Reimagining Permanence in Architecture

How adaptable and circular design principles can enhance the value and durability of buildings

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Abstract

The misguided idea of permanence in architecture has proven to be an illusion (Brand, 1994; Ford, 1997). Present-day solutions such as the adaptive and circular design of buildings strive to enable frequent changes in buildings to satisfy the needs of users in our transient society. However, this challenges the idea of permanence in architecture, a concept that people profoundly believe in (Ford, 1997).

By outlining the new notion of permanence as identified by Katrina Touw (2006) and the principles of adaptable and circular design as identified in recent literature studies (Asker et al., 2021; Hamida et al., 2022). Then establishing a framework which shows the relation between the two topics used to evaluate five case studies. This thesis seeks to identify if the new approach to building design strives to achieve permanence and in what way.

We can conclude that by thinking about the inherent value of the building at its end-of-life whether it be to maintain, reuse, recycle, or repurpose, the stakeholders involved in the design process actively engage in achieving permanence.

Keywords

Adaptability, Circularity, Permanence, Architecture

1 Introduction

"The idea of architecture is permanence."
(Brand, 1994, p.2)

Many people would agree with this statement. However, as Stewart Brand further elaborated, *"It is an illusion."* (1994, p.2). Even though this statement expresses an illusory view on the existence of buildings, many people have a profound need to believe in it and disregard the fact that buildings are subject to mutation (Ford, 1997). Brand investigates these mutations in his book *How Buildings Learn* (1994) and advocates for different approaches to building design to accommodate change. Allowing change implies the impermanence of what was before the change, and to become something different, which challenges "the idea of permanence".

The built environment is pushed around by three major forces: money, fashion, and technology (Brand, 1994). Many buildings in our current building stock are unable to adapt to the changes which are or will be needed to respond to the modern challenges our society faces (Askar et al., 2021). This leads to buildings becoming obsolete before the end of their technical life, causing them to require substantial refurbishment. Very often such refurbishment is financially not interesting which results in buildings being abandoned or demolished (Manewa et al., 2016). Brand also raised his concern with the high turnover rate in the property market with property serving only one cause, return on investment (1994). In the late 20th century buildings were being built because there was ample money and not because there was demand (Brand, 1994).

In a time where change has become something commonly accepted as a fact of life (Powell, 1993), buildings are like difficult to discard and outdated clothing. Nonetheless, they are not supposed to come and go as fast as the garments in one's closet. Alois Riegl (1903/1982) wrote that people valued age and historical significance before they came to value newness at the beginning of the 20th century and prioritised practicality. Yet when Stewart Brand (1994) asked people at a convention *"What makes a building come to be loved?"* a person answered *"Age."*. Luis Fernández-Galiano identified in 1997 that society valued the symbolic over the material. Touw (2006) proposed that people valued a combination of age and newness. When what people value changes often in a short period, it is difficult for buildings to keep up.

The seemingly impossible demand for buildings to follow this stylistic dynamism becomes increasingly possible with technology. Dismountability, standardisation, mass customisation techniques, and research into systems such as façade leasing are developing at a fast pace. This is already evident in shops such as IKEA which allow for cheap and fast change of Brand's sixth layer, stuff (1994). Sadly it is also at the cost of increased waste. With construction and demolition waste accounting for 16-43 per cent of our total solid waste stream (Graham, 2005) this is not a sustainable approach to the changing needs of our society, when taking into account the use of primary resources in the production of new building materials and components it is even less sustainable.

The concept of adaptable buildings in a circular economy has been an important topic in the transition to a more sustainable building industry (Asker et al., 2021; Hamida et al., 2022). A lot of literature has been published on the topics of adaptable buildings and circularity in the built environment. According to recent literature reviews (Asker et al., 2021; Hamida et al., 2022) a few main notions and strategies can be identified. First of all, the identification of the separation of building layers. The idea that a building could be separated into different layers each serving a different function and with inherently different lifespans was first suggested by Frank Duffy and extended by Stewart Brand (Brand, 1994). Brand identifies six "Shearing Layers": site, structure, skin, services, space plan, and stuff. This idea of shearing layers of buildings allowed for a different view of building design by looking at each layer individually in the context of adaptability and circularity. This resulted in four design strategies for adaptable buildings identified by Asker et al. (2021) which will be discussed in detail in chapter three.

