BATH SCHOOL OF ART AND DESIGN

Location	Bath, UK
Completion	2019
Client	Bath Spa University
Contractor	Willmott Dixon

Project Partner/Leads	Nick Grimshaw/Ben Heath; Allan Green
Project team	Grimshaw, Arup, Mann Wiliams, Montressor LLP, Structura

SUSTAINABILITY AND REGENERATIVE DESIGN CASE STUDY

The success of the original Herman Miller building was due in part to the design's adherence to the clients brief that the buildings must be capable of adapting to the changing needs of the business without impacting on its day to day operation. This was achieved by implementation of a kit-of-parts approach that facilitated design for disassembly decades before the concept became mainstream.

Since the building's completion in the late 1970's the terms flexibility and adaptive reuse have become central to achieving a regenerative built environment through the application of circular economy principles.

These principles have subsequently become the primary drivers for the building's redevelopment 40 years later, into a new home for the Bath School of Art & Design. The building's new lease of life has capitalised on the inherent flexibility codified into the building's fabric to maximise the positive environmental, social and economic impacts for the school, its students and the local community.

The original award-winning building, designed by Farrell/Grimshaw Partnership, was completed in 1976 as Herman Miller's primary furniture factory in the UK. It remained a factory until 2015, by which time it was Grade II listed. Bath Spa University purchased the building in 2016 in order to relocate the School of Art and Design, looking to consolidate the faculty, then spread over six sites and several buildings. The new facility, accommodating around 800 students, opened in October 2019, fulfilling an original intent of the design, that the building should be able to adapt to a future owner and entirely different use.

Maintaining the principles for adaptability was key to the design approach to the reuse, and to this end the original brief, A Statement of Expectations, was adopted. The loose fit design ethos is key to giving buildings long life, especially when it is known that the way the users will occupy the space will change unpredictably over time, as is the case with any art school. Even more important, that the building should be kind to the user and forgiving, encourages that it will be well loved. That a factory has been so successfully converted into a practical and inspiring creative arts facility gives a showcase for adaptive reuse, demonstrating that existing buildings don't have to lead to compromises on sustainability or quality of environment.

In choosing to adapt an existing building, rather than in a new building, challenges emerge beyond the complexities of blending new with old. It was critical that the investment resulted in a building that is not compromised in the quality of the user environment or its energy performance. The focus for the design was not only to reuse as much of the existing building as possible, but also to achieve a result that was able to continue to adapt to the needs of the user, as had been the successful ambition of the original design. Flexibility was considered key to safeguarding the future of the building.

A key intervention was to provide a new cross-laminated timber roof, one metre above the existing level, on new vierendeel trusses supported by the existing steel structure. This enabled several enhancements that are critical to the building's environmental quality and future flexibility. A network of "plug & play" services run at high level through the vierendeel structure, allowing the spaces below to be reorganised as required. New roof-lights and clerestory glazing reduce the reliance on artificial daylight and improves the environment for a range of uses. Increased insulation dramatically reduces the thermal heat loss and the increased structural capacity allows an extensive array of roof-mounted PV's.

"Architects in the future must design their buildings so that they can easily be changed, either by themselves or by others. Buildings in the future should be valued as a resource."
Sir Nicholas Grimshaw, Founder

The existing façade system, with interchangeable glass reinforced plastic [GRP] and glazed panels, was retained but with much improved energy performance. The improvement was achieved by replacing the existing single glazing with a bespoke double-glazed module, whilst new insulation was installed behind the refurbished GRP panels.

In order to make the best of its new location and play a role in its community, the School has made efforts to ensure that the building 'Welcomes All' and does away with traditional ownership boundaries. The riverside is completely open, as it has been since the opening of the original building, with the landscaping and picnic tables as a public amenity space. The public can access the art shop, café and associated break out spaces, as well as a permanent gallery space, ensuring the building contributes to the local community.

This approach to openness ensures a higher degree of usage of the building supporting the economic sustainability of the School and allowing it to play a more active role in the local and wider community. There is also an ambition that by bring the building back to life, in a way that directly engages with a larger and more diverse range of individuals from the local community than the original factory, it will be the catalyst for the regeneration of the surrounding area.

