

# BRILLIANT BUILDINGS

UNIVERSITY OF WARWICK

## Our journey to a sustainable estate

How we're working with the University of Warwick to reach their sustainability aspirations



WILLMOTT DIXON

SINCE 1852



## NAVIGATING THE SUSTAINABILITY JOURNEY TOGETHER

Sustainability is an important topic for all industries – we all have net-zero carbon deadlines to meet and a responsibility to limit the carbon produced by our buildings. Its importance is even more apparent for universities due to the added pressure of the student voice, which is loudly demanding more from universities around their sustainability agenda.

Perhaps this is why universities seem to be leading from the front when it comes to creating a sustainable estate, with many institutions having set ambitious net-zero carbon targets that significantly precede the Government's 2050 deadline.

We've been working with the University of Warwick for over 15 years. During this time, the importance of sustainability has increased significantly, particularly in the last 10 years. This is evident in the projects that we have delivered together during this time.

Part of the reason that the relationship between the university and Willmott Dixon has been so successful is due to how we've both gone on the sustainability journey together. We understand the importance of making sustainability a priority and aren't afraid of wading into the unknown to push boundaries, innovate, try something different and share our learnings.

We are both still part way through our sustainability journeys, but the progress we have made together so far is significant.

This Brilliant Buildings explores the journey we've been on - reaching milestones, setting new precedents for the university and, ultimately, creating a more sustainable university estate.



Peter Owen, MD for the Midlands  
Willmott Dixon

Cover image Rooftop of Interdisciplinary Biomedical Research Building (IBRB)

## CREATING A SUSTAINABLE CAMPUS



### International Institute for Product Service Innovation (IIPSI)

Completion: 2012  
Value: £5.2m

- The creation of a four-storey research building for use by the university's manufacturing group
- Facilities include a technology hall, workshop and open plan research space, full height atrium, reception rooms, meeting rooms and general research areas
- Achieved BREEAM Excellent
- Designed to make sustainable upgrades quicker and easier in the future, including the installation of solar panels on the roof



### Plant Sciences Phytobiology Building

Completion: 2013  
Value: £2.7m

- A state-of-the-art controlled environment and glasshouse facility for research into plant science and food security
- Facilities include growth cabinets, walk-in rooms and environmentally controlled greenhouses
- The glass house has high specification thermal insulation and energy efficient plant equipment
- The building has complex environmental controls with separate controlled zones to minimise energy usage in unused areas



### Life Sciences Building refurbishment

Completion: 2013  
Value: £0.5m

- Internal refurbishment and reconfiguration of existing library spaces
- Creation of a new IT suite and lecture theatre
- Enabled some bioscience facilities to relocate from a different campus



### The Oculus

Completion: 2016  
Value: £14m

- A flagship central teaching building with facilities for over 1,000 students
- Borne from research that found teaching and learning experiences could be enhanced by having multi-faculty buildings
- Facilities include a 500-seat lecture theatre, a 250-seat lecture theatre, 12 teaching spaces, social learning and networking areas, a café and outdoor terraces
- Utilised lower carbon materials such as terracotta and sandstone cladding, terrazzo tiles and abundant use of glulam timber to the roof



### Sports and Wellness Hub

Completion: 2019  
Value: £37m

- A 1,550 square metre hub with facilities including a multi-functional sports hall, a 230-station gym, a 25-metre 12-lane swimming pool and 17m-high indoor climbing and bouldering walls
- One of the UK's most energy efficient leisure centres, performing 27.5% better than CIBSE's Energy Benchmark
- Over five years, we utilised our Energy Synergy™ process to close the performance gap, identifying savings of £40,000 per annum in the first year alone
- Smart building technology helps to drive energy efficiency, maintain occupant comfort and minimise manual intervention



### Junction Building refurbishment

Completion: 2020  
Value: £2.2m

- The refurbishment and conversion of University of Warwick's old sports centre into a multi-purpose space
- Creation of a new examination space to hold 500 students
- Improved teaching space and area for postgraduate hub
- Provides accommodation for Warwick Innovation Group to carry out research



### Warwick Arts Centre

Completion: 2021  
Value: £25.5m

- A partial demolition, rebuild and refurbishment to create one of the biggest arts centres outside of London
- The state-of-the-art facilities include three cinema screens, a concert hall, a theatre, two studios, a music room, a large art gallery and a restaurant
- Delivered in time to be a key venue in Coventry's year as City of Culture
- Connected the building to the university's district heat network, helping to reduce primary energy consumption



