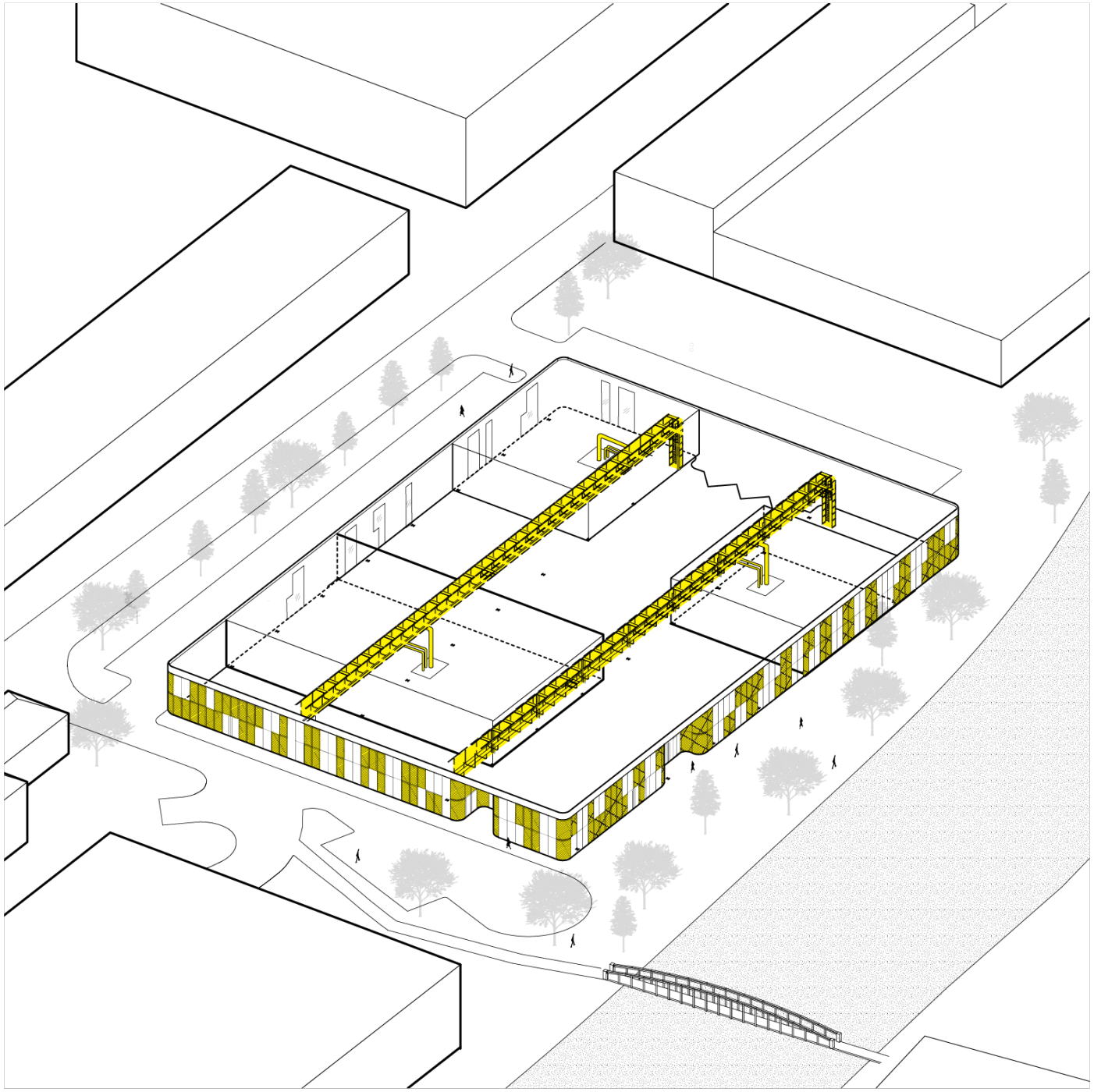


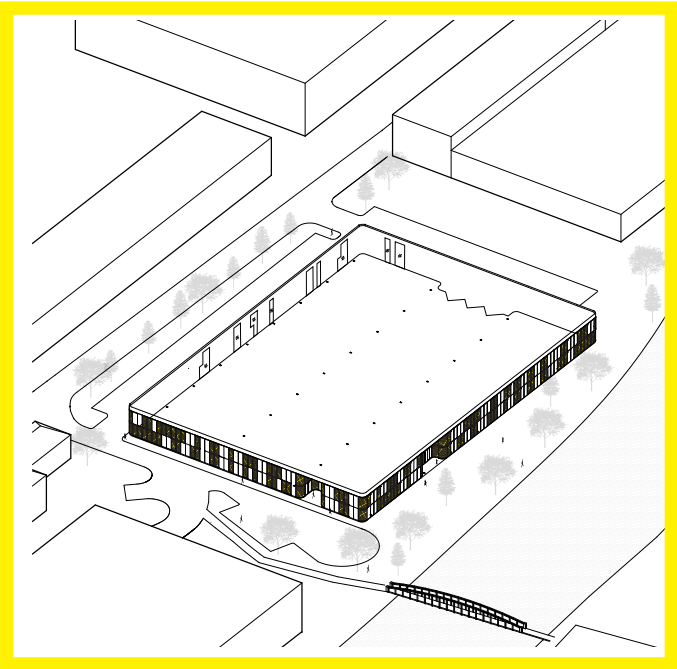
OPEN SYSTEMS
Proyectar la incertidumbre

Testing the Tenants of High-Tech
Herman Miller Factory Conversion to Bath University School of Art and Design
#technification
Lisa Martinez

