Designing for a better future
Cancer care and research
Demand for specialist cancer care is predicted to double over the next 15 years. An ageing global population means an increased incidence of the disease, while significant advances in diagnosis and treatment give new hope to cancer sufferers, improving mortality rates but also creating a new group of survivors who will require ongoing care and support. Cancer care providers must keep up, growing their capacity, offering the latest screening techniques and therapies, and adapting their services to patients with more complex needs.

At WSP, we understand the unique challenges that this exciting, rapidly evolving field presents, and the constant innovation that it requires from design teams – to accommodate state-of-the-art technologies alongside complementary therapies, for example, or create places that meet the highest clinical standards while offering a warm, supportive welcome to patients and their families.

Our global teams are proud to be working on projects that are among the world’s most sophisticated buildings dedicated to cancer care and research – from one of only two NHS proton beam therapy centres in the UK on five floors underneath central London, to a hospital that brings a range of imaging and surgical technologies together under one roof for the first time in Gothenburg. We made sure that North Texas’ biggest outpatient cancer clinic is also one of its most sustainable, combined low-energy design with leading-edge laboratories in Hawaii, and created a healthy indoor environment for a pioneering wellness centre in Victoria, Australia.

However demanding a brief may be, we thrive on the challenge. Our goal is always to find the most sustainable, efficient solutions so our clients can offer the best possible cancer care to their communities – today and for the future.
Clean, safe environments
We help clients to maximise the effectiveness of cancer treatments by designing healthcare and research settings that actively promote hygiene, infection control, security and wellbeing. Right from the start, we consider how our design can minimise the spread of germs, support effective cleaning and maintenance, and create a healthy healing and working environment. Our specialist teams plan room layouts and staff facilities to cut the risk of cross-contamination, and ventilation systems to remove airborne pathogens and harmful chemicals while ensuring wards, clinics, laboratories and offices are well-supplied with fresh air.

We design cancer hospitals where patients can feel secure and nurtured – giving them total confidence in the care they receive and the best chance of recovery. And we design research facilities where scientists can work effectively and safely, to give them the best chance of making tomorrow’s breakthrough discoveries.

Positive experiences
Modern cancer care is not just about treating a disease; it’s about supporting the whole person. We never lose sight of the importance of that patient journey. We understand that minor frustrations can quickly become major obstacles or sources of anxiety for cancer patients, so we strive to create a hassle-free environment, making our buildings as accessible, user-friendly and comfortable as possible for people at all stages of treatment. We take an empathetic, holistic approach, working closely with healthcare staff, so that even when we are refining the smallest details, we don’t forget the vital difference they can make to patients and their families – from inspiring structures that lift the spirits or offer unimpeded views of nature, to ergonomic room design and lighting that never feels artificial.

Efficient buildings
Meeting demands for cancer treatments – and the aspirations of patients, healthcare staff and scientists – means making the most effective use of limited resources. We endeavour to create robust, flexible buildings that are cost-effective to operate and maintain, and use energy and water as efficiently as possible. We know that skilled manpower is an equally scarce resource, so we collaborate closely with hospital and research staff to create workplaces that can meet their current needs while remaining adaptable for the future.

Our floor plans and room layouts mirror clinical workflows to minimise walking distances and maximise opportunities for patient visibility and contact, while laboratories must be precisely tailored to different kinds of research with high-performance services that can be readily upgraded or altered to meet the demands of a fast-moving field.

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Cancer treatment and research are evolving rapidly, with new tools for diagnosis and treatment, a growing number of patients with increasingly complex needs, and higher expectations of what cancer hospitals should offer for both those receiving treatment and for the medical staff providing it.

Our teams create unique solutions that respond to the demands of 21st century medicine. We incorporate proven innovations in building design, services and technology and the latest ideas on physical and psychological wellbeing to create cancer centres that are treasured by their communities and exemplars of world-class care.

