Designed for little people
Children's hospitals
Children's hospitals are among the most complex of all healthcare buildings. Offering many medical specialisms in one place, and caring for patients from the very youngest to those approaching adulthood, they present many design challenges – from tailoring every aspect of the fit-out to small people who love to explore, to stacking and grouping functions so that large, diverse facilities can operate with maximum efficiency.

We are passionate about supporting our clients to provide the very best care, and we’re proud to have worked on some very special buildings dedicated to children, as well as some of the most efficient and sustainable facilities in the world.

We’ve helped to create a state-of-the-art “health park” for one of Europe’s busiest children’s hospitals, and designed the groundbreaking building services for the world’s first hospital to achieve LEED Platinum accreditation. We play a key consultancy role on the transformation of some of the world’s most renowned children’s hospitals and provide a range of technical and project management services on facilities large and small, across the globe.

Every project presents unique challenges, but we never lose sight of the overall goal: creating safe, supportive, efficient environments for young patients, their families and the people who care for them.

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Clean, safe environments

Patient safety is a guiding principle in every decision we take, and never more so than when we’re designing for children. Our specialist teams integrate hygiene and infection control into the earliest concept drawings, to actively promote wellbeing and protect the very youngest and most delicate patients. We make sure rooms and staff facilities are laid out to prevent cross-contamination, carry out meticulous detailing to eliminate germ traps, and design effective, high-performance building systems to reduce airborne pathogens and stop the spread of disease. We implement secure-by-design principles and systems to keep intruders out and stop adventurous young patients from roaming where it isn’t safe. And we take a child’s eye view to create positive distractions and childproof fixtures and fittings that keep little fingers (and vital equipment) out of harm’s way.

Positive experiences

A children’s hospital is never just a building – it’s a place that touches patients and their families at a critical moment in their lives, often when they are at their most vulnerable. We think differently about how to create a nurturing environment for everyone, from the parents of premature babies, to youngsters keen to explore their surroundings and teenagers on the cusp of independence. How can we give every patient access to greenery and nature? How can we make places that capture the imagination and turn a stressful experience into a positive one? How do we fit in more single rooms so parents can stay over, and enough space to store prams and pushchairs safely? And why not make emergency buttons blue instead of red so they’re not so enticing to curious minds? These are just some of the questions that we constantly ask ourselves to make a visit to one of our children’s hospitals as fun and rewarding as it can be.

Efficient buildings

Providing high-quality, affordable, sustainable healthcare means making the best possible use of limited resources. Our clients rely on us to deliver buildings that are cost-effective to operate and maintain, so that they can focus on delivering for the children and communities who depend on them. Our expert teams leave no stone unturned when it comes to considering exactly how a hospital will run, and what we can do to make it perform better. We design structures and finishes that minimise cleaning and maintenance, building systems that use energy and water as efficiently as possible, and layouts that mirror hospital workflows, to maximise patient visibility and reduce travel time for staff.

What makes a world-class children’s hospital?

Alder Hey Children’s Park, UK
Children’s healthcare is changing all the time, so we provide design solutions to help our clients keep up with the demands of 21st century medicine.

We create inspiring spaces that incorporate new kinds of treatment and new ideas about wellbeing, supporting our clients to care for young patients with increasingly complex needs and to meet and exceed their parents’ expectations of what a children’s hospital should offer.

Our teams draw on the best available science about what makes a healing environment, and use proven technologies to put it into practice. We collaborate with healthcare practitioners to find out how we can support them to deliver better care, and we spend time listening to patients big and small about the spaces that make a difference to them. Within our children’s hospitals, you’ll find abundant natural light, fresh air and greenery; great views for patients and their families to enjoy, and attractive spaces that encourage exploration and play or provide a calming backdrop for quieter moments.