### Interdisciplinary Biomedical Research Building (IBRB)

Completion: 2021  
Value: £33m

- A state-of-the-art research building that provides 300 biomedical researchers with a 400-seat lecture theatre, a five-storey laboratory, and various social and collaboration spaces
- Utilised offsite manufactured components such as a pre-cast frame, mega-riser, timber frame and cladding
- 600 vertical PV solar panels sit on the roof, which offset approximately 26,000kg CO<sub>2</sub>
- We're in year three of monitoring energy usage using our Energy Synergy™ process to close the performance gap

"THE UNIVERSITY OF WARWICK VALUES SUPPLY CHAIN ORGANISATIONS, SUCH AS WILLMOTT DIXON, WHO DEMONSTRATE AN UNDERSTANDING OF, AND CARE ABOUT BUILDINGS IN USE. THE LONG-TERM NATURE OF THE WORKING RELATIONSHIP WITH WILLMOTT DIXON HAS HELPED TO RESOLVE PROBLEMS IN A COLLABORATIVE MANNER TO DELIVER WHAT IS INTENDED AND ENABLE THE OCCUPANTS OF THE BUILDINGS BUILT ON CAMPUS TO EXCEL. THE LONG-TERM NATURE OF THE RELATIONSHIP HAS AIDED IN BUILDING KNOWLEDGE AND EXPERIENCE BETWEEN BOTH WILLMOTT DIXON AND THE UNIVERSITY TEAMS, SUBSEQUENTLY ACHIEVING GREAT RESULTS."



JAMES BRECKON  
DIRECTOR OF ESTATES  
UNIVERSITY OF WARWICK

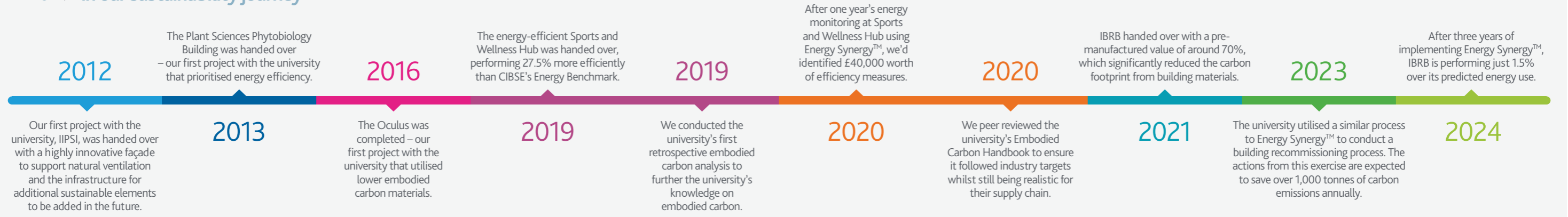
"THE UNIVERSITY HAS A LARGE CAMPUS WITH MANY COMPLEX FACILITIES. WE HAVE OVER 5,000 ENERGY METERS AND A SMALL TEAM WHO MANAGE THE ENERGY PERFORMANCE OF OUR BUILDINGS. WHEN WORKING WITH THE WILLMOTT DIXON TEAM DURING A SOFT LANDINGS PERIOD IT'S CLEAR THEY HAVE REALLY DETAILED KNOWLEDGE ABOUT THESE PROJECTS, HOW THEY CAN BE OPTIMISED AND BEST PRACTICE. WORKING CLOSELY TOGETHER HELPS THE TRANSFER OF KNOWLEDGE FROM PROJECT DELIVERY TO OPERATION, ENSURING THAT WE CLOSE THE PERFORMANCE GAP AS FAR AS POSSIBLE AND CONTINUE TO OPERATE OUR BUILDINGS AS PER THE DESIGN INTENT."



ANDREW THOMAS  
SENIOR ENERGY AND CARBON MANAGER  
UNIVERSITY OF WARWICK



**Key milestones in our sustainability journey**



**A RELATIONSHIP SPANNING OVER A DECADE**

**Striving for the same goal**

The university's 'Way to Sustainable Strategy' describes how it's tackling the climate emergency and wider sustainability goals across a range of areas including its research, curriculum and how it operates. In 2019 the university declared a climate emergency, at which point it committed to achieving net-zero carbon emissions for Scopes 1 and 2 by 2030 and Scope 3 by 2050.

Francesca Wilkinson, Sustainability Manager at Willmott Dixon, has been working closely with the university to help achieve their sustainability

aspirations. She said "At Willmott Dixon, we have our sustainability strategy, Now or Never, which includes targets for the new buildings we create to be net-zero in operation by 2030 and net-zero in embodied carbon by 2040. This is all aligned to the Science Based Target initiative.

