Discreet building services for a hospital geared to families

When Sanford Health decided to build a new hospital in Fargo, North Dakota, it set out to improve the range of medical services available in the region. But more than that, it wanted a facility that would make the hospital experience as good as it possibly could be both for patients and their loved ones.

The result is the 384-bed Sanford Fargo Medical Center, which opened in 2016, bringing top-level trauma services to eastern North Dakota and western Minnesota, as well as a wide range of medical services from orthopaedics to heart surgery. The 11-storey, Gothic-style facility includes an emergency department, plus neonatal and paediatric intensive care units, connected to an elevated helipad via a dedicated trauma elevator. The facility also includes 36 inpatient and outpatient operating rooms.

Every detail of the design and layout has been selected with the patient – and visitor – in mind. Housed in the building’s four towers, all patient rooms enjoy clear views, as well as sofa beds for additional guests and zones for families to store belongings and charge devices. Warm colours have been chosen to make patients feel at home, and every floor has a quiet zone to provide visitors with a place of retreat.

A stunning 10th-floor birthing centre aims to give new mothers the best possible start, with striking views, hot tubs and a spa. And even the supply cupboards are specially designed to maximise peace and privacy, with doors to allow restocking from hallways.

WSP contributed to this patient-centred approach with a building services design that minimises unwanted disruption. The facility is served by a central utility plant housed in a separate building, which also acts as a drop-off point for deliveries. Electric carts are used to move supplies to the main hospital along a connecting utility tunnel.

The plant itself contains back-up diesel generators with capacity to power the entire hospital for three days, reducing the facility’s dependency on the grid. Two 160-ton heat pump chillers provide heat recovery energy savings during the entire year. Hospital efficiency is also boosted by a pneumatic tube system installed to transport waste and dirty linen around the site quickly and hygienically.

522 trees planted for protection from northern winds
Seoul St Mary’s Hospital

Beating schedule and budget on one of South Korea’s biggest hospitals

**Location:** Seoul, South Korea

**Client:** Catholic Medical Centre

**Architect:** RTKL, Samoo

**Services:** Construction Management, Project and Program Controls, Government Approvals Support

**Project status:** Completed in 2009

Since completing in 2009, this mega hospital and research complex in the Seocho district of Seoul has become renowned as one of the country’s premier medical centres. With 22 upper floors, six basement levels and 1,320 beds, it is one of the largest hospitals in the country and treats almost 8,000 patients per day in a modern and spacious environment.

In the main hospital block, state-of-the-art medical facilities offer top-level care across 24 specialised centres and a 110-bed intensive care unit. Next door, the 27,400m² Catholic University Medical School hosts a centre of excellence in medical education and R&D as well as living quarters for medical staff and students.

WSP played a key role in the efficient delivery of this large-scale project, taking an integrated approach that minimised design changes and allowed for fast-track construction methods. Working alongside our local construction management experts, our specialist hospital design team conducted detailed technical reviews and value engineering workshops in a process that generated cost savings of US$40 million and helped to deliver a world-class project a year ahead of the initial deadline.

Responding to the driving vision of a functional, flexible and high-quality facility, we also created flexible patient floors that allow the hospital wards to be easily arranged into five-bed, two-bed or even private room configurations depending on demand.

1320 beds and 24 specialised centres

8000 patients treated every day
General hospitals provide care around the clock. That means highly serviced buildings with extensive energy needs and zero margin for error when it comes to meeting occupants’ needs.

We understand that our clients rely on their buildings to provide an infrastructure that enables care staff to carry out their vital work. And this infrastructure must be provided in a highly efficient way allowing healthcare providers to focus their time, and budgets, on their core role of looking after patients.

Our track record demonstrates that even large, power hungry hospitals can be beacons of sustainability. Queen Elizabeth University Hospital uses one of the largest concrete frames ever built in Europe yet is a model of energy and resource efficiency. Box Hill Hospital, Victoria’s largest suburban health infrastructure project, achieved a 4-star Green Star rating for its use of sustainable initiatives.

Our engineers consider every possible way of reducing our building’s impact on the environment and never lose sight of the hospitals’ whole life-cycle cost.
Queen Elizabeth University Hospital, Glasgow
Creating one of the UK’s largest acute healthcare facilities

Location: Glasgow, Scotland, UK
Client: Brookfield Multiplex and NHS, Greater Glasgow & Clyde Board
Architect: IBI Group
Services: Building Information Modelling, Structural Engineering, Green Building Design, Fire Engineering, Transportation Planning
Project status: Completed in 2012

Glasgow’s 14-storey Queen Elizabeth University Hospital (QEUH) is home to one of the largest adult acute hospitals in the UK. With 1,109 beds, the new build unit is a flagship facility with a focus on individual patient wellbeing that belies its grand-scale setting and where patients have their own single, en-suite room with a view.

Despite covering some 175,000m² including the children’s hospital, the facility is also a model of energy and resource efficiency. The entire project team worked from the outset of the scheme to create a low carbon structure that will create significant cost and energy savings over its whole lifecycle.

QEUH’s acute facility is part of a wider healthcare hub that includes a children’s hospital of 256 beds, paediatric and adult A&E departments, a maternity hospital and laboratory services. Together with the existing facilities it forms QEUH – the UK’s largest hospital campus. We provided services across the superstructure of the campus, as well as for each individual unit.

Our involvement with the scheme started in 2009 after we successfully demonstrated to the client our full commitment to meeting the development’s stringent sustainability agenda. Targets included diverting 96% of waste from landfill during the construction process, and helping achieve demanding carbon emissions of no greater than 80kg/m² per year.

Measures to limit waste and reduce costs included minimising the amount of excavations, and setting out masonry to minimise cut-offs. Our civil and structural team specified materials for their longevity and low maintenance with a view to the whole-lifecycle costs of the building. In a building that is constantly occupied and where the comfort of its users is of utmost priority, the high thermal mass of the floorplate was utilised to mitigate energy demands. Other benefits included in-built fire protection to the concrete frame, which is one of the largest ever built in Europe.