There’s plenty of innovation that the patients don’t see too, in the structures and systems that underpin a perfectly functioning children’s hospital. At Alder Hey, for example, we designed an innovative precast concrete facade that doubles as both structure and cladding, reducing internal columns, materials and embodied carbon. And we’re using the latest design tools and off-site manufacturing techniques, improving speed and accuracy – and ensuring that the final product will perform just as it should.
Alder Hey Children’s Health Park
A hospital designed through the eyes of children

Location: Liverpool, UK
Client: Alder Hey Children’s NHS Foundation Trust
Architect: BDP
Services: Structural Engineering, Geotechnical and Ground Engineering, Transport Planning, Building Acoustics, Noise and Vibration
Project status: Completed in July 2015

Alder Hey Children’s Hospital is one of Europe’s busiest children’s hospitals, but until last year it was housed in an almost century-old building with a leaky roof. When the local NHS Foundation Trust decided to modernise, its vision went far beyond a simple revamp: why not integrate the new hospital into neighbouring parkland and use green space to boost wellbeing? The result is a trailblazing ‘health park’ that connects patients with nature and sets new standards for paediatric care.

We worked with architect BDP on the design, but the vision was uniquely inspired by the children themselves – with patients and families being consulted throughout the project from effective access to fresh air to artwork on the walls. The patient-friendly hospital has been set out to create a calming and happy environment that doesn’t feel like a hospital and enhances the children’s healing.

The cutting-edge facility, which has 16 operating theatres and is set to treat 270,000 children and young people each year, is seamlessly entwined with the surrounding park. Its three sections blend into the landscape by reaching into the green space like fingers, while grass continues from the ground up and over the curved hospital roofs. With patient windows, specifically designed at children’s level, opening out onto the park and all departments looking over gardens or parkland, the 270-bed hospital is flooded with natural light. Room layout is also optimised to reduce distances covered by staff, while the decision to keep critical functions like A&E on lower floors has allowed space for a striking atrium at the heart of the building.

It also features a giant indoor tree house that provides relaxation areas and play space. Specialist acoustics contain noise from hospital equipment, alarms and beepers, while protecting the privacy of individual rooms.

As well as an extraordinary building with outdoor space to nurture patient recovery, the client wanted affordability and efficiency. We met this challenge head on with an innovative building-envelope design. More than 1,250 precast concrete sandwich panels on the building’s perimeter distribute loads to the foundations, removing the need for conventional columns thus allowing for maximum flexibility of room layouts. The design of the panels themselves also cut cladding requirements, removing the need for external scaffolding and the associated health and safety implications. In addition, effective installation and the use of high quality, robust and durable materials reduced the need for future labour and maintenance requirements. The vast majority of components were manufactured offsite, decreasing build time, boosting energy efficiency and contributing to the most sustainable 24-hour hospital ever. Clinicians were able to follow and visualise progress throughout the project thanks to the advanced use of 3D design that could walk them through the room flows, illustrate slices of the building and particular design specifications.

The old building will be demolished and reclaimed as parkland, proving this is more than a hospital project – it is a regeneration scheme for the whole community.

75% of patients in single rooms with park views
60% of energy is generated onsite
Concerned that too many babies are still dying in high-risk births, the German government is funding a string of new perinatal centres to care for preterm infants and their mothers. Our Frankfurt-based health team has already helped build three of these dedicated facilities. One is the specialised mother and child clinic at the Städtische Kliniken Mönchengladbach, a redevelopment of the Elisabeth Hospital in Rheydt, which also includes a centre for geriatric care.

Designed by HDR TMK Architects, the 34-bed Level 1 perinatal centre is geared to the special needs of significantly underweight newborns. Level 1 clinics care for mothers and babies where the estimated birth weight is below 1.25kg or the baby is born before 29 weeks gestation; where the mother is pregnant with triplets (or more multiples); or where serious conditions requiring specialised intensive care of the baby, such as critical heart defects or diaphragmatic hernias, are prenatally diagnosed. They feature an interconnected maternity ward, operating room and neonatal intensive care unit with at least six places.

The facility at Städtische Kliniken is designed to combine a relaxed and friendly environment for the whole family with maximum safety for mother and child. Its facilities, decorated in warm and varied colours, include state-of-the-art delivery rooms and operating theatres, plus a newborn nursery equipped to support breastfeeding, family rooms and a gym. The hospital’s layout supports the drive for enhanced safety, with the delivery rooms located just 25 steps from the paediatric intensive care unit next door. A new car park has also been built to meet demand from increased patient numbers.