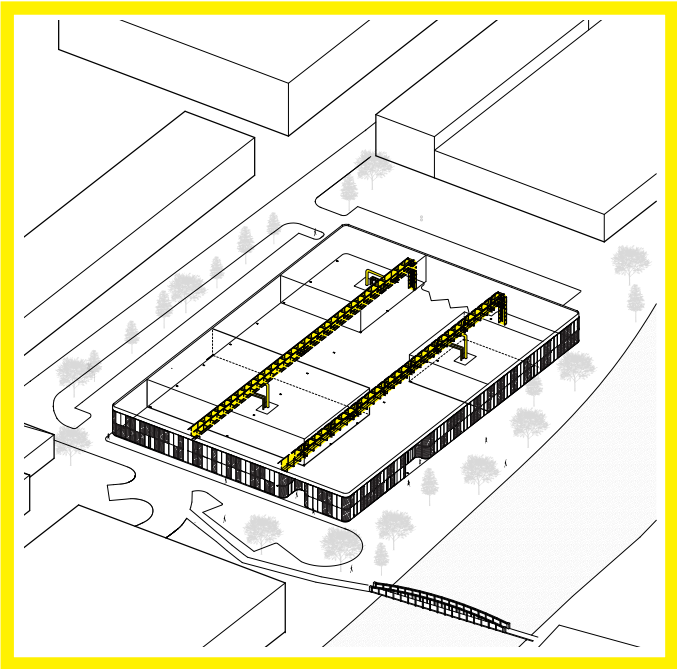
The following research proposes the building of Herman Miller Factory and its conversion to the Bath University School of Art and Design, may be read as an **"open system"** within the framework of Almudena Ribot's research titled "The 'Capacity for Action' of Architectural Spaces: Open System Design Strategies". Through the strategy of **technification,** specifically the **industrialization** of facade components, the **splitting** of building spaces and components, and the **movement** of interior containers afforded by the first two strategies have allowed, and will continue to allow, this building to change over time.

La siguiente investigación propone la construcción de Herman Miller Factory y su conversión a la Escuela de Arte y Diseño de la Universidad de Bath, puede leerse como un **"sistema abierto"** en el marco de la investigación de Almudena Ribot titulada "La 'Capacidad de Acción' de los Espacios Arquitectónicos : Estrategias de Diseño de Sistemas Abiertos". A través de la estrategia de **tecnificación**, específicamente la **industrialización** de los componentes de la fachada, el **movimiento** de los tabiques interiores y la **división** de los espacios del edificio en niveles de flexibilidad han permitido y seguirán permitiendo que este edificio cambie en el tiempo.

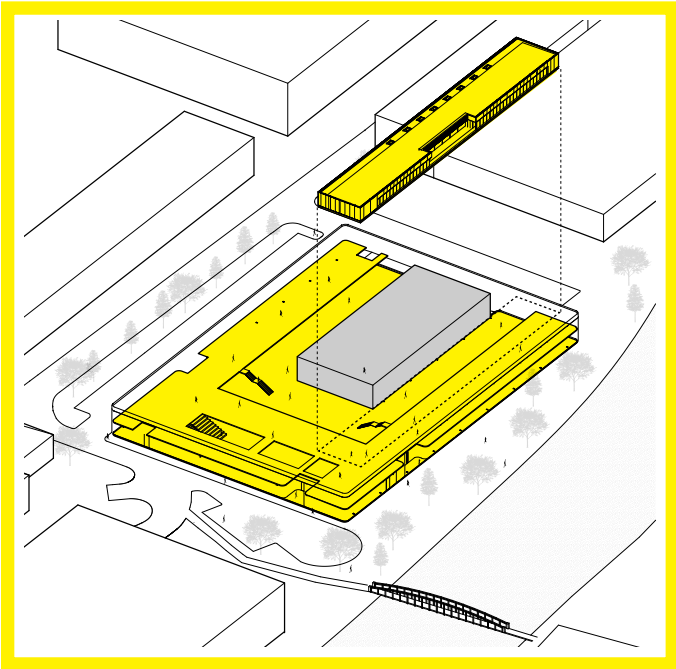
In 1977, furniture manufacturer Herman Miller approached Grimshaw Architects to design and build a factory warehouse that would hold offices and fabrication space. In 2015, Herman Miller sold the building to Bath University School of Design, who approached Grimshaw Architects once again to convert the building fit for university use. The following investigation documents the open systems strategies inherent in the original building and adapted, or added in the conversion to the new use.



INDUSTRIALIZE



SPLIT + MOVE



SPLIT + REASSMEBLE

1977

INDUSTRIALIZATION

The maintenance and adaptation of the facade without the need for skilled labor was extremely beneficial for the adaptation of the spaces interior. In an article for Dezeen, it was mentioned that in the span of fifteen years when Herman Miller occupied the building, the interior and exterior was rearranged a total of five times.