One of the greatest challenges was the scale of the QEUH development, which is equivalent in area to 11 football pitches (some 3.5 hectares). Against this context even small changes had the potential to make a huge impact on cost plans.

We used the full potential of Building Information Modelling (BIM) to deal with the project’s complexities, communicating design intent, detecting problems and analysing the future flexibility of the buildings through this technology. Our technical teams created a rich data model of the development to visualise designs, manage change, quantify and procure materials, and produce project time lines.

Our use of cutting-edge BIM, along with close collaborative working with the project team and a commitment to working towards a BREEAM rating of Excellent (the client’s initial goal), have helped to create one of Europe’s most advanced hospital buildings. QEUH was crowned Best Healthcare Development at the 2016 MIPIM awards.
Established in 1956, Box Hill Hospital is a highly regarded teaching and referral hospital with a reputation for excellence in providing acute services, as well as general healthcare. It admits upwards of 48,000 patients each year from the eastern suburbs of Melbourne.

With demands on the hospital’s facilities ever increasing, Eastern Health and the Victorian Department of Health decided that a radical redevelopment programme was needed to maintain Box Hill’s world-class clinical services. The programme set in motion Victoria’s largest suburban health infrastructure project and saw the creation of a new, ten-storey facility to the existing Box Hill site.

As a preferred services provider to the hospital with two decades’ experience of improving the existing facility, we were involved from the outset of the project to create the new, 52,000m² unit. The aim was to create a wholly fit-for-purpose facility that would house all Box Hill’s acute services under one roof, enabling staff to move quickly across the diverse areas involved in the delivery of emergency care. In addition to providing readily accessible acute care, the client wanted an efficient, high-performance building that minimised its impact on the environment.

Our approach was to integrate sustainable initiatives into both the structure and finer details of the building. For example, energy efficiency gains are made with the use of combined cooling heat power (CCHP). Four layers of glazing provides enhanced insulation, and automated blinds provide protection from the sun.

New energy-efficient backup generators are able to provide 100 per cent backup power to the clinical facility, if required. Rainwater is harvested for use as ‘grey water’ and waste water from renal reverse osmosis dialysis plant water is recycled. These measures have not only minimised the building’s carbon footprint, but reduced operational costs through reduced energy and water consumption. Importantly, the well ventilated facility means a comfortable environment for patients and staff, and helps to reduce the risk of hospital-acquired infections.

The new facility at Box Hill Hospital offers a significant extension to the original facilities. It has increased the hospital’s capacity by more than 200 beds to 621, added a larger, more efficient emergency department, as well as a new 18-bed intensive care unit (excluding 2 shells) and ten new operating theatres, with an 11th available for future expansion.
Dell Seton Medical Center at the University of Texas

A future-facing health district for Austin with a focus on the environment

Location: Austin, Texas, USA
Client: Ascension/Seton Healthcare Family
Architect: HKS, Inc.
Services: Mechanical, Electrical and Plumbing, IT Systems, Low Voltage Systems
Project status: Completed in 2017

Dell Seton Medical Center is the flagship scheme of a wider development to create a new, high-tech health district for downtown Austin based at the University of Texas. This new teaching hospital is being designed and built to minimise its impact on the environment, while maximising its capacity to house the medical technology of tomorrow.

Flanked by the newly built Dell Medical School, new research facilities and new office buildings, the 211-bed Dell Seton Medical Center will provide the medical hub with a Level 1 trauma facility. This is the United States' highest rated category of trauma unit, providing total care for every aspect of injury. The centre will replace the region’s trauma facilities that are currently housed in the University Medical Center Brackenridge. This facility ranks in the top 1% of all trauma centres in the US for best patient outcomes. Our client’s aim is to continue to improve on Brackenridge's performance by entirely updating and rehousing the trauma unit.

Adaptability is the guiding principle of the new centre’s design. The hospital's rooms and treatment facilities will be expandable and adaptable to meet the needs of new technology and evolving treatments. Our expert team of building services engineers has designed electrical and IT systems with future technological advances in mind to create a building infrastructure fit for the 21st century.

Designed according to progressive and new ideas in health, the hospital will provide collaborative space to promote cross-departmental working and teaching, enhancing connectivity between different service areas. The new, 45,990m² teaching hospital is also being designed and built to meet exacting environmental standards. Provisions are being made to create readily accessible pedestrian routes and cycle ways around the hospital campus. By using these initiatives, the design team aims to achieve Leadership in Energy and Environmental Design (LEED) Silver in Healthcare Certification and attain Austin Energy Green Building Program Certification.

Dell Seton Medical Center's impact on the environment will also be lessened due to its relatively small size – it covers significantly less space than the existing trauma unit at Brackenridge. This may seem counterintuitive for a facility serving a growing city but follows the client’s philosophy of 'bringing the care to the patient not the patient to the care'. In other words, empowering patients to manage their care beyond the hospital’s walls with the support of expert nursing teams. Importantly, operating rooms and other core clinical areas will be larger in the new unit compared to the facilities it replaces.

With construction well underway on site, Dell Seton Medical Center is expected to open its doors to patients in spring 2017.
Purpan Hospital, Toulouse
Restructuring a world-renowned hospital for improved patient care

Location: Toulouse, France
Client: C.H.U. de Toulouse
Architect: PPR building: SCAU / Cordette Huet Architectes
ICU building: Art & Build Architects and Sequences
Services:
PPR & ICU BUILDING: Structural Engineering, Mechanical, Electrical and Plumbing, Medical Fluids, Pneumatic Handling, Infrastructure Planning and Management
PPR BUILDING ONLY: Medical Equipment, Project Management, Project and Program Control
ICU BUILDING ONLY: Mechanical, Electrical and Plumbing, Vertical Transportation

In recent years Purpan Hospital in Toulouse has been undergoing major redevelopment, inspired by the need to adapt to the growing and ageing population of the Midi-Pyrenees region in the South of France and to provide a more efficient delivery of its specialist care units. The hospital’s overall goals were to improve its quality of care and efficiency, provide an exceptional working environment for staff and develop its research platform. 