For example, one of Sweden’s most advanced hospitals, a new imaging and intervention centre makes it possible for specialists to use diagnostic techniques such as Magnetic Resonance Imaging (mMRI), Computerised Tomography (CT) and Positron Emission Tomography (PET) in the same spaces as surgery for the first time. Meanwhile, Victoria’s Olivia Newton John Cancer and Wellness Centre takes a pioneering approach to wellness that stimulates all of the senses, using 100% outside air for ventilation, as well as being the largest healthcare building yet to achieve Australia’s sustainability benchmark.

Our specialists use some pretty advanced technologies themselves: 3D visualisations and walkthroughs enable medical staff to engage positively with the design process so that the finished building is exactly as they would like it to be. Computer modelling means our experts can thoroughly test every aspect long before construction phase, while the use of factory-built components offers unrivalled speed and accuracy on site, so that our clients always get the facilities they need, on time and on budget.
Sahlgrenska University Hospital

Revolutionising procedures with leading edge design

Location: Gothenburg, Sweden
Client: Region Västra Götaland
Services: Mechanical, Electrical and Plumbing, Geotechnical and Ground Engineering, Construction Management
Project status: Completed in 2016–2017

Sahlgrenska University Hospital, a world leader in research and education, was seeking an innovative approach to cancer care to streamline the imaging procedure and create new forms of collaboration between specialists. Thanks to a new centre for Imaging and Intervention a breakthrough in cancer care diagnosis and treatment has been achieved.

Traditionally imaging and surgery were housed in separate locations within the building, but this new facility offers a unique system allowing imaging and surgery to be undertaken in the same space, allowing several specialists to focus on the patient needs at the same time. Something that was seemingly impossible has now been made possible thanks to this revolutionary design.

The facility provides X-ray, Magnetic Resonance Imaging (MRI), ultrasound, Computerised Tomography (CT), Positron Emission Tomography (PET) and/or combinations thereof. Additionally, below ground level a cyclotron will supply the hospital’s PET scanners with radioactive isotopes.

The new operating rooms house advanced X-ray machines, a ceiling-mounted movable MRI, and other types of X-ray equipment that can perform diagnostics during the patient’s operation. Images are displayed on monitors within the room allowing specialist clinicians to be in different locations and monitor the operation in real time.

One of the biggest challenges for our team was to make this facility adaptable to future medical advancements. Our teams designed robust and flexible solutions that will enable continuous changes in usability, such as providing removable parts in exterior walls to allow new technical equipment into theatres whilst ensuring a high level of air quality for hybrid operating rooms.

The building is made up of two parts, each with its own power supply. A fundamental aspect of our design is to ensure full redundancy and by using the connection capability of busbars on each floor our engineers have designed a back-up system where one part of the building can support the other if required.

To mitigate any start-up time for the diesel generator we have installed a dynamic Uninterruptible Power Supply (UPS) system. This rotating UPS gives the facility a critical power supply in the initial 20–30 seconds while the diesel generator kicks in.

A real success on this project is the coordination, planning, purchasing and installation of all medical equipment, which we started at the design phase and have documented throughout. Crucial to the construction schedule is the installation process of key medical equipment and instructions for this are prepared at the design phase with our coordination team. This document describes the requirements for the equipment, the order in which the installation must be carried out and by whom. It’s all-encompassing, from purchasing, delivery, assembly and installation to when the conditions for commissioning must be carried out.

To ensure the facility is fit for the future our team considered a design that allows for future medical equipment to be installed.

Working together with our clients and the end users, we have developed cutting edge technical solutions to provide the hospital with the most advanced treatment methods and operating rooms in cancer care. Key to our design was creating an optimum spatial structure to provide an effective work space for clinicians and assure operational security for patients.
Olivia Newton-John Cancer Wellness & Research Centre
A holistic design approach combining high-quality sustainability and wellbeing

Location: Heidelberg, Victoria, Australia
Client: Austin Health, Department of Health
Architect: Jackson Architecture + McConnell Smith and Johnson Architects
Services: Mechanical, Electrical and Plumbing, Security Consulting, Fire Engineering, Vertical Transportation, Green Building Design, Hydraulics
Project Status: Completed in 2013

Austin Health has a long history of pioneering cancer treatments. The ONJ Centre brings together the hospital’s extensive cancer services and research facilities under one roof in a purpose-built facility, and offers new wellness and support programmes that offer individualised care to treat the whole person, not just the cancer.

