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WELL and good

Arup's Sydney HQ is focused on people.

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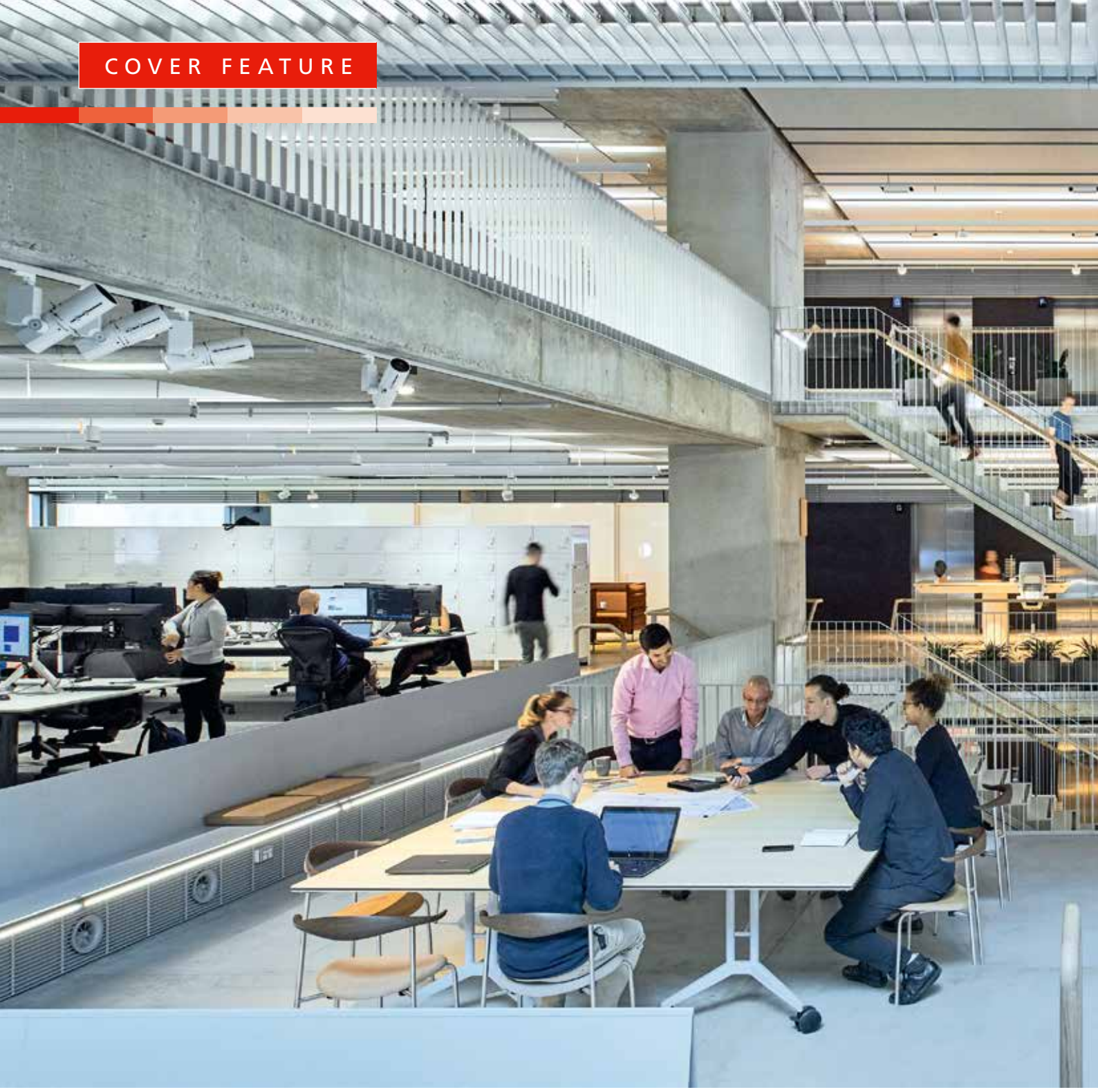
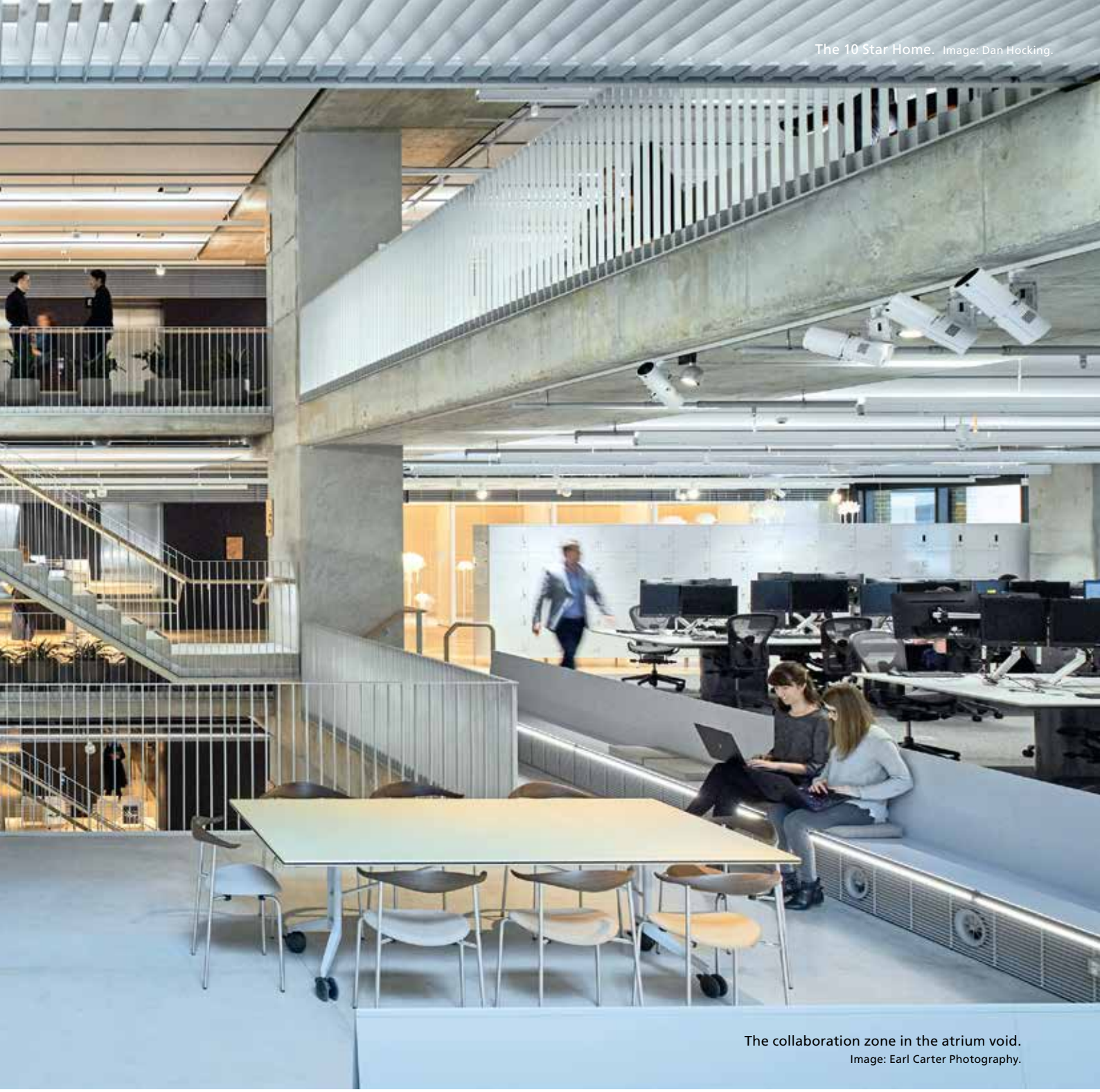


WELL and good

Built for the long-term benefit and wellbeing of its tenants, Investa's Barrack Place in Sydney has been awarded Australia's first WELL Core & Shell Precertification at the Gold level by the International WELL Building Institute. And as **Sean McGowan** reports, for one tenant there was more than just a passing interest in the building's design.