We provided project management services to the scheme, implementing stringent cost management measures to make sure it finished on time and budget. A central challenge was overseeing construction of this significant new facility on a working hospital campus. In particular, the direct link between the mother and baby clinic and the neighbouring paediatric unit called for the highest hygiene standards and minimal noise and pollution.
Children’s hospitals are complex, highly serviced, power-hungry buildings that must perform flawlessly around the clock: there can be no downtime when many young lives depend on the constant, consistent functioning of hundreds of essential systems.

But that doesn’t mean they can’t be exemplars of resource efficiency and sustainability too. Our teams bring specialist expertise in many disciplines to ensure that every component of our buildings responds perfectly to the needs of healthcare practitioners, patients and their families, while making the lightest impact on the environment. From the biggest decisions over vital infrastructure to the smallest touch-panel control, we can provide clear, relevant advice on hot topics such as district energy, combined cooling, heat and power, the “Internet of Things” and smart buildings, and on how each client can derive the greatest possible value from them.

Of course, children are often the most demanding clients when it comes to sustainability – they understand that clean energy and saving water now is key to their world in the future. We invite young people to contribute to our designs and we listen to their concerns. Then, we work hard to find the smartest, most sustainable solutions so that when they ask the tough questions, we have some good answers.
Dell Children’s Medical Center of Central Texas
Cutting-edge care in the world’s greenest hospital

Location: Austin, Texas, USA
Client: Seton Family of Hospitals
Architect: Polkinghorn Group Architects & Karlsberger
Services: Mechanical, Electrical and Plumbing, Fire Engineering, Commissioning and Start-Up Management
Project status: Completed in 2007 & 2014

Dell Children’s Medical Center was an ambitious project from the get-go. Its owner, the Seton Family of Hospitals, envisioned a forward-thinking, innovative facility offering premium paediatric care in a truly sustainable environment. The resulting building is the world’s first hospital to achieve platinum-level LEED accreditation, making it not just the premier healthcare provider for children and teens in Central Texas but an exemplar for the healthcare industry worldwide.

Sustainability was central to the 170-bed hospital from the earliest design stages, when we were engaged to model the building’s energy use to maximise conservation and comfort. This encompassed the implementation of the facility’s on-site combined heat and power (CHP) plant, which boosts efficient energy generation and recycles waste products. It includes a 4.3 MW combustion turbine generator, steam generator and absorption water chiller. By optimising heat recovery, ventilation and lighting design and using as much daylight as possible, our designers cut net energy use by 40% compared with a similarly occupied building in the same climatic conditions. Thanks to our teams innovative and collaborative thinking, as well as achieving one of the most energy efficient hospitals in the world, the owners saved $8m in capital outlay through the decision to outsource power, heating and chilled water needs to Austin Energy, which owns and operates the CHP plant.

Built on the former site of the Robert Mueller Municipal Airport, the low, horizontal hospital blends into the landscape, setting a positive example for the rest of the brownfield site. Its courtyards and use of local materials reflect and celebrate the community it serves, not only as the region’s sole dedicated, freestanding paediatric centre but one of just four level 1 trauma centres in the state.

As evidence mounts that access to nature aids healing, the hospital has worked to harness outside space, serving its commitments to the environment and medical excellence. A 2013 extension to the hospital, also designated LEED Platinum, adds an outdoor labyrinth and sensory garden alongside an epilepsy monitoring unit, toddler rehab centre and therapy gym. We served as mechanical, electrical & plumbing engineer on the $25m expansion.

lower net energy use compared with similarly occupied building in same climate

40%
Phoenix Children’s Hospital
A major renovation proves comfort and sustainability can go hand in hand

Location: Phoenix, Arizona, USA
Client: Phoenix Children’s Hospital
Architect: HKS Inc.
Services: Mechanical, Electrical and Plumbing, Fire Engineering, Urban Planning and Master Planning
Project status: Completed in 2011

Phoenix Children’s Hospital prizes comfort, not just for the children it treats but their families too. When its leaders decided to launch a major expansion to meet ballooning regional demand, their challenge to the design team was clear: create an efficient, sustainable facility that enhances the experience of patients, siblings and parents.