01: INDUSTRIALIZATION OF THE FACADE: THEN AND NOW

A key feature of the original building's design facilitation of **adaptability** was the modular façade system of **interchangeable** solid, glass, louvred and door panels[1]**.** The panels could be easily dismounted without the need for skilled labor or designer input, thereby allowing the façade to adapt to the processes within the building[2]. According to Herman Miller, the company made use of this feature several times[3] over the course of their ownership of the building, as it increasingly housed office, research and design spaces, along with the factory fabrication areas.[4]

Thanks to the **operability** of the facade modules, opaque panels could be easily swapped for glazing units, or vice versa, should the uses inside require more or less daylight. In the initial drawings and interviews with Sir Nicholas Grimshaw it was even stated that entire lengths of the facade could be **moved interior** to the building, thus creating courtyards as shown to the left. But evidence of this actually occuring over the life of the building as the Herman Miller Factory remains to be provided. Another operable component of the building design were modular bathrooms that could be **moved across the factory floor** as space required, and easily plugged into the service spine that is discussed later in the analysis.

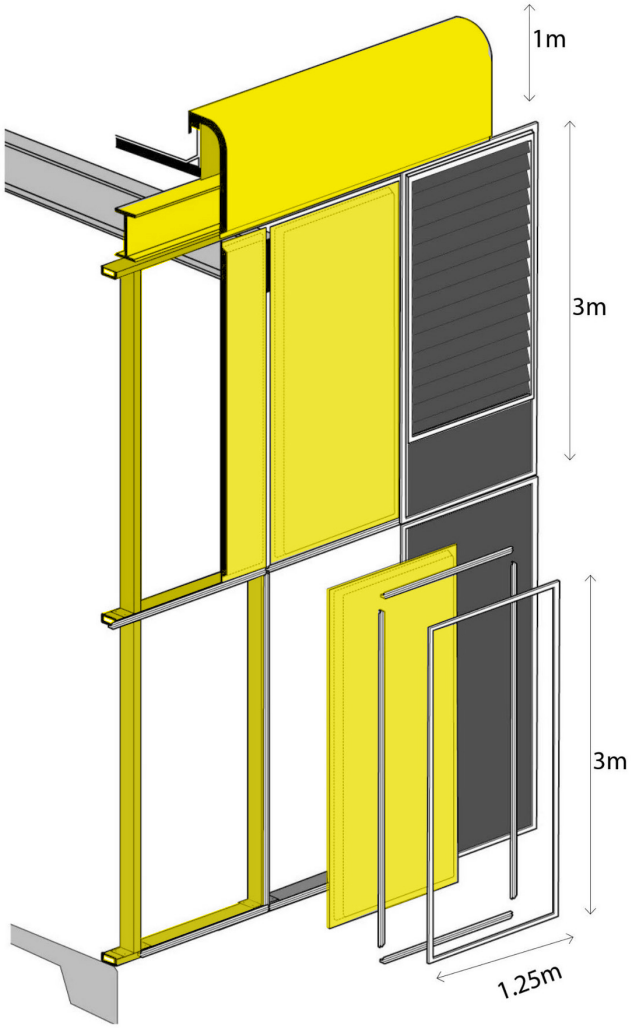
1 "Herman Miller Factory: Architectural Systems," *Grimshaw*, https://grimshaw.global/projects/industrial-design/herman-miller-factory-architectural-systems/

2 "Grimshaw Bath School of Art and Design: Sustainability Case Study," *Grimshaw,* 2020. https://grimshaw.global/assets/uploads/Grimshaw_BathSchool_Case_Study.pdf

3 Semi Han, "Herman Miller Factory was a flexible, non-monumental high-tech factory," *Dezeen,* December 4, 2019, https://www.dezeen.com/2019/12/04/herman-miller-factory-grimshaw-farrell-high-tech-architecture/

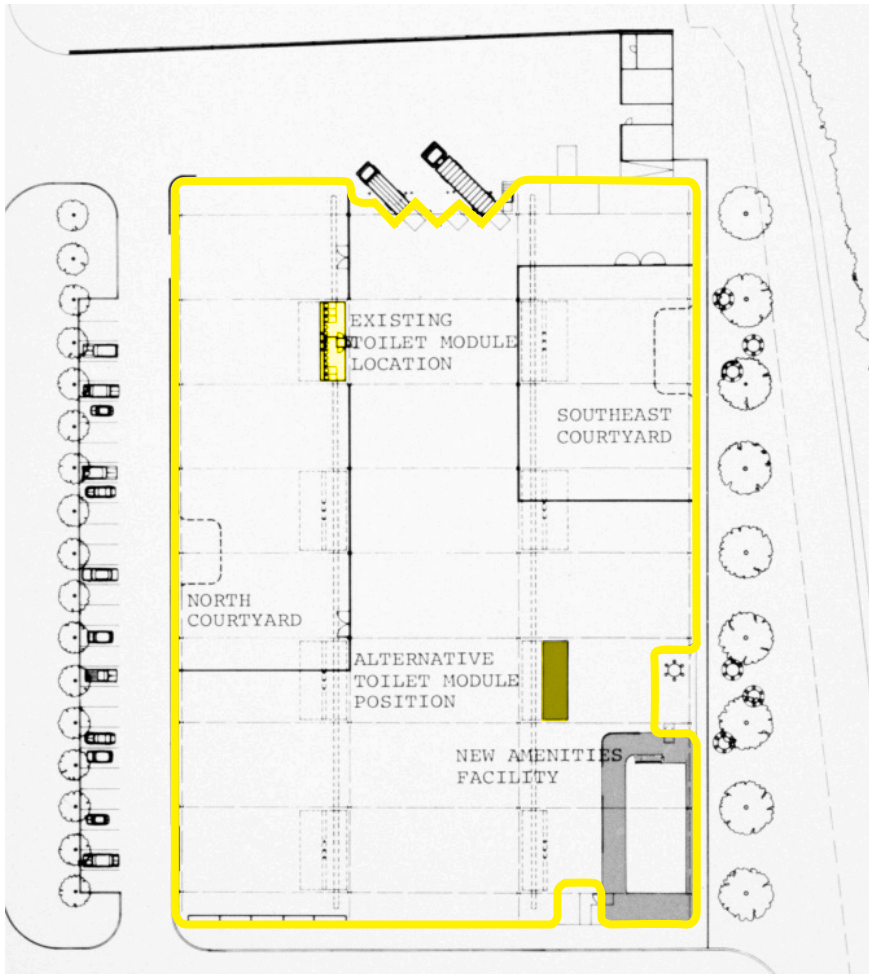
4 Clark Malcolm, "The Bath Brief: Why Max De Pree's brief for Herman Miller's UK manufacturing facility serves as sage advice for architects and designers of all ages." *Herman Miller*, https://www.hermanmiller.com/en_lac/stories/why-magazine/the-bath-brief/