In relation to the new strategies, the question of permanence is brought up. Soylu (2019) argues that permanence is a quality attributed to architecture since the early ages, but since in modern society this is no longer a quality that fits the current paradigm, temporary structures may be the solution. Touw (2006) questions the definitions of permanence and how society should look at permanence. She looked at how the understanding of the permanence of the built environment had changed throughout history and how it relates to the understanding of it at the beginning of the 21st century. This relationship between permanence and architecture is not only told by philosophers and architects but also by the buildings themselves.

Buildings are extremely valuable to historians, they do not only convey past building techniques but also ways of life. As architectural historian Patricia Waddy

said, "Buildings have lives in time, and those lives are intimately connected with the lives of the people who use them." (1990, p. 11). The high vacancy and demolish rate of the newly built building stock, which reflects the values of our current society, is not only environmentally unsustainable but also not sustainable for our future history.

> *"Buildings are the vessels of our stories; they are our cultural artifacts and contain the stories of who we are, where we have come from, and where we will be going to." (Shahid, 2022)*

Modern answers to the need for "sustainable" architecture are focused on adaptable and circular buildings. It is important to consider the topics of adaptability and circularity and their connection to permanence and impermanence and also to position it in the larger conversation about history. Buildings that are allowed to exist for a long time, are very interesting objects to study and understand our history. This is demonstrated by Brand in his book How Buildings Learn (1994) which analyses multiple buildings, their history, and how that reflected societal norms.

This thesis aims to investigate how the relationship between architecture and permanence has further developed in the past decade in the context of adaptable and circular design. We seek to identify if the new approach to building design strives to achieve permanence and in what way. The topic of the historical value of this approach will also be discussed in the context of its (im)permanence.

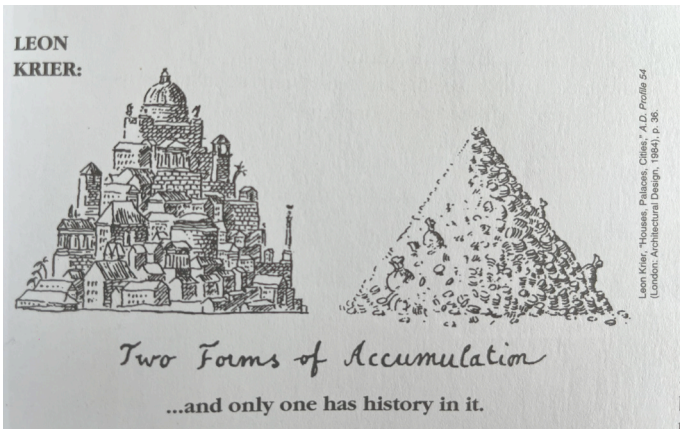

Figure 1 Two Form of Accumulation by Leon Krier with added subtext by Stewart Brand (1994, p.87)

2 Method

To understand the relationship between permanence and design for adaptability and circularity, this thesis will first outline the new notion of permanence as identified by Katrina Touw (2006) and the principles of adaptable and circular design as identified in recent literature studies (Asker et al., 2021; Hamida et al., 2022).

Then the principles of adaptable and circular design will be positioned within the new notions of permanence to establish a framework for evaluating case studies.

Next, five case studies of buildings built in the past decade will be examined in relation to their position in adaptable and circular building design and their position in the new notion of permanence using the previously established framework.

Subsequently, the thesis will focus on how the result from the case studies relates to past theories on the permanence of buildings and how it has changed.

Finally, the new relationship between permanence and building design for adaptability and circularity will be discussed.

3 Framework

The introduction started with a quote from Stewart Brand that the idea of architecture is permanence, followed by how he suggests to review this "illusion". This is exactly what Katrina Touw discusses in her publication, *Firmitas re-visited: Permanence in Contemporary Architecture* (Touw, 2006). To further understand the new notions of permanence and its relationship with designing for adaptability this section first explores and defines the new versions of permanence. The concept of design for adaptability and circularity is then examined. Design strategies will be identified and linked to the concepts of permanence.