The opportunity to be both anchor tenant and full multi-disciplinary engineering consultant on a ground-breaking project doesn't present itself often. So when Arup was given the opportunity to design its own workplace in Sydney's healthiest commercial office building, the engineering firm leapt at the chance.



The 10 Star Home. Image: Dan Hocking.

The collaboration zone in the atrium void.
Image: Earl Carter Photography.

"It was a win-win for us and Investa," says Arup's principal NSW region leader Andrew Pettifer. "For Arup, it meant we could design our own new home and for Investa, it provided the commercial impetus that the project needed to be able to proceed."

Developed by Investa and constructed by Built, Barrack Place at 151 Clarence Street in the heart of Sydney's CBD comprises 22,000m² of A-grade office space and retail over 18 levels.

Investa's progressive approach to the project saw it embrace wellness principles from the outset. It engaged with the International WELL Building Institute (IWBI) early to explore how WELL Core & Shell Certification could be adapted to the Australian office environment for the entire base building design at Barrack Place.

> For Arup, it meant we could design our own new home

This led to the building being awarded Australia's first ever WELL Core & Shell Precertification at the Gold level by the IWBI in mid-2017.

A remarkable achievement in its own right, the WELL precertification was also achieved in parallel with a commitment to world's-best environmental design. This resulted in both the base building and Arup's office fitout achieving 6 star Green Star Design ratings from the Green Building Council of Australia (GBCA).

Investa senior development manager Shen Chiu says that being the first Australian development to achieve

Looking down into the Arup University courtyard.
Image: Earl Carter Photography.

precertification involved upgrading the building systems and improving the design. This aligned with Investa Office Fund's (IOF) commitment to designing and building for the long-term benefit of tenants.

"New buildings provide a unique opportunity to deliver a healthy place to work from the ground up," says Chiu.

"The WELL Building Standard allows us to go one step further, by incorporating the science of wellness into the fabric of the building and locking in these benefits for decades to come."

WEARING TWO HATS

Arup commenced work on the design of the base building in 2013 – providing all of the technical disciplines the firm offers while establishing a separate fitout design team led by fitout architect, HASSELL.

A client-side team, led by Pettifer, was intentionally kept separate from the design teams.

By being involved in the project from such an early stage, Arup was able to influence the design of the base building and not simply fit out a building already designed or constructed by others.

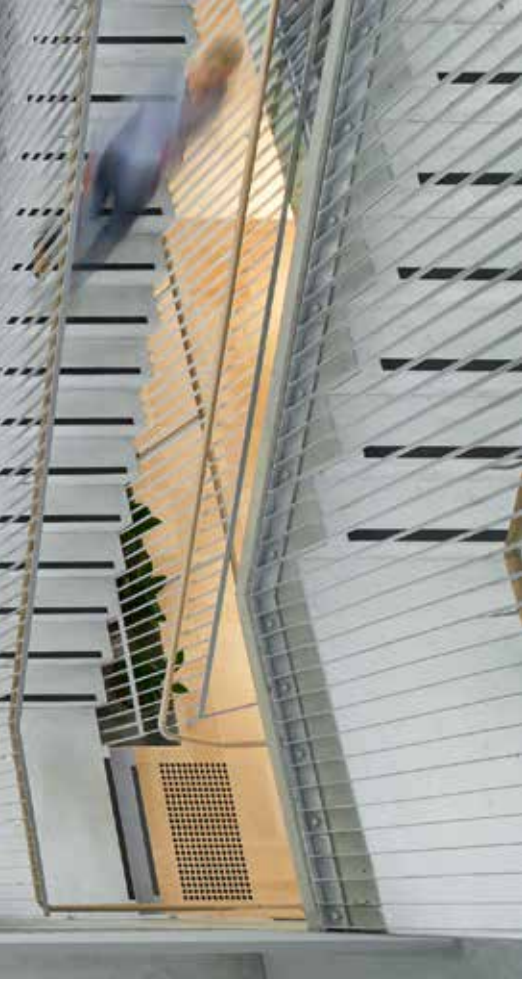
The staff café area.
Image: Earl Carter Photography.