1977



INDUSTRIALIZE

The facade assembly consists of a grid of rectangular hollow sections, and each frame holds glass, fiberglass or louvred panels, fixed with aluminium sections and neoprene gaskets.



*"One should envisage even the possibility of **turning the whole building over** to offices, with courtyards introduced in the centre and the storage and warehouse facilities **moved elsewhere**."*

-Sir Nicholas Grimshaw,
Architects' Journal 1978.

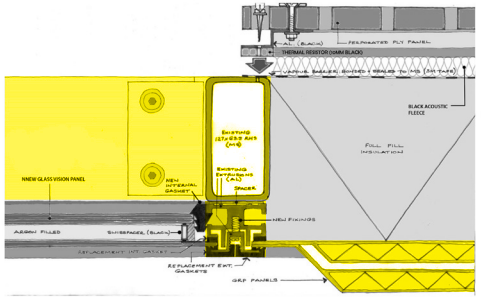
2019

INDUSTRIALIZE

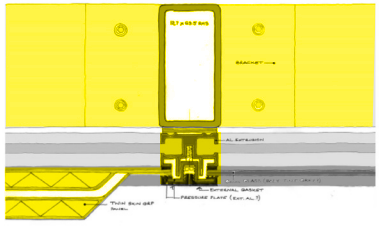
Seen from the interior of the open studio spaces, the facade modularization still functions with the same adaptability in swapping glazed panels for opaque panels.

Thanks to the **industrialization (modularization)** of the facade, creating minor updates to the existing system was fairly simple in the conversion of the building in 2019. For example, the outdated single-paned glass panels were easily replaced with double glazed units, utilizing the existing steel frame and fixing system. Originally on the interior, the insulated metal panels were left exposed, which caused issues with panels easily being damaged over time. In the building conversion, a new flexible internal lining of timber was added, which offers a usable surface for mounting and increased acoustic performance This enabled additional insulation to be installed between the new lining and the façade panels, which significantly improved the energy performance of the building. These changes saw the environmental performance of the envelope (thermal, acoustic, and solar gain) improved by over 400%[1]

1 "Grimshaw Bath School of Art and Design: Sustainability Case Study," Grimshaw, 2020. https://grimshaw.global/assets/uploads/Grimshaw_BathSchool_Case_Study.pdf