Original 1975 brief was to create an environment that:

- Encourages an open community and fortuitous encounter
- Welcomes all
- Is kind to the user
- Changes with grace
- Enables this community (in the sense that an environment can), to continually reach toward its potential
- Is person-scaled
- Is subservient to human activity
- Forgives mistakes in planning
- Is a contribution to the landscape as an aesthetic and human value
- Meets the needs we perceive
- Is open to surprise
- Is comfortable with conflict
- Has flexibility, is non-precious and non-monumental

Overall Site ↓

Internal Street, daylight from above ↓

Key Sustainability Facts

PROJECT SITE
Adaptive reuse of an existing site and building

OPERATIONAL ENERGY/CARBON [REGULATED ONLY]
- EUI: <105 kWh/m2/yr [Predicted]
- EUI: 83.53 kWh/m2/yr [In-use]*
  ** In line with the 2025 benchmark target for non-domestic buildings of < 110 kWh/m²/yr as set out in the RIBA 2030 Challenge.*
- Energy/fuel types: Gas + electricity [grid + on-site renewables]

EMBODIED CARBON
- Whilst the projects total embodied carbon was not measured it is likely - based on the retention of a majority of the original buildings structural and facade elements - that the building would meet the RIBA 2025 target of >650kgCO2e/m2

WATER USE AND DRAINAGE
- Water use within the building is controlled with low-flow fittings for basins and low volume dual-flush cisterns in all WC areas. Consumption of an estimated 14L/person/day for potable water is in line with the 2020 benchmark target for non-domestic buildings of <16L/person/day. Consumption is further reduced by using the adjacent river as a supply for the buildings sprinkler system.

Alignment with UN Sustainable Development Goals

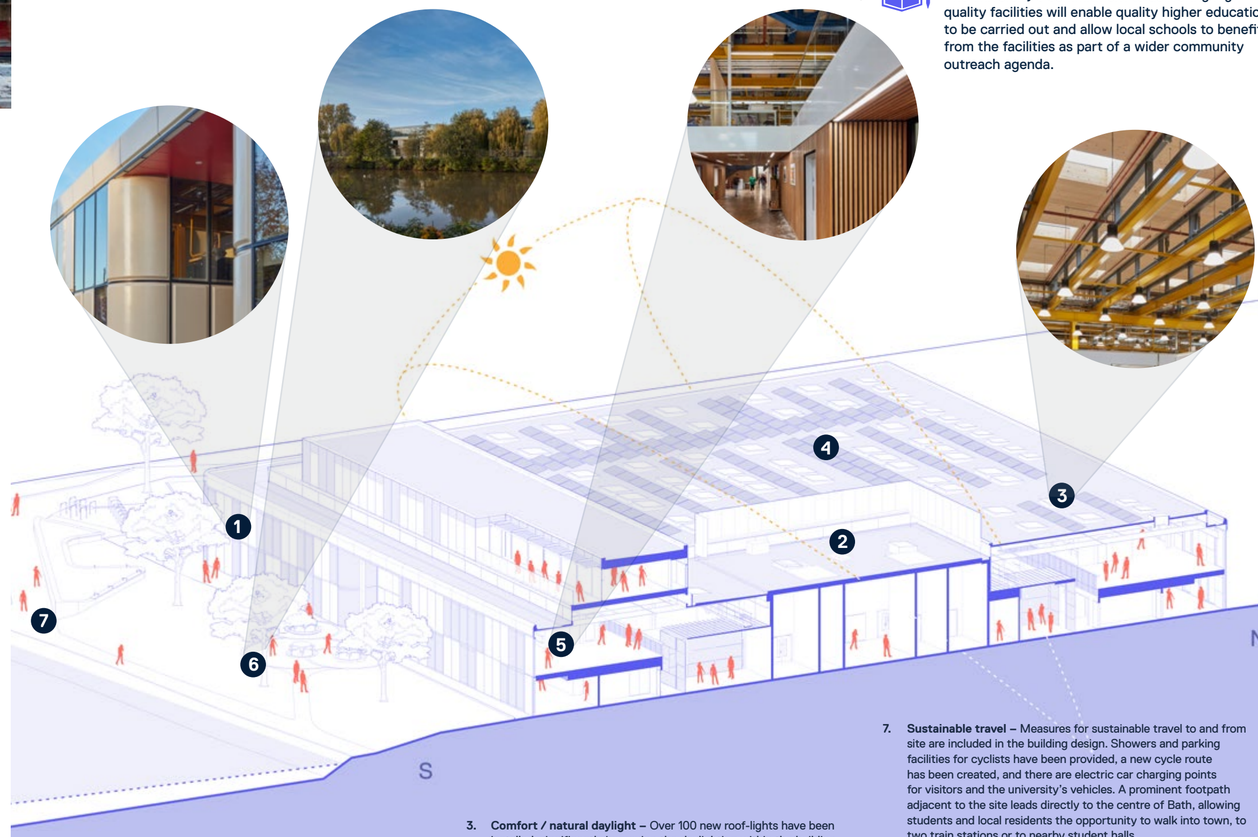
SDG 3 GOOD HEALTH / SDG 13 LIFE ON LAND
The introduction of daylight, publicly accessible green space and the use of natural materials all contribute positively to the health and well-being of students, staff and the wider community.