> In Australia, most commercial offices have to deal with significant solar heat gains

Several key interventions were specifically integrated into the base building design to meet Arup's aspirations. These were the building's large atrium void featuring interconnecting stairs, openings into the base of the atrium, and the top floor doors to the external terrace, which provides mixed-mode natural ventilation.

Recognising changes in community expectations, Arup also incorporated gender-neutral toilets on its main event level.

With Investa committed to the pursuit of a Gold level WELL certification, and the energy efficiency influences of NABERS Energy and Green Star ever-present, Arup produced a gap analysis report for the base building. This outlined a strategy and initiative list to WELL-enable the building design.



This included a recommendation to adopt a UFAD system serving Arup's tenancy.

"We know from our global experience that underfloor air distribution (UFAD) systems create a comfortable environment with particularly good air quality," says Cameron Dymond, Arup regional property leader. "And the reasons for this are well understood and really quite simple.

"Air that is substantially fresh and clean passes through the occupied zone once, before being returned to the air-handling plant. Contaminants generated in the space rise with heat, and are taken away without being mixed up and pushed back into the occupied zone, as happens with conventional systems."

But like every system, UFAD systems also have their limitations – including the cooling capacity they can achieve without causing discomfort due to draughts in the occupied zone.

"In Australia, most commercial offices have to deal with significant solar heat gains due to the extent of the glazing used and their exposure to direct sunlight," says Dymond. "As a result, heat gains are invariably beyond the capacity of the UFAD system."

However, the location of the Arup tenancy within the building, and the building's position within the CBD, combined to allow UFAD to work.

At Barrack Place, the lower levels that Arup occupies feature a brick façade with "punched" windows, in line with the nature of the other buildings in that part of the city. And being in the heart of the city also means that the building is substantially overshadowed at these lower levels.

In fact, the extent of overshadowing at the Arup tenancy levels is such that no blinds are required in the office areas.

"We quickly realised that these two factors meant that the air conditioning loads [of the tenancy] would be low enough for UFAD to work," says Dymond. "So we set about convincing Investa that this would be the best solution – helped of course by the fact we were going to occupy the space."

The higher levels of the building are more exposed to solar heat gain and predominantly feature a glazed façade. They have been designed with a conventional, low-temperature variable air volume (LTVAV) system.

Dymond says that while the provision of different air conditioning solutions that respond to the architectural characteristics of different parts of the tower is unusual, it is entirely appropriate for Barrack Place.

"The UFAD system is a low-energy system relative to a VAV system," he says. "And utilising it in the lower floors made for an overall more energy-efficient building."

Its use also enabled improved glazing transparency via the JV3 alternative assessment for NCC Section J compliance.

TWO SOLUTIONS, ONE PLANT

Invited to work with main contractor Built, mechanical services contractor A.G. Coombs has delivered the building's mechanical and HVAC services in a design and construction (D&C) capacity.

Working alongside Arup to ensure the mechanical services design would function as intended, A.G. Coombs was able to refine equipment selections and floor layout opportunities.

According to A.G. Coombs Projects' project manager Tom Taylor, a significant amount of time was also invested in the coordination of both the floor void construction, and the services within it.