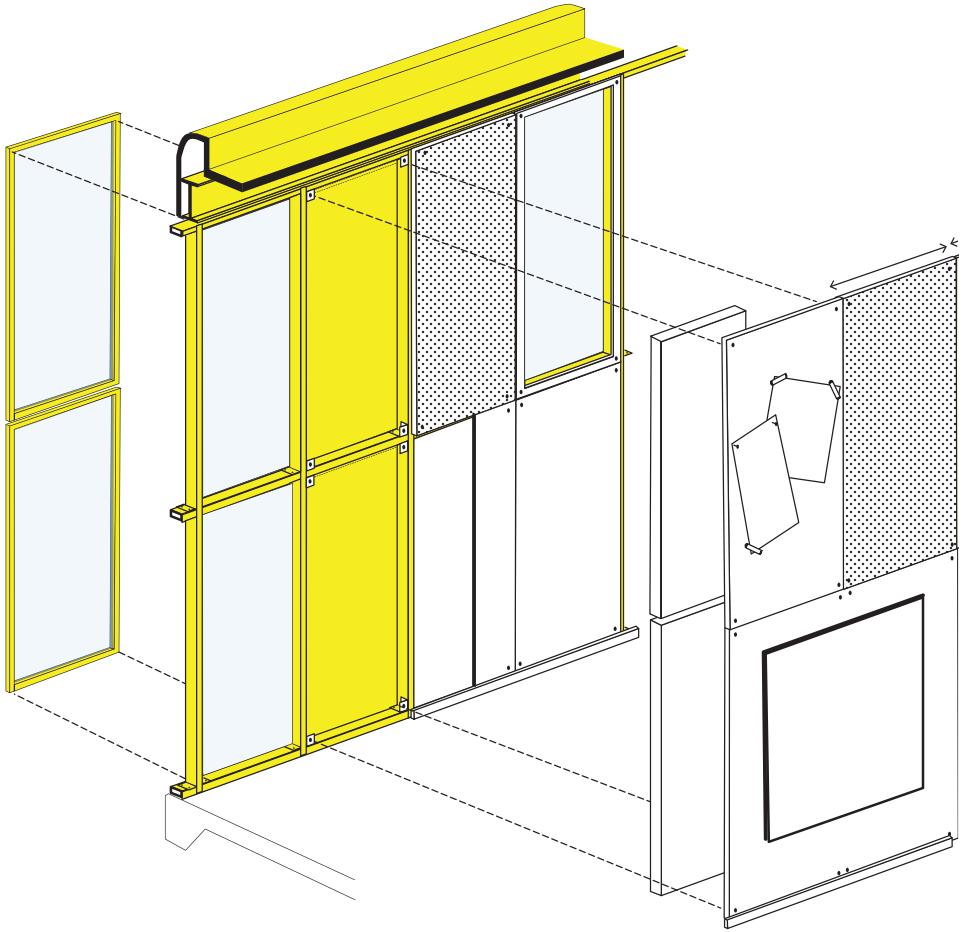


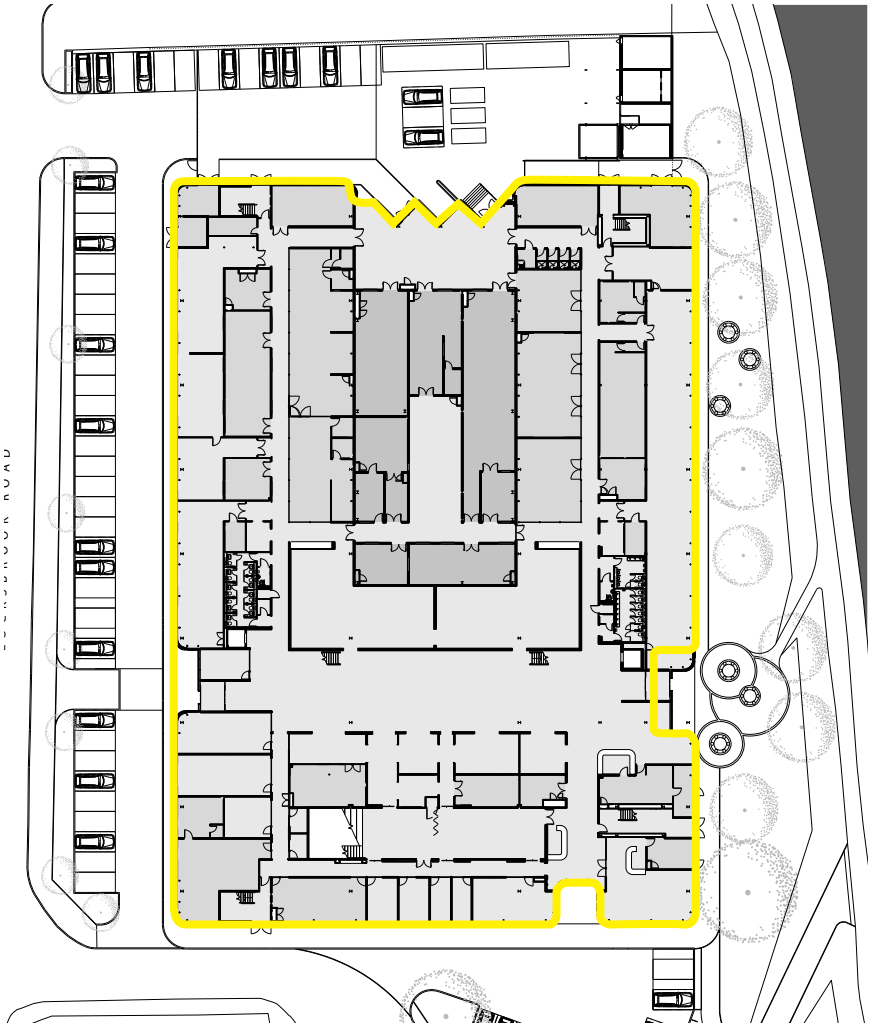
2019



1977

2019





INDUSTRIALIZE

The facade upgrade makes use of the existing steel frame, as shown here in yellow. The original panels are utilized with upgrades made to the system as required for improved thermal conditioning.

MOVE

As discussed further, the light gray spaces above are flexible studio spaces, seminar rooms, office spaces and other shared facilities. The adaptability of the facade allows for any of these spaces to be changed, with more or less daylight introduced as needed.