SDG 7 RENEWABLE ENERGY / SDG 13 CLIMATE ACTION
Upgrades to the façades thermal performance and air tightness have significantly reduced the buildings heating demand whilst on-site renewables have been installed reducing the carbon intensity of the energy consumed.

SDG 8 GOOD JOBS 7 ECONOMIC GROWTH/ SDG 11 SUSTAINABLE CITIES & COMMUNITIES
Investment in the university's expansion and relocation to the area has contributed to the regeneration of the neighbourhood and brought jobs and new amenities to the local area following the vacation of Herman Miller from the area.

SDG 12 RESPONSIBLE CONSUMPTION
The re-use of building has had a positive impact on the projects whole-life carbon emissions demonstrating the successful implementation of circularity in the built environment via re-use of the buildings priary structure and envelope.

SDG 4 QUALITY EDUCATION
The university's commitment to delivering high quality facilities will enable quality higher education to be carried out and allow local schools to benefit from the facilities as part of a wider community outreach agenda.



Axonometric sectional diagram ↑

1. **Façade retention & upgrade –** The thermal performance of the existing walls was a key area of enhancement, with new insulation installed to the façade and roof, and the replacement of single-glazing with double-glazing. This was achieved utilising the existing façade frame and fixing system, ensuring that solid and glazed modules can still be easily interchanged. This saw a predicted reduction of around 80% of thermal heat loss through the envelope. Additionally, the façade refurbishment dramatically improved the airtightness of the envelope.

2. **Heating, cooling & ventilation –** All-air cooling and heating systems for most spaces allows for free cooling by direct outside air whenever this is favourable, avoiding chiller and pumping energy use during mid-season periods. Variable air systems with demand control ventilation also allow the fans to ramp down when demand is lower, as well as when the spaces are less occupied, and thus need less outside air. The high-efficiency chillers are also rated as having an ultra-low global warming potential refrigerant (GWP=6).

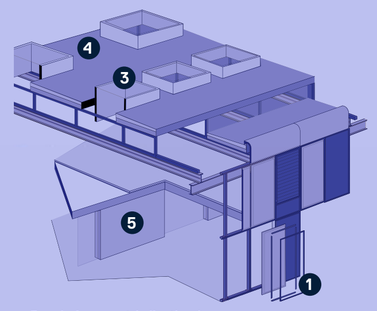
3. **Comfort / natural daylight –** Over 100 new roof-lights have been installed, significantly improving the daylighting within the building, reducing the reliance on artificial lighting, which itself is low energy LED with occupancy sensors.

4. **Renewable energy –** The building incorporates a PV array on the roof for on-site renewable energy generation. Total estimated on-site renewable energy generation = 76,000 kWh/yr.

5. **Natural materials –** Natural and self-finishing materials have been used to provide robustness, minimise carbon intensity and provide some warmth and tactility to the interior spaces. This includes a new timber lining to the inside face of the solid façade panels, which enclose new insulation, protect the GRP, and provide either a working surface for studios, or acoustic absorption in offices and traching spaces. This lining follows the same module as the façade, so can be easily relocated if the elevation is reconfigured.

6. **Biodiversity –** The surrounding landscape has been enhanced with a net increase in planting of native pollination friendly plants and trees. Light pollution from the building onto the banks of the River Avon has been avoided through the introduction of internal louvres. This is essential for bats that are not tolerant to high levels of light, so maintaining dark corridors at dusk and dawn .

7. **Sustainable travel –** Measures for sustainable travel to and from site are included in the building design. Showers and parking facilities for cyclists have been provided, a new cycle route has been created, and there are electric car charging points for visitors and the university's vehicles. A prominent footpath adjacent to the site leads directly to the centre of Bath, allowing students and local residents the opportunity to walk into town, to two train stations or to nearby student halls.



Facade Axonometric Section ↑