In 2014, a new Purpan Hospital opened its doors to the public: Pierre-Paul Riquet Hospital (PPR). The 84,000m² building includes three medical centres, bringing together three previously dispersed specialist areas of healthcare: neurosciences, locomotor and cephalic disorders – totalling 600 beds and 27 operating rooms. Patients are at the heart of the hospital’s design with light and airy spaces and 80% of the rooms being single, providing privacy and comfort. The hospital is also easier to access thanks to a new 400 space car park and better connections to public transport.

A central challenge was the sharp incline of the site, requiring 6,000m² of Diaphragm walls and 24,000m² of earthworks. Our services on the project included structural engineering, building services (MEP: HVAC, electrical, plumbing and others hydraulic services), medical equipment design and project management.

Another key objective for our client, Centre Hospitalier Universitaire (C.H.U.) de Toulouse, was to improve the efficiency of their emergency services. Our teams were involved in the design of the new 28,500m² Intensive Care Unit (ICU) building, directly linked to the Pierre-Paul Riquet Hospital. This facility provides services such as accident & emergency, anaesthesia and reanimation and intensive care.

The restructuring and specialisation of these facilities has enabled a better and more efficient delivery of Purpan’s healthcare services. Patients in need of specific treatment are sent directly to the appropriate service, improving waiting time and treatment.

Sustainability was central to the design with all new buildings fulfilling a set of French environmental objectives (‘haute qualité environnementale’) and sourcing energy from renewable sources and the site’s own central biomass energy plants.

80% of the patient rooms are single
For more than 30 years, the Prince of Wales Hospital has been providing comprehensive healthcare services to Hong Kong’s New Territories, as well as serving as a teaching hospital for the Chinese University of Hong Kong. In 2010, this vital facility received a major boost when it opened the doors to a brand new, hyper-efficient clinical block.

The 13-storey, 870-bed building is the new heart of the hospital complex, housing its 24-hour accident and emergency department, as well as 14 operating theatres and a range of patient facilities, including special isolation wards. Other services include a rapid response laboratory, cardiovascular intervention centre and diagnostic radiology unit.

WSP provided mechanical and electrical engineering services, with responsibility for the design of specialist hospital systems, isolation and infection control systems, and critical backup building services systems.

Efficiency is designed into every aspect of the new building. A façade of modular tinted glazed windows, aluminium sunshades and aluminium cladding panels and louvers work as an insulation layer to reduce solar heat gain and help cut energy used for air conditioning, while extensive glazing in the major public areas maximises daylight while enhancing the ambience for visitors.

Cutting-edge building services include chillers that recover waste heat for water heating, plus a flexible air-handling system, which allows the Intensive Care Unit to switch to lower-energy mode when the rooms are being used for patients with non-airborne infectious diseases. Automatic sensor taps and low-volume cisterns also keep water consumption down.

The project was completed in a fast track 3-year design and build programme with flexibility to allow for future adjustment and expansion.
South General Hospital, Stockholm
A green haven within a busy urban landscape

Location: Stockholm, Sweden
Client: Locum
Architect: LINK Arkitektur
Services: Logistics, Landscape Design, Traffic Planning
Project status: Due for completion in 2019

South General Hospital, one of Stockholm’s biggest medical facilities, is being expanded and modernised to cater to a growing and ageing population. With environmental protection at the heart of the design brief, the project promises to become a green beacon for healthcare development in Sweden.

Already host to the largest emergency department in Scandinavia, the renovated complex will boost these services further with three new hospital buildings, set to house an upgraded emergency room, operating theatres and patient wards with private rooms, as well as a modern catering block. Aiming for a gold rating under Sweden’s Miljöbyggnad certification system, the client has placed heavy emphasis on environmentally friendly design.

We were hired to landscape the facility’s external environment, provide traffic planning and oversee project logistics in close cooperation with other consultants. A major challenge was to design the peaceful, green spaces needed to aid healing and meet environmental goals, while also providing convenient access for ambulances, taxis and other vehicles. Our solution was to maximise greenery on all available space, including building joists and rooftops, as well as to create scenic paths for patients to walk on.

As a result, the hospital grounds will become a green lung, offering respite to patients, visitors and staff amid a congested urban environment.

GOLD
rating under Sweden’s Miljöbyggnad certification

5000
new admissions a year
Busamed Modderfontein Private Hospital

Shielding patients from radiation – without breaking the bank

Location: Johannesburg, South Africa
Client: Busa Holdings
Architect: Ruben Reddy
Services: Structural Engineering, Mechanical, Electrical and Plumbing, Construction Management
Project status: Completed in 2016

When healthcare provider Busamed set out to build a crop of new private hospitals across South Africa, it took WSP along for the ride. We were commissioned to provide civil, structural and building services on four facilities, including the group’s new hospital in Modderfontein, a suburb of Johannesburg.

This 240-bed, three-storey hospital is now up and running, and offers a wide range of medical, surgical, day and paediatric services. Facilities include general, cardiac and neonatal intensive care units, plus high-care, labour and maternity wards.

During the design process, the hospital’s radiology practice received particular attention. As well as MRI and CT scanners, and eight operating theatres, it features an oncology unit with two dedicated oncology bunkers – special rooms for treating cancer patients using a machine called a Variant Linear Accelerator.

These bunkers have unique specifications to ensure the radiation used is contained, posing challenges for construction and budget. After a value engineering process, in collaboration with the University of Pretoria, our team found a solution that saved significant cost and time. High-density concrete slab and lead bricks were replaced with standard density, high-reinforced concrete slab and mild steel, allowing us to achieve the desired impact with greater efficiency.