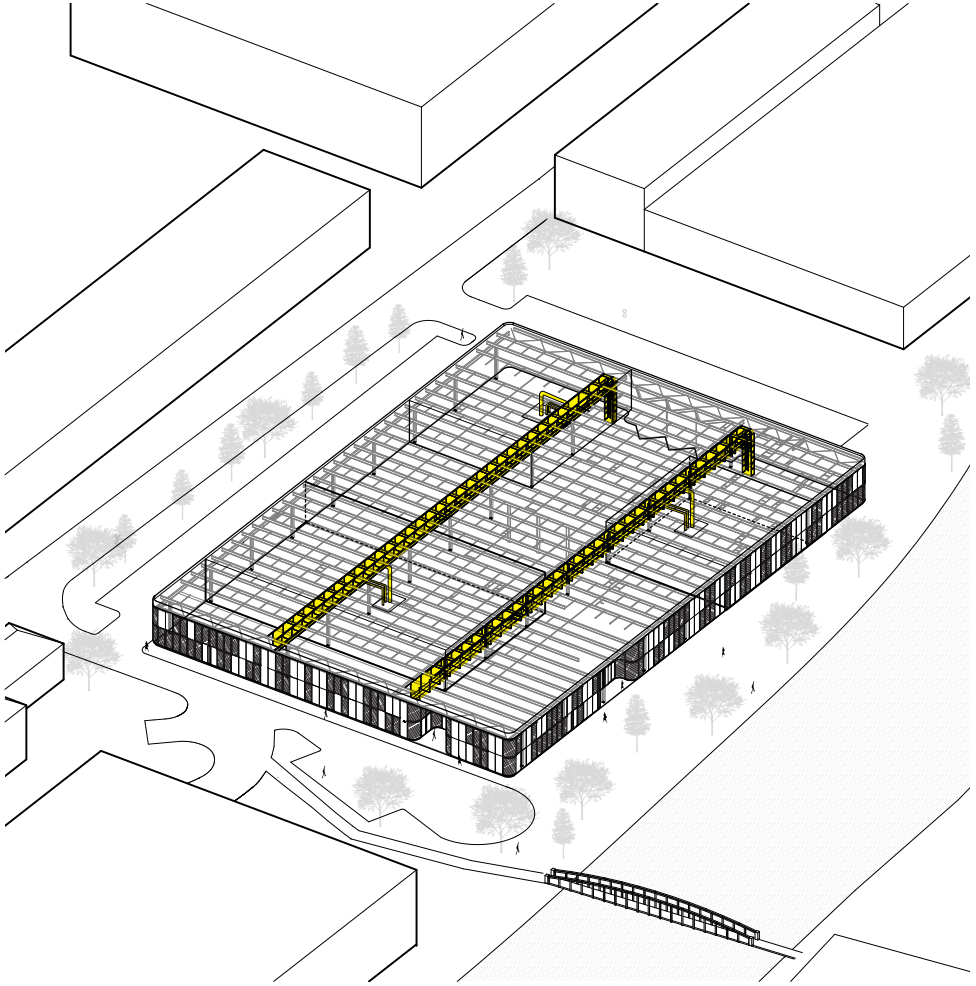
02: SPLIT BUILDING COMPONENTS: THEN AND NOW

The building that formerly housed the Herman Miller Factory and currently houses the Bath School of Art and Design demonstrates two instances where architectural elements are **physically separated**, or **split**, allowing different components of the building to transform independently.

The first instance can be seen to the left diagram that highlights two central service spines. These service spines were part of the original design in 1977 and were envisaged to allow additional systems and new technologes to **be added over time**, as the processes involved in the manufacturing of furniture changed. From these central spines, a network of services could branch off, running at high level, before dropping down to any required location the factory floor. This allowed rooms to be placed anywhere within the empty shell of the building, as could be seen in the initial GIF.

In the building conversion the principles of this strategy remained, including the service gantries themselves, but were updated to

1977



SPLIT

Two central service spines run longitudinally in the space, coincident with the main column bays of the space.

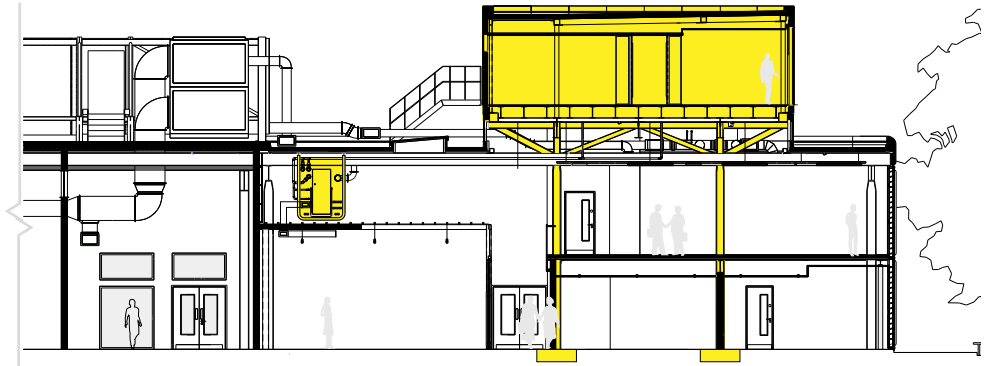
support technology that focused more on spaces for people than for machines[1].

Also in the conversion of the building from the Herman Miller Factory to the Bath School of Art and Design, a rooftop 'pavilion' was added in order to offer "flexible teaching and event space"[2] and hosts regular public events.