Looking across the void showing the relationship between primary work points and adjacent presentation/collaboration spaces.
Image: Earl Carter Photography.

He says the air-handling plant for both the UFAD and LTVAV systems is co-located in a mid-level plantroom on level eight. These systems have been zoned to meet Property Council of Australia Grade A zoning requirements.

"The low-temperature VAV perimeter zone air-handling plant that serves the base building, operates down to an 8°C supply-air temperature to reduce fan energy," says Taylor. "But as the UFAD system operates using high supply-air temperatures, the air-handling plant specifically serving the UFAD system has been incorporated with dehumidification using cooling coil bypass control."

Ultraviolet filters that emit UV light have been fitted to all air-handling systems to achieve the required microbe and mould control WELL precondition – essentially sterilising the air to improve air quality.

> The brief to our design teams was to create a workplace that could only be Arup

The requirement for a high standard of air filtration by WELL has also resulted in an increase in the physical size of the AHUs and the fan capacities.

This had a corresponding fan energy penalty, with energy savings needing to be found elsewhere to compensate.

The cooling plant serving Barrack Place consists of two equal-sized chillers located in the basement plant room, served by three equal-sized cooling towers located within a rooftop plant room. The building's heating hot water requirements are met by two equal-sized gas-fired boilers located in a separate rooftop plant.

Another requirement of the WELL certification was the need to ensure all ductwork and air distribution equipment was kept clean and dust-free during installation. To achieve this, A.G. Coombs had all ductwork carefully cleaned in the factory and each open

Client reception.
Image: Earl Carter Photography.

end enclosed with distinctive blue plastic film prior to deliver to site. All ductwork remained sealed until completion of the installation.

"We carried out weekly inspections on all ductwork throughout the building to ensure the plastic film remained intact," says Michael Grayson, project engineer with A.G. Coombs Projects.

"Where it had come off or been damaged, we would vacuum inside the ductwork and re-seal it to ensure cleanliness."

The site team also requested ductwork to be delivered on a "just-in-time" basis to avoid ductwork lengths sitting on floors exposed to construction conditions for extended periods of time.

References in the WELL tool to US standards (as compared to Australian standards) also presented a practical challenge for both Arup and A.G. Coombs, particularly during the design process.

"An example was validating that minimum ventilation rates nominated in AS1668.2 are equivalent or greater than those specified by ASHRAE," says Grayson. "There are overlaps between both standards, meaning ventilation rates were always checked against two standards."

In addition, WELL certification required that duct leakage testing be performed in accordance with the Heating and Ventilating Contractors' Association (HVCA) DW/143 practical guide to ductwork leakage testing.

Cooling plant consists of two equal-sized chillers served by three equal-sized cooling towers.
Image courtesy of A.G. Coombs.

Building flush-out was also performed as per WELL requirements, including a change-out of filters before handover.

At times during the design process, Arup also submitted Alternative Adherence Pathways (AAP) to the IWBI to clarify compliance considering local codes.

The WELL certification process also requires additional filter replacement during the first 12 months' maintenance period, while the UV filter systems require additional maintenance inspections that do not fall into standard maintenance programs.

ACTIVITY-BASED WORKING

Spanning the building's bottom five levels, the new Arup Sydney office features an activity-based working (ABW) design. It includes a number of collaboration zones on each floor, as well as primary work areas on either side of the four-storey atrium void and a variety of meeting rooms, studios, focus rooms and lounges.

Arup commissioned a workplace strategy and design guidelines document that informs briefs for the firm's office fitouts across the region (Arup has also recently completed new fitouts in Melbourne and Singapore).

According to Pettifer, this strategy was developed specifically to provide for the changes in workplace practices that are now occurring. These changes include the growing use of technology and the workforce's increased agility.

"At the same time, it is very important to us that our spaces reflect and enhance everything that is different and special about the culture of our firm," he says.

LESSONS FROM THE CONSULTANT

Arup regional property leader Cameron Dymond offers some of the key lessons from the firm's experience designing both the base building and its own workplace fitout.