The ensuing $350m development, which increases capacity to 377 beds, includes a new patient tower designed by HKS Architects, plus an ambulatory care building, main entrance boulevard and expanded parking garage. We provided master planning and mechanical and electrical design services on the 139,355 m² scheme.

True to the mission, family-centred care was at the heart of all design decisions, from the illuminated façade that welcomes visitors to rooftop gardens providing a place of retreat, and the extensive use of day-lighting to create a calm atmosphere in waiting areas. All rooms in the new tower are private and fitted with amenities that allow visitors to control their own environment. Patient rooms and many of the public areas also enjoy stunning views over mountains and desert, connecting the facility to the surrounding landscape. Stacking and grouping of functions within the tower meanwhile have made the hospital easier to navigate and cut travel distances. The facility also includes a Level 1 trauma emergency department and low temperature operating rooms capable of reaching -60 degrees F.

Proving that comfort and sustainability are fully compatible, the design team also found a myriad of ways to minimise the facility’s carbon footprint. Building services were central to this. The new Central Utility Plant (CUP) and tunnel distribution system includes a unique 800-ton heat pump chiller. This allows heat from the cooling cycle to be ‘injected’ into the water-heating system, enabling significant heat recovery and saving around 5.5m gallons of water per year. Meanwhile, the new tower is designed to take advantage of the natural light provided by the Phoenix sun while avoiding excess heat gain, reducing the pressure on mechanical systems. The impact of this sustainable approach can be seen in the hospital’s utility bills – down a third per square metre in the first year after expansion.

5.5M gallons of water per year saved through reduced cooling tower use
Advances in medical care bring new hope for patients and their families, but they also present great challenges for the design of children’s hospitals. Often encompassing many different departments under one roof, these buildings must accommodate a growing range of highly specialised equipment, which must all be tailored to the needs of younger patients.

WSP has delivered some of the world’s most technologically advanced healthcare facilities, so we understand the unique demands that they present. We can offer efficient design solutions to manage the risks of housing powerful but sensitive machines in close proximity to busy clinical areas, and meet very precise requirements on electricity, water, vibrations and radiation shielding.

We support children’s healthcare providers to make the most effective use of smart building technologies, IT and communications to operate more efficiently and offer a higher quality of service. After all, today’s patients are tomorrow’s digital natives for whom, seamless networks and interactive devices are second nature. Our digital experts share their infectious enthusiasm for what technology can offer – but we combine it with a very grown-up scrutiny of the real costs and benefits to your organisation.

State-of-the-Art Care
The Hospital for Sick Children
30-year collaboration propels care and research facilities to new heights

First hired by Canada’s "The Hospital for Sick Children" in 1985, our engineers have worked with this world-renowned centre for paediatric care for more than 30 years. The initial $200m project, which saw construction of a new inpatient tower and a master plan for redevelopment of the older part of the hospital (annex buildings), laid the ground for an enduring relationship. We have since worked with them to deliver the state-of-the-art Cardiac Diagnostic Intervention Unit, magnetic resonance imaging facilities, computerised genomics laboratory space and providing civil and building science services on a major research laboratory occupying over a third of the hospital building area.

In contributing to projects that have expanded the capacity of the hospital, our teams have taken on tasks from operating room and central plant upgrades to the synchronisation of generators across three different buildings in order to boost available emergency power.

Over the years, we have worked closely with architects, interior designers and client advocates to understand the complex requirements of a facility that cares for newborns and teenagers alike. Specialist design needs range from tamper-resistant lighting and covered emergency buttons (less tempting for little hands to press than the standard red ones) to child-adapted CT scanners and soothing lighting systems. In addition, the hospital has to cater not just for patients but also their families, and environments that minimise stress are crucial.