The actress and singer Olivia Newton-John believes that positive thinking and a supportive environment played an important role in her own recovery from cancer, so she wanted to create a wellness centre that stimulated all of the senses. In addition to high-quality medical care, the ONJ Centre offers a full range of complementary therapies to support people throughout their treatment.

As well as the wellness centre, the building includes radiotherapy bunkers, ambulatory oncology, inpatient wards, three floors of Research Laboratories, including a physical containment level 3 laboratory suite, high-acuity areas and negative and positive pressure isolation suites.

We provided all engineering building services, including environmentally sustainable design. Our team took a holistic approach, with a strong emphasis on improved wellness and indoor environment quality. The design includes chilled beam technology, no recirculation of air, rainwater collection, solar water heating and future capacity for cogeneration.

The centre is the first building in Victoria, and the largest in Australia to date, to achieve the Green Star Healthcare sustainability accreditation.

100% outside air with heat recovery
We know our clients want to focus their resources on supporting patients and developing new treatments, not on the buildings themselves. So we focus ours on delivering flexible, robust structures and services that perform flawlessly now, and that will remain cost-effective to run and maintain even as environmental conditions become more challenging over the century.

Efficiency & Performance

As experts in sustainable design and smart buildings, we understand how to minimise energy and water use without compromising on patient safety, hygiene or the optimal conditions for scientific research. Our cancer facilities meet the most exacting clinical and laboratory conditions, as well as the highest local or global environmental standards — as at the University of Hawaii, where an expert team drawn from our local office and our global community of healthcare specialists designed a world-class research facility with LEED Gold-rated performance.

On our projects, you’ll find many firsts, big and small, from Hawaii’s first use of chilled beam cooling to the first green roof in Prince George, British Columbia. We help clients to harness proven advances in technology to meet their unique needs, whether that’s ultra-efficient heating and cooling systems, district energy networks or the internet of things.
University of Hawaii Cancer Center
State-of-the-art research facility with innovative cooling technology

Location: Honolulu, Hawaii, USA
Client: University of Hawaii at Manoa
Architect: Shimokawa + Nakamura, ZGF Architects LLP
Services: Mechanical, Electrical and Plumbing, Lighting Design, Audiovisual Systems, Security Consulting, Green Building Design
Project status: Completed in 2013

As one of only 69 National Cancer Institute-designated centres in the US, The University of Hawaii Cancer Center aims to be a world leader in eliminating cancer. It plays an important role not only in providing access to life-saving treatment breakthroughs for the local population, but in attracting investment and talent into Hawaii. A new building was essential to its continuing success, because it was coming to the end of its lease, and the old facility was too small. The University of Hawaii decided to create a new world-class facility in the district of Kaka’ako, consolidating its programmes under one roof and providing accommodation for cancer biology, prevention and control, epidemiology studies, and clinical and translational research.

Working in collaboration with our local office in Hawaii, our specialist teams provided mechanical, electrical and plumbing support, lighting design and energy modelling to demonstrate energy savings beyond the baseline design, enabling the project to achieve LEED Gold certification.

Building features include an optimised envelope to minimise air-conditioning loads, high-performance lighting design to reduce shadows and maximise use of daylight, ultra-efficient plumbing fixtures, and the use of waste heat from the condenser system for temperature control. The laboratory neighbourhoods are designed to promote collaboration between researchers, as well as to reduce the number of air changes required, by separating offices from lab space. Cooling was a particular challenge, as the building sits on Honolulu’s hot, humid coastal plain, so we introduced innovative chilled beam technology as part of a low-energy HVAC system supplying fresh air at the correct temperature to the clinical and lab facilities.

The project was completed three months ahead of schedule and substantially under budget.