Once we started working with the University of Warwick, we discovered that their sustainability journey closely aligns with ours, and we have very similar targets. By being so closely aligned, we've been able to provide additional value to the university by sharing learnings from our sustainability journey."

**Learning together**

At the beginning of our journey together, one of the biggest challenges of being ahead of the curve was that there were many unknowns around sustainability. As time has passed, knowledge has been developed and shared and we can do more and adapt faster.

The levels of sustainability on each project with the university pays testament to how far the industry has come. Earlier projects demonstrate the university's early commitment to the sustainability measures available at the time, but our most recent projects have started to take both operational and embodied carbon into account.

James Breckon, Director of Estates at University of Warwick, commented: "The partnership with Willmott Dixon has been really positive. We've done a variety of buildings together and have learnt from every project. We've then taken those learnings and implemented them into future projects together, including utilising modern methods of construction and looking at how we reduce operational and embodied carbon.

Naturally, each of the projects have had their challenges, but what's been great in terms of the relationship with Willmott Dixon is that we've worked together through those areas of challenge and remained focused on the ultimate goal of delivering some great facilities."



The Oculus

**Putting people at the centre of projects**

Sustainability forms a large part of the journey we have been on with University of Warwick, but there is also another key element that cannot be forgotten: people.

Although reducing carbon and protecting our planet is, ultimately, a people-focused goal, the decisions being made on the projects at University of Warwick ensure the end-user requirements for buildings have remained at the forefront of building design.

From The Oculus, which brings faculties together to encourage socialisation across subjects, to an energy-efficient Sports and Wellness Hub that balances energy reduction with occupant comfort, and then to the partial rebuild and refurbishment of Warwick Arts Centre to make it a key venue in Coventry's year as City of Culture.

Dr David Roper, Biochemistry Professor at University of Warwick and occupant of IBRB, commented: "For the first time, IBRB brings together microbiologists in both the medical school and life sciences into the same laboratory area.

This is a major, strategic advance in the way that we do science and in the way that we collaborate with other people. It was just such an exciting, wonderful new building to move into. It's a truly immersive biomedical experience."



IBRB



## OPERATIONAL CARBON

### The importance of reducing operational carbon for energy-intensive buildings

Two of the projects we completed for University of Warwick are building types that are notoriously high in energy usage. The first being the Sports and Wellness Hub we completed in 2019 and the second being a laboratory building in 2021 – IBRB.

Both buildings require a great deal of energy to power the regulated and unregulated energy sources that are present. Sports facilities include gym equipment and swimming pools. Science buildings often have energy-intensive equipment and laboratories that require high levels of ventilation. It's also common for both building types to be open for extended hours, which means they are using high levels of energy for extended periods of time.

James shares some of the challenges and opportunities from creating the Sports and Wellness Hub: "To create a low-carbon, low-energy leisure centre is extremely challenging. When we were designing the building back in 2015/16, it was even more of a challenge. We already had an active carbon plan where we were monitoring the reduction in carbon emissions across the campus, so for a building of this scale, we needed to ensure it was going to contribute as little carbon as possible.

There are also some very sensible commercial reasons for doing a low-energy building, the main one being that it's cheaper to run. As long as building occupants remain comfortable in the buildings then low-energy buildings are a no brainer."

### Minimising energy usage through building form

To minimise the energy requirements of a building, it's important to take a fabric-first approach to its construction.

"There are some fundamental construction basics that should be considered when you're looking to create a low-energy building." Nick Preedy, Project Lead at Willmott Dixon, explains.

"Considering efficiencies around the building envelope and fabric is critical. A building needs to be well-insulated and airtight to prevent heat leakage. This helps to keep buildings at a comfortable temperature and reduces the demand for heating and cooling.

This was particularly significant for the Sports and Wellness Hub and IBRB. By the very nature of the buildings, some rooms need to be heated or cooled to different temperatures – take the gym in the sports hub, for example. In summer it can be energy intensive to keep this room at a cool temperature, so ensuring the building's fabric will retain the cool air inside for longer is vital."

### Closing the performance gap

One of the key elements that we've delivered as part of the soft landings at both the Sports and Wellness Hub and IBRB is the implementation of our Energy Synergy™ process.