The construction process has at times also proved complicated. One major challenge was the phased renovation of a 1,394 m² emergency department in 2009. Our team ensured this critical facility stayed operational throughout, overseeing complex coordination of mechanical and electrical services through three phases of construction as well as incorporating plans for a future diagnostic imaging department into the building services design. The project also included 28 new examination rooms and five isolation units as well as other procedural rooms and administrative space.

33% of building area occupied by cutting-edge research facility
Queen Silvia’s Children’s Hospital
A vast range of services under one roof – all tailored to children

Location: Gothenburg, Sweden
Client: Västfastigheter
Services: Building Acoustics, Noise and Vibration, Mechanical, Electrical and Plumbing, Building Information Modelling, Logistics
Project Status: Due for completion in 2020

With its new premises, Queen Silvia’s Children’s Hospital aims to embrace a completely new way of thinking about children’s hospitals which puts the patient at the heart of every aspect of design and operations. The hospital has been in its current home since 1973, so the new building is needed to update its ageing facilities and to meet an increased need, including for more specialized and new equipment.

The eight-storey hospital will cover 33,000m², with a broad range of facilities including outpatients, intensive care, operating theatres, sterilisation unit and wards, across many medical specialisms, as well as a rehabilitation pool, helipad and library. To create a more home-like, safe and secure healing environment, all patients are accommodated in single rooms, which allow parents to stay overnight and reduces the risks of infections spreading.

We have provided engineering services including mechanical and electrical design, acoustics, systems engineering, logistics and developing and coordinating the building information modelling (BIM) strategy. Extensive use of BIM has been essential to keeping track of 450 systems – including security, lighting, x-ray equipment, electricity and ventilation – and the complex logistics of the project. BIM was used to keep the user and technical requirement specifications in a database connected to the different CAD-tools. BIM was also essential for good communications with the project stakeholders. Planning for how BIM can play a valuable role in maintenance and adaptations throughout the building’s lifecycle is ongoing.

The energy efficient design includes advanced lighting technologies so that lights are only on in occupied rooms, and ventilation that is tailored to the precise need in each space. Flexibility is also a key part of the design – each operating theatre can be isolated from the rest of the building and can therefore be rebuilt with minimal impact on adjoining rooms.

Great effort is also being made to stimulate the children’s imaginations and encourage them to think beyond their illness. There will be facilities for education and therapy, a music studio, play areas for younger children, a dedicated area for teenagers, relaxation spaces and places for activities such as table tennis and video games. And with technology second nature to young people today, each patient will have their own page on a dedicated site, with information about the day’s events, details of their medication and treatment and a place where they can send questions to the doctors.
Successful children’s hospitals become much-loved landmarks for their communities, caring for generation after generation. We never lose sight of their true value and the role that building design plays in creating it.

We know that facilities for children have to withstand a lot over their lifetime. We design buildings to last, with robust fit-outs that stay clean and look good, even as thousands of patients and their families put them through their paces every day. We understand the importance of finishes and fixtures that are easy to maintain, and flexible structures and systems that can be altered or upgraded as needs change or new treatments become available. For older buildings in need of modernisation, we collaborate with stakeholders young and old to give them a new lease of life, retaining what makes them special, without compromising on safety, comfort or efficiency.

The climate is changing too, so our expert teams assess and mitigate the potential risks to building structures and the lives of vulnerable patients. We keep one eye on the future, so that internal temperatures remain safe during warmer summers and essential systems won’t fail in the event of flooding or storms. That’s part of our rigorous, holistic approach to future-proofing an investment in children’s care, equipping our clients to meet today’s highest standards and whatever tomorrow brings.
Representing the largest single investment in paediatric health research in Queensland’s history, South Brisbane’s Centre for Children’s Health Research marks a major, long-term commitment to this field of study. This is reflected in the design of the nine-storey centre, which shares a precinct with the new Lady Cilento Children’s Hospital and a central energy facility. The building, which can currently house over 400 researchers, has been deliberately ‘future-proofed’ to allow for expansion, ensuring it has the flexibility to meet the state’s child health research needs for the long term. Most notably, all building services are designed with sufficient spare capacity for future demand and in a way that allows the 14,108m² facility to expand horizontally when the time comes.