30%
less electricity and water usage than a baseline design
Centre for the North
World-class care in a highly sustainable building

Location: Prince George, British Columbia, Canada
Client: BC Cancer Agency, Northern Health, Provincial Health Services Authority
Architect: HDR Architects, CEI Architects
Services: Mechanical, Electrical and Plumbing, Information Technology
Project status: Completed in 2012

BC Cancer Agency wanted to provide world-class cancer care for the residents of northern British Columbia, closer to their homes. The concern was that locals exhibited higher rates of cancer with significantly poorer cancer-related health outcomes, and used fewer cancer services than those elsewhere in the province. The agency therefore sought a new treatment centre that would deliver high-quality services more accessibly, within a sustainable and affordable publicly funded healthcare system.

Centre for the North accommodates a radiation therapy department with linear accelerators and a computerised tomography simulator, a chemotherapy treatment unit, pharmacy, outpatient clinics, support spaces and a multistorey car park. The centre provides cancer control programmes including primary prevention, accessible screening and early diagnosis, enhanced oncology treatment services, and surgery and radiation therapy. One of the main features of this project is the look and feel of the entire site, incorporating natural materials such as wood, extensive landscaping and principles of holistic patient care and wellness. The 5,020m² building is designed to achieve LEED Gold certification with a range of sustainable features including the city’s first green roof.

We were retained to provide mechanical and electrical engineering services, delivering an efficient design that would support the client’s wider goals with a range of innovative, sustainable features. Key elements included storm water management to reduce the building’s impact on local sewer systems, a green roof to aid cooling and reduce the urban heat island effect and interior and exterior lighting designed to minimise light pollution. Great care has been taken to preserve a high-quality indoor atmosphere with frequent air changes, separate ventilation systems for photocopier rooms to prevent pollutants from spreading throughout the building, and a monitoring system that will feedback to the operator on temperature, airflow and humidity levels to maximise comfort for the occupants.

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47% lower energy consumption than a baseline design
Cancer care is one of the most technologically advanced fields of medicine, encompassing a range of diverse and highly specialised equipment for diagnosis, treatment and research.

For facilities dedicated to cancer treatment, this means hosting sensitive, expensive machinery in close proximity to vulnerable patients and their families, and protecting people and equipment from each other. Isolating building structures and services, ensuring redundancy in power and communications systems, and developing robust security procedures are just some of the challenges that our building designers meet on our clients’ behalf every day.

WSP is designing some of the world’s most sophisticated buildings dedicated to cancer treatment and research, including one of only two NHS proton beam therapy centres in the UK, and we bring extensive in-house experience of designing facilities such as high-energy cyclotrons and synchrotrons. And because today’s breakthroughs are tomorrow’s essential treatments, we always design in flexibility so that spaces and systems for new technologies can be accommodated without extensive remodelling.

As for the people making those breakthroughs, we help our clients to support and inspire them with workspaces that encourage innovation and creativity and laboratories and offices ventilated with fresh air and flooded with natural light. We know that research scientists seek spaces that are not only functional and safe, but pleasant and comfortable – and that in a thriving life sciences sector, offering a good working environment is an essential part of attracting the brightest minds.
An existing purpose-built medical radio-pharmaceutical facility site in Dinnington, South Yorkshire, is being expanded to add an additional cyclotron facility. It will manufacture radioactive sterile products for injection, essential for early and detailed diagnosis.

This bespoke facility will house a TR24 cyclotron - a particle accelerator used to produce radioactive isotope. This includes products radiolabelled with $^{18}$F for products such as Fluorodeoxyglucose which is used as a radioactive tracer for cancer diagnosis in Positron Emission Tomography (PET) medical imaging scan units. This revolutionary diagnosis method may detect the early onset of disease before it is evident on any other imaging tests.

ACSI’s (Advanced Cyclotron System Inc) TR24 24MeV cyclotron is suitable for those in the global nuclear medicine industry interested in producing PET and Single photon emission computed tomography (SPECT) isotopes including $^{18}$F, $^{99m}$Tc, $^{123}$I and $^{68}$Ge.