Our experts help to eliminate the performance gap that exists within a building when in use compared to what was predicted at design stage. Having a performance gap is common and can be caused by a range of things; user error, building management system errors, or it could be indicative that some elements of the building aren't working as they should. Without intentional monitoring, this performance gap can go unnoticed and reduce the efficiency of the building.

By analysing the energy data of a building for two to five years post-completion, we're able to identify areas where energy usage is too high. Through investigation from our expert team, we then work with the customer and supply chain partners to resolve the issue.

Francesca explains: "A big part of good energy management is ensuring energy isn't being used unnecessarily, which is something that Energy Synergy™ helps us to identify. The Energy Synergy™ process can identify underperforming systems, but its main aim is to determine energy efficiency opportunities.



Sports and Wellness Hub

When analysing the lighting being used by the building after handover, a substantial 66,975kWh was being used out of hours, resulting in an overspend of more than £7,000 per annum. This was caused by a few different factors that the monitoring enabled us to identify and resolve.

As an example, the Sports and Wellness Hub lighting management system is linked to the booking calendar for the indoor sports courts. The system recognises when there is a booking, as well as which court it's on and how long it's booked for. It then uses this information to turn the lights on the courts on and off based on whether they are in use or not.

Having never used a system like this before, some of the employees had overridden the system, and the sports hall lights were being left on all day. After identifying the readings for the sports hall were higher than expected, I worked with the university's energy team to find out the root cause of the issue. Once this was uncovered, we worked with the facilities team to retrain staff on the systems and ensure they were being used as intended.

This is a prime example of why it's so important that active, ongoing building management takes place."

By adopting this approach, University of Warwick became the proud owners of an energy-efficient leisure centre that performed 27.5% better than CIBSE's Energy Benchmark. By working to close the performance gap, in the first year alone we identified potential energy saving measures that equated to savings of £40,000. At the peak of the energy cost crisis in 2022, this would have been equivalent to over £100,000!

Following the success of Energy Synergy™ at the Sports and Wellness Hub, our team are also implementing it at IBRB, which we handed over in 2021. With nearly three years of implementation complete, the current data shows that IBRB is performing just 1.5% over its predicted energy use. According to the Carbon Trust's 'Closing the gap' booklet, a building's actual energy usage is, on average, 16% higher than predicted at design stage. Given that IBRB is a complex building with very diverse energy requirements, reaching 1.5% is a significant achievement.

James adds: "As a director of estates, knowing that a low-energy building will continue to be low-energy is really important. Working with Willmott Dixon and their energy experts is proving very beneficial. It's really making the soft landings approach work.



Sports and Wellness Hub

The Sports and Wellness Hub was the first time we brought in energy monitoring in such a purposeful way. Our energy team have been working closely with the Willmott Dixon team since the building was handed over in 2019, and we're still working together now to finetune the operation of the building to make it as efficient as possible. This journey is an example of the collaborative relationship that we have between Willmott Dixon and the university."

### Improving occupant experiences

Using Energy Synergy™ has been beneficial to Warwick Sport who occupy and manage the Sports and Wellness Hub. The process has proven helpful in improving the end-user experience.

Andrew Thomas, Senior Energy and Carbon Manager at University of Warwick, explains: "Warwick Sport is very interested in the energy that the building consumes and want to make sure the building works properly.

One example of how this has benefitted them is when we noticed that we didn't have the control of the pool temperature that we ought to. The inconsistent pool temperature was also being fed back by customers.

Through Energy Synergy™, we were able to see exactly what the source of the problem was, and it only took a few tweaks on the building management system to resolve the issue. The outcome was a consistent pool temperature and happy customers."

### Building recommissioning at the university

The university has followed a process very much like Energy Synergy™ during a significant recommissioning process across its campuses.

"Energy Synergy™ has been a great example of the cost and carbon savings that you can make by really scrutinising energy data and how buildings work." Andrew explains.

"We've now recommissioned over 100 buildings that we have on campus using a very similar process to Energy Synergy™. We look at the data, challenge it, ask questions and if things look wrong, go back and start exploring what could be causing the issue.

It could be something as basic as needing to reset the time schedules, but when small issues like this are replicated over a campus of our size, it makes a big difference. In fact, in 2024 we expect to save over a 1,000 tonnes of CO<sub>2</sub> emissions as a result of this process."





IBRB The mega-riser at IBRB

## EMBODIED CARBON

### Taking embodied carbon into account

When looking at the whole-life carbon for a project, embodied carbon is much harder to tackle than operational carbon. The awareness of embodied carbon in construction projects has grown significantly. This has led to us working with the university to start exploring how they can reduce the embodied carbon of their buildings.