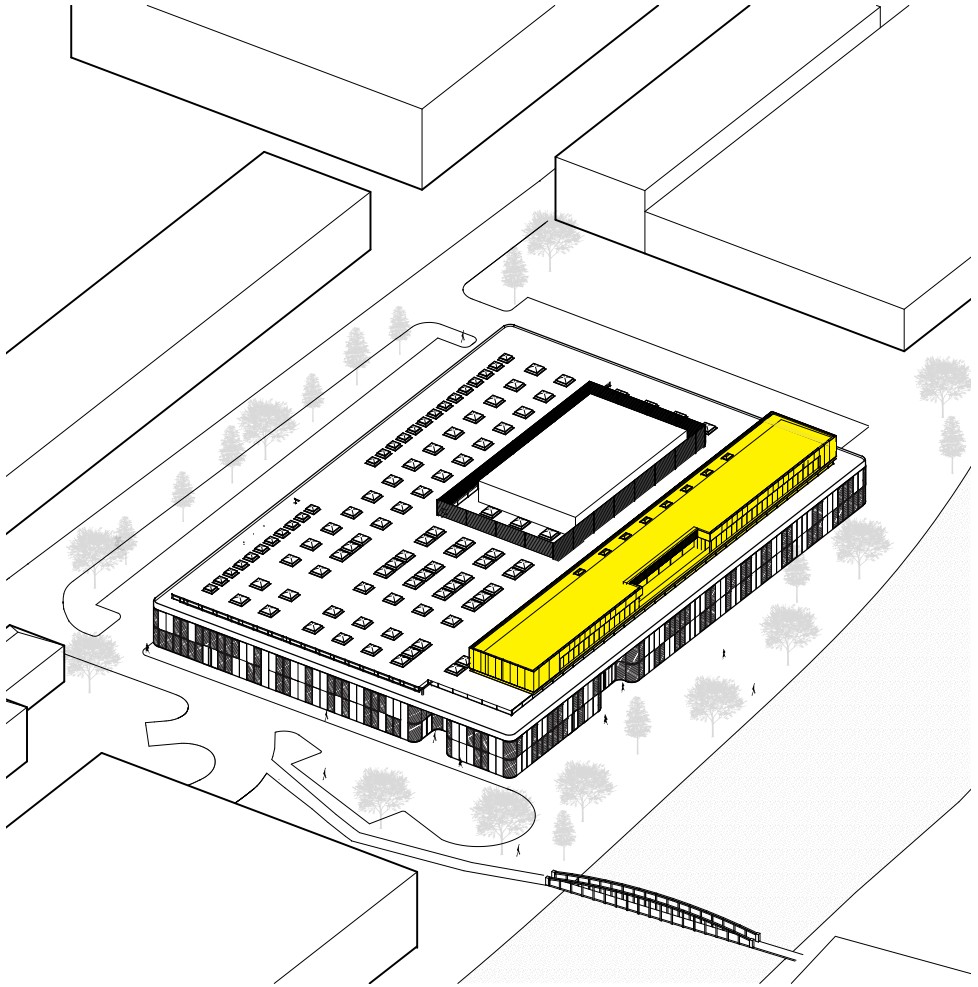
The steel that supports this roof top pavilion threads between the existing structure, as can be seen in the section below. A cantilevered truss supports the load of the pavilion and connects directly to a cross-laminated timber floor deck. The truss transfers the load to new columns that make use of pre-existing concrete pad foundations that were delivered in the original build to allow for **future extension**. These strategies not only limited the impact of the new works on the existing, but also mean that the alterations could relatively simply **be dismantled back to the existing** should this be required in the future. This

1 Chris Obayda, Associate Principal with Grimshaw Architects in discussion with the author, January 2023.

2 "Bath Schools of Art and Design," *Grimshaw,* accessed February 13,2023, https://grimshaw.global/projects/education/bath-school-of-art-and-design/



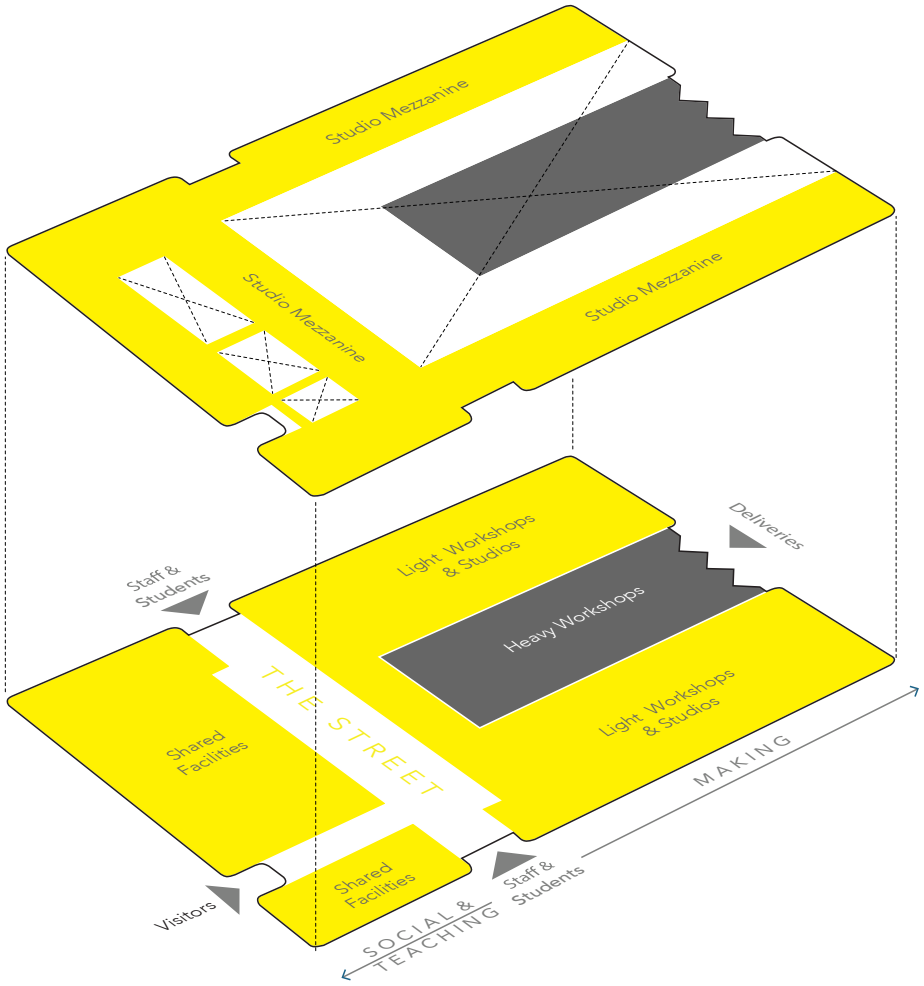
2019



SPLIT

The rooftop pavilion is structurally separated from the original structure of the building, allowing for future change or disassembly.