$^{99m}$Tc produced in the TR24 cyclotron is an exciting alternative to current global production methods which utilise a small number of old nuclear reactors, one of which is due to close in 2016.

Our client, Alliance Medical, commissioned our highly experienced cyclotron equipment experts to provide full engineering design services for the development of the TR24 cyclotron building, as part of a multi-disciplinary team. Our team will be focused on providing the client with best value for investment, an efficient delivery process, adherence to a schedule driven by cyclotron importation timings, radio-pharmacy clean room facility design, cyclotron bunkers and radiation shielding and monitoring equipment to assure operational dependability in a highly regulated environment.

This existing facility will be modified to manufacture the most commonly used radioisotope in medical imaging scans, $^{99m}$Tc (sodium pertechnetate), which requires the replacement of the existing cyclotron bunker with a larger bunker designed to accommodate a larger and higher energy cyclotron, and the reconfiguration of the existing Clean Room.

The project includes the review and assessment of the condition, suitability and capacity of the existing mechanical, electrical and sanitary systems and of their suitability for reuse within the remodelled and extended building. Systems that have been assessed as unsuitable for reuse will be replaced to support the larger cyclotron. New isotope delivery systems, hot cell suite and GMP clean production, packaging and delivery areas will also be installed.

Upgrades to the building engineering services systems include enhanced differential pressure control of all air systems to reinforce the sterile and clean environments and to enclose temperature and humidity performance, a new incoming electrical power supply and upgraded building security and access control systems.
UCLH Proton Beam Therapy Centre
Specialist design to bring this groundbreaking radiotherapy treatment to the UK

Location: London, UK
Client: University College London Hospitals / Bouygues UK
Architect: STW Architects
Services: Mechanical, Electrical and Plumbing
Project Status: Completion due in 2019

Proton Beam Therapy (PBT) is an advanced form of radiotherapy which delivers higher dose, highly targeted doses of radiation to reduce side-effects and damage to surrounding tissue. The UCLH Proton Beam Therapy Centre will be one of only two NHS sites in the UK to offer this, in a state-of-the-art building that will also house Europe’s largest facility for the treatment of blood disorders.

Located in the heart of central London, the project includes the construction of five floors below ground, to house the PBT equipment, and six floors (including plant) above, covering more than 25,000m² in total. Bouygues UK selected us alongside structural engineers Campbell Reith because of our experience of delivering similar facilities and our ability to work closely with other team members using the latest building information modelling (BIM) techniques. The implementation of Level 2 BIM, including 6D asset management, offers long term benefits in providing a detailed design, cost and construction model. This model will be used in the operations and maintenance of the building to ensure its future use and flexibility.

Our design team is providing specialist mechanical and electrical services for the design and installation of the PBT systems to our client Bouygues UK, as well as building services for the above-ground support areas, including operating theatres, MRI and imaging areas. The PBT facility will also include a cyclotron and related beam line serving three 360° gantry areas, plus capacity to install a fourth in the future.

We bring extensive experience in the design of healthcare facilities and of high-energy cyclotron equipment, and an understanding of its unique challenges, such as the routing of electrical conduits and interaction with the radiation shielding design. On this project, our team provided HVAC, electrical controls, piping and device embeds for the cyclotron, proton beam line installation and proton treatment systems, including coordination of services with the radiation shielding, meeting the complex servicing requirements of the equipment vendor and overseeing the interfaces with clinical services and the wider patient experience. Providing PBT equipment entry and egress is vitally important to minimise disruption not only to the site but to adjacent areas as well. We are working closely with the system manufacturer and Bouygues UK our client, and phase plans will be developed and tested virtually using a shared BIM platform and 4D planning software.

Asset Management
With longer life expectancies and a greater incidence of the diseases of old age, there is a pressing need to increase the capacity of dedicated cancer centres, and to place facilities for prevention and early diagnosis at the heart of communities.