Nick said: "There is evidence of embodied carbon reduction in several of the projects we have delivered for the university. The Oculus and Sports and Wellness Hub, for example, made use of timber elements to replace more carbon intensive materials.

Although the impact of material selection and embodied carbon was only just emerging during our earlier projects with the university, when we began work on IBRB, embodied carbon had become more of a focal point. Being involved in the project from RIBA stage 1 meant we were able to consider this and look for ways to minimise embodied carbon.

That led us on the journey to increase the use of modern methods of construction being used on the project, which reduced the carbon footprint of materials."

For the university, this was the first time they'd used modern methods so extensively, but they did bring many benefits to the project.

"One of the benefits of having such a collaborative relationship with Willmott Dixon and our wider supply chain is that you can share learning from across organisations." James explains.

"IBRB was a major building for us, and a big focus of the project was using modern methods of construction. The benefit to the university of that approach was immense. We had a better quality building with fewer defects, it helped to reduce the carbon footprint of materials, and we reduced disruption on a very tight site where students are in and out of the nearby buildings every day.

We achieved around 70% pre-manufactured value, which meant that a high proportion of construction took place offsite."

### Helping the university to create an Embodied Carbon Handbook

As embodied carbon started to grow as a topic of importance, the University of Warwick listened and recognised the need to understand embodied carbon more thoroughly.

James expands on this: "Since the Sports and Wellness Hub, the industry has moved quite quickly to start understanding embodied carbon.

Willmott Dixon carried out a retrospective embodied carbon analysis for the Sports and Wellness Hub, which was one of the

first ones we'd done as a university. We've then conducted studies on a variety of other buildings across the campus and we've also investigated where the industry measures and targets are.

We've been aligning ourselves with industry targets so that we can challenge the embodied carbon content on future buildings."

As well as carrying out retrospective embodied carbon studies for the university, we also played a role in helping the university create its new Embodied Carbon Handbook, which sets out targets for future buildings.

Andrew explains our involvement: "Our work with Willmott Dixon on embodied carbon has started us on our journey of preparing a new standard. All our new buildings will have an embodied carbon target, something that we didn't have at the time of the Sports and Wellness Hub or IBRB.

In creating a new standard on embodied carbon, we didn't want to write something that the supply chain couldn't respond to. We knew we still had to have a supply chain that felt able to work with us. The Willmott Dixon team did a peer review to make sure we weren't asking for something that the supply chain couldn't deliver, which was a great help."

## RETROFIT AND REPURPOSE

We've completed three refurbishment projects for University of Warwick, helping them to repurpose spaces rather than rebuild them.

One example of this is Warwick Arts Centre, which was originally built in the 1970s. To update facilities and modernise the space, the university set out on a four year-long redevelopment.

The new and improved Warwick Arts Centre is now one of the largest outside of London, housing three state-of-the-art cinema screens, a concert hall, a theatre, two studios, a music room, a large art gallery, a restaurant and more.

"Our route into delivering this project was borne from the fact that it had a tight deadline to meet." explains Nick.

"Phase one of the centre's refurbishment completed in 2019, but the second phase needed to be completed in 2021 to align with Coventry's year as City of Culture. With the university's campus based in Coventry, Warwick Arts Centre was set to feature as one of the key venues in the celebrations.

At the time of our appointment, our team had already delivered multiple projects and we were in the process of delivering IBRB. The university brought us on board knowing that we'd collaboratively work with them to overcome challenges and make the project happen in the required timescales."

The scope of the project was demolishing part of the building, creating an extension and refurbishing some of the existing spaces. This was all completed while most of the centre remained open. A key part of this was ensuring that we seamlessly connected the new extension to the remaining 1970s structure.

By retaining part of the 1970s building, the university reduced the amount of embodied carbon when compared to a complete demolition and rebuild. We also connected the building to the university's district heat network, which will enable the university to decarbonise the building as they change the heat source on the network as part of their 'Way to Sustainable' strategy. This energy infrastructure also reduces primary energy consumption by 13% across their campus. The improvements made to the building in the rebuild and refurbishment also led to the building achieving BREEAM 'Very Good'.



Warwick Arts Centre



## WHERE NEXT ON THE JOURNEY?

"From the university's capital development perspective, there are many things to consider. Wellbeing and inclusion are massive agenda items for the university – we want our campus to be a welcoming and accessible place for everyone." shares James.

"On the sustainability side of things, we've developed carbon handbooks and design guides that set out some quite stringent targets for us to aspire to, for both operational and embodied carbon. We'll also be aiming to align any building refurbishments with [LETI standards](#).