Today, five of its nine floors are dedicated to research, including wet and dry laboratories. The remaining storeys accommodate a pathology service for the Lady Cilento Children’s Hospital as well as office areas, retail space and car parking. A service tunnel connects the centre to the hospital.

Our services on the project included mechanical, electrical and plumbing and fire protection engineering, plus security and communications consultancy. A major challenge for the team was to provide a fully operational pathology department to serve the hospital next door while the Centre for Children’s Health Research was still under construction. Again, careful building services design provided the solution, allowing the pathology clinic a level of independence from the rest of the building.

In addition, chilled and hot water, gas, power, communications and security monitoring are all provided on a precinct basis, meaning a significant coordination effort was required from our engineers to guarantee high performance across the site.
The Royal Hospital for Children, Glasgow
A low-carbon new build for an acclaimed institution

Location: Glasgow, Scotland
Client: Brookfield Multiplex
Architect: IBI Group
Services: Structural Engineering, Fire Engineering, Green Building Design, Geotechnical and Ground Engineering
Project Status: Completed in 2015

Glasgow’s Royal Hospital for Children is synonymous with world-class paediatric care. The hospital reopened in 2015 on a new site at The Queen Elizabeth University Hospital Campus, providing the young people of Scotland with new buildings and spaces for a consistently exceptional patient experience. This 256-bed children’s hospital has created a cutting-edge clinical environment with the highest standards of sustainability.

We started our journey on the project in 2009 working alongside principal contractor Brookfield Multiplex for NHS Greater Glasgow and Clyde. The new hospital is physically linked to the refurbished maternity unit and the new adult hospital in order to provide the best possible care for babies, children, young people and their families. The overall site is equivalent in size to 11 football pitches making it one of the biggest NHS construction projects in the country. It is also one of the largest reinforced concrete frames ever built in Europe, allowing for an in-built fire protection, improved acoustic performance for enhanced patient experience, better ability to resist vibration and increased thermal mass for reduced energy consumption.

This outstanding hospital was designed around the needs of children, with key insight from the young patients themselves as well as architects, nurses, doctors and other clinical staff. The children’s hospital provides a comfortable single-room environment for increased privacy and reduced infection rates and enabling parents to stay at their child’s bedside overnight. The hospital is a fun and vibrant space designed in collaboration with the Glasgow Science Museum. Flooded with natural light and decorated with soft colourful furnishings and interactive technology, the non-institutional design helps to distract children by positively impacting their senses and providing them indoor and outdoor play areas and a cinema. It is surrounded by parkland, offering them a place of sanctuary and well-being.

Efficiency and sustainability were high on the hospital’s list of priorities and our designers fully embraced this aspect of the brief, contributing to an award-winning environmental strategy, which included aiming for BREEAM Excellent. The design of the building has been optimised and uses a high-quality air-tight cladding system to ensure a draught free environment, lower energy costs and improved internal air quality control.

Minimising and managing waste generation was an essential aspect of the construction phase. Early in the project we provided waste management licensing and exemption registration support to the client by demonstrating to the Scottish Environmental Protection Agency (SEPA) that a full site waste management license would not be required for the proposed on-site waste sorting facility. This subsequently enabled a range of environmental, economic and operational benefits including a 96% diversion of construction waste from landfill, reduced traffic movements, increased quality and value of recyclable materials and two out of the three BREEAM credits initially targeted by Brookfield Multiplex.

Throughout construction we monitored the operation and performance of the sorting facility against compliance with the exemptions registered and applicable waste regulations. We also audited the development’s progressive BREEAM performance against the waste related credits targeted by Brookfield Multiplex.

In addition we worked with the construction team to maximise the amount of off-site fabrication, such as pre-cast columns, edge beams and stairs, which assisted in further waste reduction.
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Can we trace horizons, hold true to our ambitions, and hold ourselves accountable? What if we can?