The sloping site’s unique geology also called for a nuanced approach to foundation design, resulting in a dual solution in which the portion of the building on the upper terrace is founded on friction augur piles and the lower on reinforced concrete pad footings. The building has a brick façade with concrete cantilever canopies.

As well as this 20,000m² facility, Busamed’s new Paardevlei Private Hospital in the Western Cape is also fully operational. The other two projects in the programme – Harrismith and Bloemfontein private hospitals – are under construction.

New facility covers

20000m²

2 metres thick reinforced concrete walls for dedicated oncology bunkers
State-of-the-Art Care

Bringing together a vast array of medical specialisms under one roof creates complex design challenges. Not least among them is the constant march of medical progress, with research and technological advances delivering better treatments year by year. It is vital that hospitals can adapt to offer critical patients the best and latest therapies.

WSP excels at creating hospitals capable of housing the most advanced treatments available, bringing new hope to patients and their families. Our building systems can cope with the needs of the most delicate and sensitive machines and equipment – like those in Puttaker at George Washington University Hospital, which hosts one of the most advanced cardiology centres in the US.

We make full use of state-of-the-art techniques to design and implement our projects too. Through the latest Building Information Modelling (BIM) techniques we can bring ideas to life, analysing how buildings would perform in reality, finely tuning and optimising our designs and construction techniques.
Location: Stoke-on-Trent, UK
Client: University Hospitals of North Midlands NHS Trust
Contractor: Laing O’Rourke
Architect: HKS, Inc. / Ryder Architecture
Services: Structural Engineering, Mechanical, Electrical and Plumbing, Fire Engineering, Building Information Modelling
Project status: Works completed in phases from 2002–2014

One of the UK’s largest acute teaching hospitals, the Royal Stoke University Hospital in Stoke-on-Trent serves a local populace of half a million people and provides specialist services to three million people across the wider region. It has a reputation for clinical excellence, particularly in the field of emergency medicine.

In 2002, the NHS implemented a ‘Fit for the Future’ project to reorganise the then University Hospital of North Staffordshire’s (UHNS) facilities, which were spread across three sites in Stoke on Trent. The NHS Trust wanted to streamline UHNS’s services to create an efficient healthcare centre capable of offering state-of-the-art clinical services.

The decision was made to house all the city’s clinical services in one new-build facility to be constructed within the existing City General Hospital site, now renamed Royal Stoke University Hospital. This new facility would include a new accident and emergency (A&E) department, maternity centre and oncology unit. Refurbishment work would also be carried out to the three existing sites, including the City General Hospital where some buildings were over a century old.

Our most complex challenge was to deliver the UHNS’s new facility while working in a live and congested hospital environment. The new unit had to be created in a phased programme of construction works with the new facilities completed before the old units could be demolished. Careful planning was required to organise the build schedule and we maintained a very close relationship with the NHS Trust, main contractor and design team to ensure minimal disruption to the hospital’s usual activities.

Meeting demanding energy targets was another key challenge. Our response was to use natural ventilation, as opposed to air conditioning, throughout the new hospital by exploiting the embodied mass of the building’s façade together with energy-efficient plant systems.

Our engineers added significant value to the project by using a method of ‘hybrid’ off-site construction for parts of the building, reducing the need for site labour and saved time within the build schedule. This is one of the first times this technique has been used in hospital design and construction.

A key part of our approach to the new-build facility was to involve the UHNS’s clinical teams during the design consultation phase. Through the use of Building Information Modelling (BIM), we were able to demonstrate how the hospital environment would work, creating clinical adjacencies and allowing for vertical and horizontal movement between different clinical zones.

The direct input from hospital staff resulted in the creation of a central ‘hub’ within the new facility that co-located key diagnostic and treatment facilities. This design strategy led to economies of scale in the number of specialist facilities required and has helped to create a healthcare facility that is easily navigable, minimising patient transfer times.

In addition to being a value-engineered and energy-efficient building that is able to support advanced clinical strategies, the Royal Stoke University Hospital’s new facility has met the client’s brief of being ‘Fit for the Future’. The buildings will be able to accommodate future expansion and allow for internal conversion for different use in the future in acknowledgement of ever-evolving patient treatments.

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George Washington University Hospital

Maintaining standards of excellence at hospital serving the US president

Location: Washington D.C., USA
Client: Universal Health Services & George Washington University
Architect: SmithGroup JJR
Services: Mechanical, Electrical and Plumbing, Fire Engineering
Project status: New hospital completed in 2002; New Heart Center completed in 2012

George Washington University Hospital (GWUH) is world renowned for the excellence of the emergency healthcare it provides to 75,000 patients a year, as well as its role in serving the president and congress when in session.

Providing 24 hour, in-house acute care, the hospital receives the most critically injured patients from Washington DC and Northern Virginia, as well as transfers from the other nearby counties. GWUH is an American College of Surgeons (ACS) verified Level 1 Trauma Centre, which is the highest level a hospital can receive.

With a total of 571 beds, of which 52 are in the Emergency Department, the hospital moved to its present site in 2002. The $96m new build development allowed GWUH to expand its services and offer state-of-the-art facilities across a range of services including emergency medicine, cardiovascular surgery, neurological care, maternity care, oncology, laboratories and research centres.

As the lead mechanical and electrical engineering contractor for this successful scheme, we were appointed again by our client in 2011 when the decision was made to further update the hospital’s Heart Center, already a national centre of excellence in cardiovascular emergency surgery, treatment and research.

With limited space for expansion to existing facilities, the only way to upgrade the Heart Center was through a wholesale refurbishment of the 2002-built, 2,500m² area, while the rest of the hospital continued to operate around the clock. We were part of the Integrated Project Team tasked to deliver this new facility within a build programme of just 12 months.