1. Close collaboration of the whole project team, and in particular between the developer, designers and tenants, ensures that innovations can be supported.
2. Truly integrating the design of a base building and fitout creates opportunities to produce a workplace that goes beyond what can normally be achieved.
3. Green Star, WELL and great workplace design are complementary to each other and should be considered in a holistic design approach.
4. Offices don't have to be glass boxes! The integration of the architectural concept with the internal environment and services design is what has created an interesting, high-quality environment for the occupants.
5. Full utilisation of BIM, rather than just using it as a drafting tool, has benefits for the long-term operation of the building, but has to be planned into the project from the outset.

Lighting designers in the lighting laboratory. Image: Earl Carter Photography.

"The brief to our design teams was to create a workplace that could only be Arup."

The long gestation of the Barrack Place project gave the fitout design team an opportunity to pilot different ways of working and different types of spaces prior to relocating to the building.

In particular, the successful adoption of agile work practices and the manner in which Arup staff embraced innovative collaboration spaces such as the workshop and studios in its old Sydney offices gave the team the confidence that a move to full ABW would be embraced in the new office.

BLUE BANGERS

The use of cast-in-slab ferules for equipment hangers – colloquially known as blue bangers – requires close and early coordination with the builder and concrete form-workers.

Prior to the concrete slab being poured, a BIM-driven laser positioning system is used to position the cast-in ferules above the ply formwork for all of the ductwork and services hangers for a given floor zone. These ferules are then exposed when the formwork is stripped away.

According to A.G. Coombs, the use of this digitally-driven technology results in quick, safe and accurate overhead services installation, including ductwork. It also significantly reduced time for on-site staff to be working at heights, and completely removed the need for overhead drilling into the concrete slab soffit – removing drilling-related risks such as dust, noise and injuries.

Pettifer says one particular lesson learned from the pilot spaces was the critical importance of getting the acoustic environment right in this type of fitout.

"It's something I'm happy to say we achieved at Barrack Place," Pettifer says.

Arup also designed specialist spaces to be clustered around the side lift core on each level. These include a fully acoustically insulated sound laboratory, a lighting laboratory, library, art gallery and business lounge.

Located in the courtyard at the base of the atrium is the Arup University and its "tree of knowledge". This has been intentionally and symbolically placed at the heart of the business.

"The extent to which Arup generates, manages and shares knowledge globally is a defining characteristic of our business," says Pettifer.

"The decision was taken very early in the design to accommodate Arup University at the base of the atrium void, thus making it highly visible. The space includes a number of workstations that University staff and those wishing to work alongside them can use, as well as an adaptable collaboration/meeting space for talks and events."

SETTING THE BIM BAR HIGH

Robert Saidman, M.AIRAH, is principal and Sydney Buildings leader for Arup. He says Investa set the bar high for all parties in the delivery of BIM (building information modelling) on the Barrack Place project.

The building models followed a BIM executive plan (BEP) that ensured they were set up from the beginning so as to be ready for the embedding of information.

Very exacting levels of installation accuracy were required to closely match the detailed 3D model, these were delivered using BIM-to-laser set out methods. Image courtesy of A.G. Coombs.

LESSONS FROM THE CONTRACTOR

A.G. Coombs Projects' project manager Tom Taylor shares some insights from the company's involvement in the Barrack Place project.