2019



SPLIT

Two central service spines run longitudinally in the space, coincident with the main column bays of the space.

The third example of the separation of building components, or split, that can be seen in the Herman Miller Factory/Bath School of Art and Design is in the **separation of use by intensity of systems required,** as can be seen to the left.

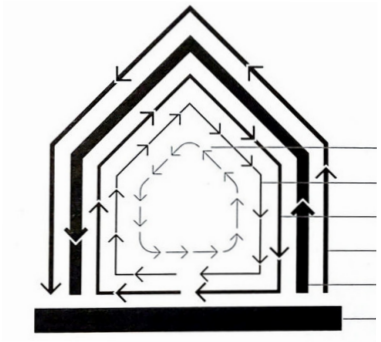
The box in gray represents the heavy double height workshops, which necessitate the highest safety requirements in addition to being the most intrusive acoustic environments. Therefore this zone is contained within its own acoustic and fire compartment, linked directly to the service yard.

On the ground floor and upper mezzanine in the yellow zone, which demonstrates the **building split,** are located the more programmatically flexible studio spaces, light workhop spaces, and shared facilities, such as cafe, seminar rooms, meeting spaces[1]. These spaces are much more likely to be required to **change size or location over time**, therefore the separation of building zones by intensity of use allows the flexibility of those zones to change than if the heavy duty workshops were to be scattered throughout the building.

1 Chris Obayda, Associate Principal with Grimshaw Architects in discussion with the author, January 2023.

Crítica / Discusión

Jerry Tate, a columnist for the online architectural platform *Dezeen*, wrote in late 2022 the following: "The original high-tech projects are all reaching an age where they will have to **prove that they can be altered** as much as the creators promised"[1]. The High Tech movement was marked by an **aspiration for adaptability** achieved through the use of industrial systems and processes in architecture, and as many of the buildings emblematic of this movement are over fourty, even fifty, years old, they have endured with more or less success thanks to the integrity of their architectures, or the "physical natures" of the building. But how long exactly have particular components of the building endured? In his seminal book *How Buildings Learn*: *What Happens After They're Built*, Stewart Brand extrapolates on an idea brought forth by Frank Duffy of DEGW that architects should analyze, and plan for, change over time specifically via a building's layers or components[2]. The below diagram (left) Brand introduces in the book as a means to visualize the lifespans associated with a building's components or layers. To the right of Brand's diagram, this author has initially sketched out a rough association of months or years documented for the longevity of components in the Herman Miller Factory/Bath School of Art and Design case study.



Herman Miller Factory/Bath School of Art and Design Building

SPACE PLAN	3-5 years (Herman Miller changed layout 5 times in 15 years)
SERVICES	**42 years** (upgraded in conversion in 2019)
SKIN	**42 years** (upgraded in conversion in 2019)
STRUCTURE	**40-100 years** (existing steel structure unaltered, new roof added)
SITE	Forever

Of note are the lengths of time associated with the duration of the building skin, services and structure, written in bold. Generally, these time frames are longer, some by double, than what Brand summarizes are the expected obsolences of certain components: 7-15 years for services, 20 years for skin, 60 years for structure. For example, at the time of the conversion of the Herman Miller Factory to the Bath School of Art and Design, forty-two years had passed, and the HVAC system was updated for the first time to a more sustainable system with greater control and less harmful refrigerants (a variable air volume system with demand control ventilation)[3]. Additionally, as was previously stated, the facade was updated in 2019 to add additional insulation and swap single pane glass for an insulated glazing unit with double panes. As for the structure, the existing steel structure remained unchanged, however a new roof was added in order to add proper clear height for the mezzanine component, providing an opportunity to upgrade the waterproofing and insulation. This investigation makes evident the association between the "open system strategies" such as the industrialization of the facade and the splitting of the services from the building envelope via the spine, and the ease of building conversion in 2019. But perhaps these strategies also allowed the building skin and services to be maintained with smaller, quicker fixes over time, allowing the building to endure for nearly double Brand's estimates before requiring wholesale upgrade. If further analysis were to be executed for other buildings of the High-Tech movement, would similar results be found and what might this confirm (or deny) in the core tenants of the movement?

1 Jerry Tate, "High Tech is next in line for a revival and I for one would welcome it," *Dezeen*, August 22, 2022, https://www.dezeen.com/2022/08/01/high-tech-revival-jerry-tate-opinion/
2 Stewart Brand, *How Buildings Learn: What Happens After They're Built*, (New York: Penguin Books, 1994), 13.
3 "Grimshaw Bath School of Art and Design: Sustainability Case Study," *Grimshaw*, 2020. https://grimshaw.global/assets/uploads/Grimshaw_BathSchool_Case_Study.pdf