Facilities to be provided by the new Heart Center included an expanded operating theatre, improved recovery and endoscopy rooms, larger data centre and a new helipad for the admission of acute cases. The facilities needed to accommodate and enhance the Center’s advanced clinical techniques.

Our role was to streamline the overall build schedule to maximise the length of the project and undertake key mechanical and electrical engineering work. Importantly, we also needed to ensure that the rest of the hospital was not interrupted by the construction works. To achieve these aims we used LEAN project management techniques including a Choosing By Advantage (CBA) decision making system. By using a methodical and value-focused approach to organising and delivering the build schedule, the Integrated Project Team was able to handover the project on time and within budget.

GWUH’s Heart Center continues to fulfil its mission of being one of the most advanced cardiovascular health centres in the US supported by a state-of-the-art acute care hospital.
Hälsostaden Ängelholm
Connecting a hospital more closely with the city it serves

Location: Ängelholm, Sweden
Client: Bravida Sverige AB
Architect: White Architects
Services: Mechanical, Electrical and Plumbing, Green Building Design, Logistics
Project status: Due for completion in 2018

The hospital complex at the heart of Sweden’s city of Ängelholm is split in half by a railway line. It’s one aspect of this complicated site set to be fixed by a major redevelopment, due for completion in 2018. The ambitious project aims to improve the accessibility – and quality – of healthcare in the region, and to integrate the hospital more tightly with the surrounding city.

The scheme will see a number of outdated buildings replaced with efficient and modern facilities. This includes the new 13,200m² ‘Building 71’ over 5 floors and the rebuild of the existing 5,500m² ‘Building 08’, spread over three floors of an existing five-floor building. The site’s central feature houses a brand new facility to accommodate diagnostic and treatment wards with private rooms, plus an activity centre dedicated to physiotherapy and occupational therapy. By bringing services closer together, the complex aims to improve coordination and logistics, facilitating more efficient care. It connects to the city centre via a pedestrian and bicycle bridge, deepening the links between the upgraded complex and the surrounding urban landscape. A public indoor swimming pool is also being built within the hospital grounds.

Interiors throughout the complex have been designed with nature in mind, incorporating warm and natural colours to enhance the sense of calm, while extensive natural light and opening windows will further contribute to a positive healing environment.

WSP is working on several projects within this redevelopment, providing services including electrical engineering and environmental consultancy. The biggest challenge comes from the requirement to keep the existing hospital fully functional throughout construction, calling for complex coordination and high attention to detail.

18700m²
of new facilities
An evolving hospital complex in the heart of Montréal's new health district is transforming the medical landscape of Quebec. The multi-billion dollar, three-phase project is bringing the services of the CHUM teaching hospital network's three facilities – Hôtel-Dieu de Montréal, Hôpital Notre-Dame, Hôpital Saint-Luc – onto a single, 37,000m² site. The result will be one of the largest healthcare facilities in North America, and a high-tech centre for research, teaching and patient care.

Once complete, the new hospital will provide 772 private rooms, a critical care unit and 39 operating theatres, including dedicated rooms for robotic surgery, heart surgery, neurosurgery and transplants. Innovative features include a network of self-guided vehicles to carry equipment around the hospital – expected to make 3,500 journeys a day – plus nine kilometres of pneumatic tubing for efficient delivery of drugs, blood samples and other items. Cancer patients will also benefit from treatment rooms equipped with state-of-the-art linear accelerators, facilitating faster, more accurate radiotherapy.

The CHUM Research Centre, a major new knowledge hub for the city, opened its doors in 2013, marking the end of phase one of this mammoth scheme. The second phase – construction of the main hospital – is currently under way. Under the third and final phase, the old L'Hôpital Saint-Luc will be demolished to make way for additional clinical space, as well as offices and a copper-clad amphitheatre. This striking structure will form the centrepiece of the wider complex and contain a 500-seat auditorium.

WSP is part of the consortium hired to project manage the research centre and general hospital, and to provide a range of other services including cost, schedule, change and risk management. The scale of this project led the team to create new processes and management tools including a new project office to enable synergies and efficient communication; performance benchmarks; regular team workshops and client and stakeholder meetings; and processes that ensured the evaluation and choice of partners met key criteria. These innovative management methods have resulted in a unique collaboration with the client and the opportunity for us to achieve key milestones.

The complex includes a number of green features, such as efficient plumbing fixtures that will help reduce fresh water consumption by 30% compared to a similar, standard building, plus a unique HVAC design that will make CHUM the only hospital in North America to supply 100% fresh air throughout the building. The research centre has already been awarded LEED Gold and the hospital is aiming for LEED Silver.
St Paul’s Hospital Redevelopment
Smooth-running services for a tall and complex structure

Location: Causeway Bay, Hong Kong, China
Client: The Mother Superior of The Soeurs de Saint Paul de Chartres (Hong Kong)
Architect: P&T Group
Services: Mechanical, Electrical and Plumbing, Construction Management, Site Supervision
Project status: Block A completed in 2009; Block B due for completion in 2017

From its origins as a converted cotton mill, St Paul’s Hospital has grown to become a modern, high-tech medical complex and a crucial feature of the community in Hong Kong’s Causeway Bay. Almost a century after it opened its doors, the private hospital has taken yet another step into the future with an extensive redevelopment program that includes two new towers of 21 (Block A) and 24 (Block B) storeys with a three-level basement car park. The new blocks will be constructed in phases and will increase capacity from 360 beds to almost 800 beds as well as new medical wards and facilities.

WSP was responsible for the mechanical and electrical engineering consultancy including design, contract preparation, construction planning and site supervision of the building services installations and ensured normal operation of the hospital during construction.