1. Early engagement by Built of the building services design and construction contractor provided us with the valuable opportunity of being able to contribute to the completion of the design, and better coordinate and document the project. As a result of early engagement, we were able to implement a number of buildability improvements including offsite prefabrication and digitally driven set-out initiatives such as the use of laser positioned cast-in ferules for overhead services hangers.
2. Strong communication and effective working relationships between the contractors and design teams worked very well on this project and cannot be underestimated in their contribution to project success for all.
3. Products that are new or not widely used in the Australian market should be bench tested prior to application and installation onsite. There were lessons we learned from the new water-cooled packaged units (WCPUs) that were specified as part of the Arup fitout. The technical data for the units indicated that the control functions required were available; however, their interface with the building management and control system (BMCS) was limited. The units were eventually configured to operate as needed after the manufacturer provided high-level interface (HLI) access.
4. Stair pressurisation systems are often a challenge to commission. At Barrack Place with fitouts properly integrated with the base building design, there was the opportunity to improve system performance outcomes through detailed coordination between the architect and the project team. Improved, clear relief air paths around internal fitout partitions and doors were established and were critical to system performance.
5. Mechanical electrical cable distribution including cable trays is usually part of the mechanical package. This needs to be included in all up-front design BIM, particularly when to LOD500. It is often overlooked. However, with the increased use of point cloud scanning for verification of as-build documentation, addressing this with post-installation modelling is time-consuming, and particularly onerous late in a project.

"The BIM models were used to inform cost plans and were set up with COBie (Construction Operations Building Information Exchange) so as to be ready for the contractors to complete with actual selected equipment information," Saidman says.

According to A.G. Coombs, utilising pre-agreed COBie schema across the project resulted in the correct detail, accuracy and consistency in the digital information deliverables.

A.G. Coombs applied its "BIM to field" approach on the project, which required very exacting levels of installation accuracy to match the detailed 3D model, to meet Investa's requirement for assurance that the installation was installed as per the conditioned model. These outcomes were delivered using proven BIM-to-laser set-out methods, including the use of precast positioned ferules for services hangers and supports.

A.G. Coombs' Taylor says the use of COBie is already influencing the construction industry.

"This approach will change the future of project delivery and support commissioning through to building operations and management," says Taylor, "leveraging smart building interfaces into building operations.

"The Barrack Place digital twin has now been realised, and its potential for use as a management tool is being tested now that the building is up and running."

WELLNESS DELIVERED

Barrack Place reached practical completion in early October 2018. With the benefit of the integrated fitout, Arup was able to occupy its tenancy almost immediately.

Saidman says the firm has a commission to oversee the performance of the building and monitor energy consumption, including fine-tuning as necessary.

He says indoor environmental quality (IEQ) is being monitored, with early indications suggesting that the benefits of the UFAD system are already being realised.

Monthly informal tuning of the mechanical services systems is being undertaken by A.G. Coombs to ensure the project's targeted ratings are achieved, including the pursuit of WELL Gold certification. Formal quarterly tuning is being conducted with project stakeholders to improve building operation.

With much of the building now tenanted, Investa is pursuing Gold WELL certification, and using the full virtual twin (BIM) to manage the ongoing operations of the building.

PROJECT AT A GLANCE

The personnel

- Acoustic and AV Engineer: **Arup**
- Architect (base building): **Architectus**
- Architect (Arup): **HASSELL**
- Contractor: **Built**
- Developer and owner: **Investa**
- Electrical engineer: **Arup**
- Façade engineer: **Arup**
- Fire engineer: **Arup**
- Hydraulic and fire services engineer: **Arup**
- Independent commissioning agent: **WT Partnership / Thwaite Consulting Group**
- Mechanical services contractor: **A.G. Coombs**
- Mechanical services engineer: **Arup**
- Sustainability and ESD: **Arup**

HVAC equipment

- ACUs: **Mitsubishi Electric**
- AHUs: **Daikin**
- BMS: **Controlworks**
- Boilers: **Airatherm**
- Chillers: **York**
- Cooling towers: **BAC**
- Dampers: **Celmec**
- Diffusers: **Smartair**
- Fans: **Fantech**
- Grilles: **Ideal Air**
- Heat exchangers: **Alfa Laval / Teralba**
- Pumps: **Wilo**
- VAV boxes: **Celmec**
- VSDs: **Danfoss**

(Source: Arup and A.G. Coombs)