WSP works with healthcare providers to ensure that their cancer care buildings can meet this demand, efficiently and sustainably. We design cancer centres that are flexible enough to expand or contract as the needs profile of an area changes; to offer new treatments as they become available; and to remain comfortable in a future climate that may be very different to the one we know today or in which energy costs are much higher.

We have advised clients on many projects to optimise their current estates, such as the LEED Gold expansion and renovation of North Texas’ only dedicated cancer hospital in downtown Dallas. Or the Oncology Institute of Nîmes in southern France, where a major new addition combines advanced treatments with specialist patient support and upgraded transport networks provide easy access for patients, their families and healthcare practitioners. We support you to future-proof your investment and the safety and comfort of your patients, equipping you to meet today’s highest standards of cancer care and whatever tomorrow brings.
Oncology Institute of Nîmes
A modern and flexible design, providing optimum conditions for patients and staff

Location: Nîmes, France
Client: Centre Hospitalier Universitaire de Nîmes
Architect: Agence Michel Beauvais
Services: Mechanical, Electrical and Plumbing, Lighting Design, Project Management, Green Building Design, Building Information Modelling
Project status: Completed in 2015

The Oncology Institute of Nîmes has continued its expansion to meet the growing needs of this region in Southern France, providing patients with all stages of cancer screening, diagnosis, treatment and supportive care, on a 16,000m² site.

Bouygues Bâtiment Sud-Est was the contractor on this major development project which has brought every step of cancer diagnosis and treatment to a single site, providing patients with world-class care, advanced research and new technologies, comfort and wellbeing to every step of their recovery. With 99 individual rooms this centre focuses on patient experience with highly specialised services and efficient processes reducing the length of stay.

The particular attention dedicated to the layout of the institute has allowed for a well-organized flow of the rooms, enabling staff efficiency and satisfaction, and improved links and relationships between facilities, specialists and physicians, directly benefitting the patient experience. In addition, thanks to the upgraded transport networks designed by our team, this oncology centre is easily accessible to its patients and their families and provides approximately 200 car parking spaces. The centre also offers a self-service catering facility.

Our team also provided the client with Fire Safety System coordination and electrical engineering which allowed the production and distribution of high and low power currents. We also designed the lighting and undertook the sustainability designs including dynamic thermal simulation, sunlight simulation and daylight factor assessments, climatic studies and the environmental constraints management.

99
Individual patient rooms
With life expectancy increasing and the diagnosis of cancer set to rise in the next 20 years, Baylor Healthcare Systems took the decision to expand and renovate the Charles A. Sammons Cancer Center in order to continue delivering outstanding cancer care to the community. With the necessity to expand came the opportunity to offer world-class advanced technologies and integrated therapies for cancer treatment. This development has enabled the doubling of trials supporting the health system in its growing cancer clinical, research programme. Baylor Cancer Center, located in downtown Dallas, now stands as the largest outpatient cancer centre facility and the only dedicated cancer hospital in North Texas.

We were appointed to supply multidisciplinary services for the renovation of the 23,230m² inpatient care facility and a new adjacent outpatient centre covering 43,390m² over 10 floors. The new outpatient facility is connected by a sky bridge to the inpatient areas of the Baylor University Medical Center campus.

Our team performed mechanical, electrical, plumbing and fire protection design services taking particular care to ensure quality of materials was optimised for patient care and infection control. An 1,800 ton chilled water plant was designed to provide cooling in a highly energy-efficient scheme for the full range of cancer-related facilities, including physician offices, radiation, chemotherapy, pain management and complementary medicine. This contributed to the overall sustainability of the project which achieved LEED Gold.

Our designs included the installation of four linear accelerators as well as imaging equipment to include Magnetic Resonance Imaging (MRI), Computerised Tomography (CT) and Positron Emission Tomography (PET) scanners in keeping with the state of the art medical treatment provided by the hospital.

14% more energy efficient than commercial building energy codes
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Can we trace horizons, hold true to our ambitions, and hold ourselves accountable?

What if we can?