All aspects of the new building were designed using the latest hospital planning techniques, ensuring a smooth-running facility that can provide the highest care to patients far into the future. As is common in Hong Kong, restricted land supply has pushed St Paul’s to build upwards in order to fulfil its development potential, raising the challenge of how to maximise efficiency in a tall and complex structure.

Our team hit the ground running, wasting no time in designing a building services strategy with energy efficiency and flexibility at its core. It includes, for example, an air-to-water heat pump that simultaneously allows domestic hot water to be pre-heated and fresh air to be pre-cooled, plus a central chiller plant consisting of a single loop system with variable chiller control.

Water-saving basins and toilets and occupancy sensors for controlling light and air conditioning in office areas further boost efficiency. Meanwhile, patient security is ensured by full CCTV coverage and a card reader system for door and lift access in designated areas.

46 47

 Additional beds
Gleneagles Hong Kong Hospital
High-speed delivery for a new centre of excellence

Location: Hong Kong, China
Client: GHK Hospital Limited
Architect: P&T Group
Services: Mechanical, Electrical and Plumbing
Project status: Due for completion in 2017

Hong Kong’s development as a regional healthcare hub is due to get a fresh boost in 2017 when the 500-bed Gleneagles private hospital opens its doors to the public. The state-of-the-art facility will provide not only significant additional resources for patient care, but also a new centre for the education of healthcare professionals and advancement of clinical research.

The 47,000m² hospital in the Wong Chuk Hang district of Hong Kong Island will offer medical services across 35 specialisms, including orthopaedics, traumatology and gynaecology, as well as out-patient and ambulatory care sections, operating theatres, a cardiovascular laboratory and a rehabilitation clinic. Under the auspices of the renowned medical faculty at the University of Hong Kong, it will also act as a key training ground for doctors, nurses and other healthcare staff.

As a key design consultant, WSP has made sure Gleneagles has the building services fit for a cutting-edge medical and educational facility. Notable features include an air-cooled chiller plant designed to prevent legionnaire’s disease and a water-to-water heat pump, which helps both to pre-heat domestic hot water and to heat the hospital. A Central Control and Monitoring System (CCMS) and water-saving plumbing fixtures will allow the hospital to save both energy and water.

A fast track schedule has made it possible for this important facility to be ready much earlier than would typically be expected for a project of such scale and complexity. In our role as building services engineer, we worked closely with the rest of the project team to fast track the design process, using 3D CAD to speed up the preparation of drawings and to minimise conflict of services during construction. This contributed to a programme that moved from design to the granting of the occupation permit in just 24 months, a remarkable achievement for a major hospital.
Populations around the world are ageing, and hospitals built today need to withstand the pressure on their services tomorrow. Each hospital project, whether an existing building in need of modernisation or a new build, represents a long term investment.

Our designers and engineers future-proof every aspect of our buildings. Fit outs need to be easy to maintain and look good year after year; building services need to house emerging technology that will become tomorrow’s ‘norm’; building structures need to withstand the effects of climate change; and power systems need to work efficiently as energy costs continue to rise.

This constant reference to the future is especially important in long running projects. For example, our work to redevelop Hong Kong’s Kwong Wah Hospital will complete in 2025. By then a new generation of technology will be standard, while demand for frontline medical services, in one of the most populous places on earth, will have soared.

Through intelligent design that draws on sophisticated tools like Building Information Modelling (BIM) technology, we make sure hospitals are fit for tomorrow, whatever the future may bring.
Kwong Wah Hospital Redevelopment
Creating a future-fit hospital for one of the world’s most densely populated areas

Location: Kowloon, Hong Kong, China
Client: Hospital Authority
Architect: Simon Kwan & Associates
Services: Mechanical, Electrical and Plumbing, Structural Engineering, Geotechnical and Ground Engineering
Project status: Ongoing (2013–2025)

On an average day, around 400 people attend Kwong Wah Hospital (KWH)‘s Accident and Emergency (A&E) Department, while up to 2,000 patients are treated by its specialist, family and general out-patients clinic. Based in Kowloon, Hong Kong, one of the most densely populated areas in the world, KWH is renowned for its comprehensive range of acute services. But the majority of the hospital complex is over 50 years old and many buildings are no longer fit-for-purpose and require constant repair.

When the hospital’s stakeholders decided that a new development was required to replace KWH’s overstretched infrastructure, the vision was not only to meet the current needs of Kowloon’s residents but create a world-class clinical facility ready for tomorrow. KWH, the flagship of the Tung Wah Group of Hospitals (TWGHs), needed a building that would be ‘future proof’, accommodating technological advances and clinical methods that are only just emerging.

We were brought on board the redevelopment plan early in 2013 to fulfill two key contracts; firstly building services, engineering consultancy and secondly, civil, structural and geotechnical engineering services. These services are to be provided across the two phases of the 12-year redevelopment scheme, which is still in its first phase. The first phase covers surveys and preparations, the second will see the demolition of most of the existing hospitals and the creation of a new main building.

This will result in a complex covering 270,000m² and providing 1,600 beds.

Central to the redevelopment is the expansion of KWH’s acute care services. The new building will offer an expanded A&E department of 5,000m², which includes a new emergency medicine ward to care for A&E admissions. KWH’s existing intensive care unit (ICU) will also be redeveloped. Enhanced isolation facilities, which are easily accessed from A&E and ICU, will be installed to reduce the risk of the spread of infection. Other features of the new building include 20 operating theatres, an ambulatory care centre, specialist out-patient department, new oncology unit and maternity centre.

Our approach is to embrace the opportunities offered by the almost total rebuild of KWH to weave future-proofing initiatives into the very fabric of the new hospital. This means comfortably accommodating current technologies such as computer tomography (CT) scans and creating flexible building engineering services that can, for example, support spaces for disaster contingency. Over 140 beds are fitted out with negative pressure control isolation facilities, to control the risks of infection. In addition, approximately 100 beds are convertible from ‘normal mode’ to ‘isolation mode’ in the case of an outbreak of infectious diseases.