More widely, we're now looking toward the [Passivhaus](#) standard, so we need to understand how we deliver that in an economic fashion.

The next steps will be us engaging with our supply chain to utilise their experience and knowledge to try and help us resolve some of the challenges that could stop us from achieving our aims. In the current environment, with the cost of construction projects having increased, it's making business cases difficult to get through approval. We need to work creatively and utilise the expertise of our supply chain to get those through and keep pushing the sustainability agenda forward."

On delivering projects to Passivhaus standards, Nick adds: "At Willmott Dixon, we are seeing more industries starting to move towards Passivhaus, including higher education.

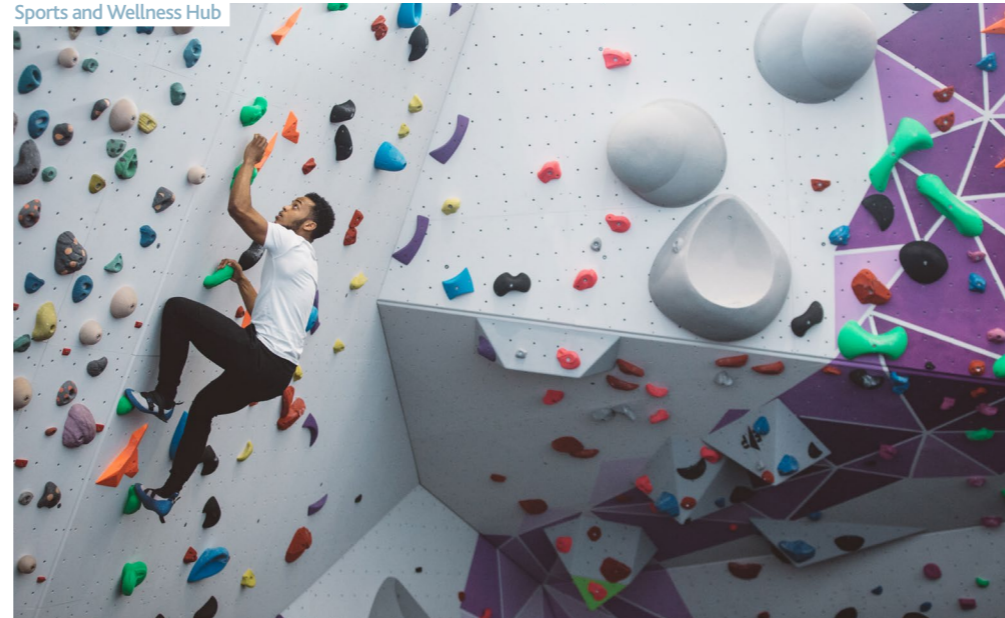
In 2015, we delivered the largest non-commercial Passivhaus project for University of Leicester – [the George Davies Centre](#). This was a trailblazing project for higher education Passivhaus buildings as it was four times larger than the previous record holder.

More recent examples of where we're seeing higher education turning to Passivhaus include [Passivhaus student accommodation for University of Oxford](#) and a [Passivhaus Multi-Faith Centre at University of Exeter](#), both of which we're currently delivering.

We're also seeing more universities setting their own carbon targets for projects, which is really starting to drive forward sustainability and building performance in higher education. A recent example is a Student Village that we're delivering for Staffordshire University with consortium partners. We have worked with the university to develop bespoke carbon targets for both the student hub and the student accommodation. This considers industry targets and sets out a path for achieving them.

As for our relationship with University of Warwick, we're ready to join forces on future projects to help them navigate any challenges they're facing on their sustainability journey. We look forward to continuing to work together to push sustainability boundaries and find new and innovative ways forward together."

Sports and Wellness Hub



Warwick Arts Centre



IBRB



The Oculus



IIPSI





**WILLMOTT DIXON**

**SINCE 1852**

# BRILLIANT BUILDINGS

UNIVERSITY OF WARWICK

Willmott Dixon is a privately-owned contracting and interior fit-out group. Founded in 1852, we are family-run and dedicated to leaving a positive legacy in our communities and environment. Being a large company means we can create a huge and lasting positive impact on our society. This is not only done through what we build and maintain; it's achieved through the fantastic efforts of our people who make a major contribution to enhancing their local communities.

**[willmottdixon.co.uk](http://willmottdixon.co.uk)**  
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**If you'd like to find out how we can help you on your journey to a sustainable estate, get in touch with:**



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