Founded in 1911, KWH’s charitable origins and long commitment to providing traditional Chinese medicine all mean the hospital has a special place in the local community. Its iconic Tung Wah Museum, KWH’s original building, will remain the cultural focus of the new campus. But the critical zones that provide acute care, along with the rest of the new campus, will be entirely fit for the future.
Baylor Scott & White Medical Center

A green and efficient healthcare facility fit for tomorrow

Location: Waxahachie, Texas, USA
Client: Baylor Scott & White Health
Architect: CallisonRTKL
Services: Mechanical, Electrical and Plumbing, Fire Engineering
Project status: Completed in 2014

Creating a future-fit hospital that cares for the community and the environment was the guiding vision behind Waxahachie’s new $175m medical facility. The Baylor Scott & White Medical Center provides a full range of health services, including an Emergency Department and intensive care units, from a building that exploits natural light and uses advanced systems to reduce its energy and water needs. The result is a facility that promotes the welfare of patients and staff, while minimising its impact on the environment.

With a capacity of 129 beds, the Baylor Scott & White Medical Center has more than doubled the size of the century-old facility it has replaced in Ellis County. Furthermore, it has shell space for 25 more beds to meet future patient demand. The main hospital building covers 25,640m², which includes a six-storey tower, along with a 1,490m² dedicated Cancer Care Center and a separate 27,870m² Central Utility Plant.

The acute care wards are located in the tower allowing for the immediate transfer of patients to these facilities from the Emergency Department below or the four operating theatres above. Designed to facilitate a healing environment, the 12 acute care suites are spacious enough to comfortably accommodate visitors so that patients can be near their loved ones. The suites are light and airy to engender a sense of positivity.

Designed in accordance with Leadership in Energy and Environmental Design (LEED) certification, efficiency is at the heart of the Baylor Scott & White Medical Center. Our client wanted to create a building that would perform over the long run as well as in the short term, with detailed attention given to all its energy requirements.

Our response was to design a heat recovery chiller system that has a projected net energy saving of around 342,000 kWh per year. This system works by harnessing the heat generated from the hospital’s chilled water systems. We also installed a cooling coil condensate recovery system. In this case, cooling coil condensate from the air handling units is collected and pumped back to a central plant and then used as top-up water to the system’s cooling towers. The system has created an estimated potable water saving of over two million gallons per year.

Another key way to reduce the building’s consumption of resources was the use of a low voltage design for the hospital’s data centre on Floor 4 of the tower. Boosting efficiency in this part of the medical centre was important because of the high energy demands made on the data centre, which acts as the hospital’s nerve centre. It houses the hospital’s IT infrastructure, video surveillance equipment, nurse and doctor call systems and physiological monitoring systems.

Additional ‘green’ features include the hospital’s light coloured (‘cool’) roofing to reduce the Heat Island Effect and energy-efficient (highly insulated) windows. The building itself makes use of sustainably harvested wood and the landscape strategy uses a range of native plants to reduce the need for irrigation and support the local ecology.

The Baylor Scott & White Medical Center has achieved LEED Silver certification making it one of the greenest healthcare facilities in Texas. Its energy efficiency and advanced infrastructure, along with its potential to meet future patient demand, mean the centre is a model of future-fit acute and general healthcare.
Klinikum Offenbach GmbH
Guaranteeing the future of a historic institution

Location: Offenbach, near Frankfurt am Main, Germany
Client: Klinikum Offenbach GmbH
Architect: wörner traxler richter / Planungsgesellschaft mbh
Services: Project Management
Project status: Completed in 2010

Founded in 1843 as an alms house for the poor and sick, Klinikum Offenbach has grown into one of the largest health centres in the Frankfurt Rhein-Main area treating around 32,000 patients each year. The centre has been subject to numerous redevelopments and extensions over its long history. In 2004, an ambitious scheme was launched to replace the entire complex with a new, state-of-the-art hospital with a full suite of acute facilities to serve ever growing demand for its services.

WSP was commissioned to provide a comprehensive project management service for the 60,000m² new build unit. The goal of the client was to create a facility that would meet both the present and future needs of the local 420,000-strong populace, offering advanced clinical services across a range of areas. The facilities also needed to support the teaching activities of the prestigious Goethe University Frankfurt. In addition to emergency and acute care, the new centre would also offer oncology; a children’s hospital; burns unit; maternity; stroke unit; laboratories and a range of other advanced clinical facilities.

One of the key challenges in delivering the scheme was the build schedule because the old facility needed to be demolished in phases as the replacement facilities became available. This required an advanced approach to site logistics. Our priority was to safeguard the working of all clinical services on site, keeping access routes to existing hospital units clear and minimise the project’s impact on patients and staff.

The four-year build programme concluded in 2010 and has delivered the largest, post-war health project in the region. Offenbach Klinikum is now an eight-storey, 744-bed hospital with 60 acute care beds and ten operating theatres along with all core medical areas sited in its main building. These areas are connected via a central hall, linked vertically by four lifts that are each capable of accommodating acute care beds. A tubular ‘post’ system runs throughout the entire complex allowing specimens to be transported quickly and efficiently. The helipad was moved from the ground onto the roof with direct access to the operating theatres meaning that emergency cases can be treated without delay.

Our role was to ensure the connectivity of all these areas and services, in addition to overseeing the overall construction schedule for the new build unit. Our expert teams organised and co-ordinated material qualities and quantities, costs and financing, deadlines and capacities.

A patient-centred approach informed every aspect of the Klinikum Offenbach scheme. Geometrical coloured patterns guide visitors to their destination. The system is based on a highly flexible concept that can be easily and quickly modified. The hospital building also supports the use of advanced clinical techniques such as cardiac catheterisation, shock rooms, stroke units, computerised tomography and magnetic resonance imaging techniques in a warm, welcoming environment that has the potential to adapt to future technologies.
Gold Coast Private Hospital
A flexible facility with room for growth

As Australia’s Gold Coast becomes ever more popular as a place to live, its health infrastructure is under growing pressure. One new development helping to meet the demands of a rising – and ageing – population is the Gold Coast Private Hospital, a seven-floor, state-of-the-art facility from Healthscope, one of the country’s leading healthcare providers.

The 284-bed hospital forms a key part of the Gold Coast Health & Knowledge Precinct, an expanding complex of healthcare buildings including the $1.7 billion Gold Coast University Hospital and $150m Griffith University Health Centre.

The new private facility comprises seven floors of top-class clinical space and support accommodation, including 13 operating theatres, an emergency department, intensive care unit and maternity centre, plus consulting suites for a range of specialisms from oncology to kidney health. A kitchen, workshop and four-storey open-deck car park are incorporated in the lower levels of the 50,000m² building.

Our services on this exceptional facility, which is designed to feel more like a hotel than a clinic, included mechanical engineering, fire protection, vertical transportation and medical gas infrastructure design. The hospital’s owners are looking to the future, and a crucial part of the brief was to keep the building sufficiently flexible to cope with future expansion. Already, the next phase of works has been fast-tracked in the face of huge demand for the hospital’s services and will see the number of beds upped to 344, plus the addition of 10 operating theatres.

We designed the building services with growth in mind, leaving sufficient space for new plant and equipment to serve a larger facility, and paving the way for seamless expansion. The project was also documented in REVIT 3D to ensure a fully co-ordinated design, reducing the risk of additional time and cost during construction.

Location: Southport, Queensland, Australia
Client: Healthscope
Architect: dwp|suters
Services: Mechanical, Electrical and Plumbing, Fire Engineering, Vertical Transportation, Medical Gases
Project status: Completed in 2016

340 bed expansion and 23 operating theatres
Sollentuna Hospital
Behind an old façade, a facility for the future

Location: Sollentuna, Stockholm, Sweden
Client: Locum AB
Architect: Norconsult AB, Semrén & Månsson
Services: Project Management, Project and Program Controls, Green Building Design, Mechanical, Electrical and Plumbing
Project status: Due for completion in 2018

Rapidly expanding Stockholm has made improving its healthcare facilities a priority for the years ahead, drawing up a programme of regional building and renovation works to improve care and working conditions, boost bed numbers and lower energy consumption.

The modernisation of Sollentuna Hospital is a key piece of that puzzle. Since it was first built in 1978, the world of healthcare has transformed. Now the hospital is being overhauled to create a progressive and accessible facility, capable of integrating 21st century medical advances and providing the highest level of patient-centred care.

Located at the centre of Sollentuna, a town to the capital’s north, the upgraded, 230-bed hospital will focus on geriatric care, as well as providing family doctors’ surgeries, a rehabilitation centre and extensive outpatient facilities offering a number of specialisms.

With parts of the old façade kept intact, Sollentuna will retain much of its external character, as well as beautiful views over Edsviken, an inlet of the Baltic Sea. Inside, however, it will be a completely different hospital. Every aspect of the new interior is designed around the patient journey, from easy access down to bold colour schemes that help elderly visitors orient themselves. Structurally, the facility is also getting a new lease of life, with carbon fibre and steel lattice girders used to reinforce the weak concrete frames of the existing building.

WSP is project managing the scheme, as well as providing a number of other services including HVAC design and environmental consultancy. A major challenge has been the project’s tight schedule, which called for a contractor to be appointed and construction to begin before the design was complete. The team has met this through extensive use of BIM, ensuring a closely coordinated approach to this significant development for east central Sweden.
King Fahad Medical City

An energy-efficient expansion with an eye on the future

Location: Riyadh, Kingdom of Saudi Arabia
Client: King Fahad Medical City
Architect: HKS, Inc.
Services: Mechanical, Electrical and Plumbing, Fire Engineering, Energy Management and Efficiency
Project status: Due for completion in 2018

Saudi Arabia’s King Fahad Medical City (KFMC) has a clear mission: to offer the very best diagnostic, therapeutic and rehabilitative healthcare services in the region. That’s the driver behind a major expansion, which will keep the hospital complex at the vanguard of clinical care in the Middle East for decades to come.

The 1.5M m² project is bringing a number of advanced facilities to the campus, including a 231-bed Cancer Center with proton beam treatment due to make KFMC one of a handful of institutions offering the innovative cancer treatment worldwide. A new neuroscience institute, cardiovascular centre and laboratory are also under construction.

From the outset, the team behind KFMC has been determined to meet the highest environmental standards, believing that a sustainable hospital benefits not only the planet but patient outcomes too. The urban site is set in a green landscaped park providing the optimal healing environment for its patients. Setting its sights on LEED certification, the client assembled an international team, including members from the US, Great Britain, India and Saudi Arabia, to push for the very best in energy-efficient and patient-oriented design. Resources and materials have been carefully selected to minimise volatile organic compounds (VOC).

WSP was hired to provide, master planning, concept and schematic design engineering services for the expansion’s MEP and fire protection systems. Additionally, we also provided design development drawings for the 5,570m² central energy plant. The plant is designed to deliver 14,000 tonnes of chilled water to the complex, meeting existing needs while allowing for future growth.

Similarly, a 13.8kV dual-circuit electrical service – brought in from the local electricity provider – is geared for further campus expansion. The system also includes standby diesel engine generators, with enough capacity to power all essential systems in an emergency.

The campus also includes a new four gantry Proton Beam cancer treatment center, the first in the Kingdom of Saudi Arabia. Our teams provided complete buildings services, fire protection, IT and BIM drawings for the complex facility.

231 cancer patient beds with a new four gantry Proton Beam treatment centre
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Can we trace horizons, hold true to our ambitions, and hold ourselves accountable?

What if we can?