3.1 Contemporary permanence

The classical notion of permanence is similar to what is understood as the term *firmitas*, coined by Vitruvius in his *Ten Books on Architecture*, which is an absolute understanding of material durability. It believes that a perfect construction will last forever and ignores the fact that all materials decay (Touw, 2006). This classical understanding of permanence is a struggle against the nature of existence. In our transient society, currently dominated by a symbolic economy which lacks concern for material durability, the Vitruvian idea is less relevant. Recently the struggle against the natural cycles of life processes has turned into a struggle against ourselves to preserve nature. For this reason, it would be fitting to redefine permanence, Touw (2006) identifies two realms: absolute or relative permanence and two modes: static or dynamic permanence.

First of all it is important to understand absolute and relative permanence. Absolute permanence is an abstract concept which denies eventual material deterioration and is something that can exist for an indefinite amount of time independent of entropy. Relative permanence considers material to be able to exist for an indefinite amount of time, but eventual deterioration is accepted. Each realm also distinguishes two modes: static and dynamic permanence. Static permanence is location bound and produces stability and continuity as a result. Dynamic permanence is flexible in both location and function, able to exist in all scales, from screws to entire buildings.

The two realms and modes can be visualised on a graph with absolute and relative permanence on the x-axis, and dynamic and static permanence on the y-axis (Fig. 2).

Absolute static permanence can be related to memories, images, and ideas which are bound to certain locations or situations. Under absolute dynamic permanence dreams and non-location bound data can be classified. Absolute permanence becomes an abstract idea such as Vitruvius' desired values, while relative permanence is how the current society experiences the built environment. Relative static permanence is for example buildings, sculptures, and monuments; relative dynamic permanence can include all different building elements, non-location bound structures, pavilions, and more. Both types of permanence can be closely related to the concept of designing for adaptability, as will be discussed in the next chapter.

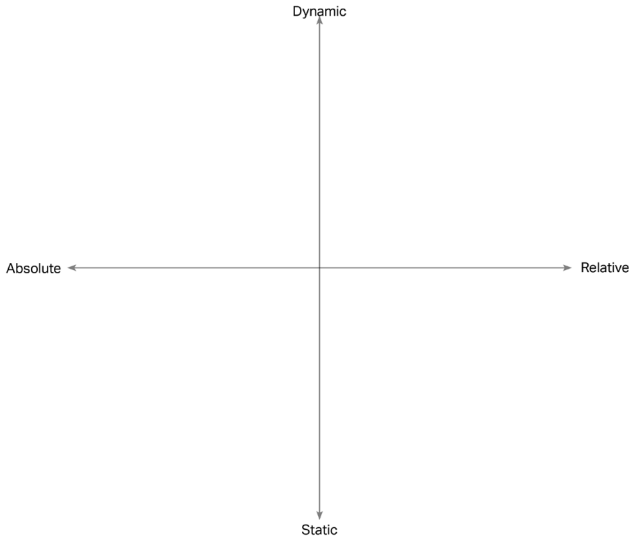

Figure 2 Permanence graph

3.2 Adaptive and circular design strategies

Designing for adaptability is a relatively new concept of the 21st century. Its origins can be traced to several other concepts that arose in the 20th century. The Open Building approach is often considered to be the foundation of the later development of designing for adaptability (Asker et al., 2021). First put forward in the 1960s by Stichting Architecten Research the open building implies a building with a simple durable structure which is called the "base building", and the "fit-out" which is the flexible infill. These buildings allow, and facilitate, future changes to be performed by the inhabitants. In reality, the concept did not catch on due to the lack of attention paid to the choice of materials, which often turned out to limit the technical feasibility of future change.

Even though the open building concept did not take off immediately, it might have inspired the shearing layers theory. By expanding Frank Duffy's four S's, shell, services, scenery, and set, to the six "Shearing

Layers", site, structure, skin, services, space plan, and stuff, Brand suggest a separation of these building components. Separating elements with different lifespans facilitates the ease of replacement of certain building elements without disrupting the performance of the other layers (Brand, 1994). Brand also mentions that "souls" could be added to his 6 S's, other studies also analysed Brand's model and have suggested additions such as surroundings and social (Schmidt & Austin, 2016). The main advantages of layer separation are the ability to extract elements without disturbing other parts, and easier maintenance of different layers.

Shearing Layers distinguish building elements and limit the interaction of elements of different lifespans which allows them to be maintained individually. This subsequently enables the further implementation of the **Circular Building (CB)** concept which aims to minimize the consumption of raw resources and energy by "closing and slowing the loop" of building materials (Asker et al., 2021). As Geldermans (2005) argues, increased adaptability in buildings allows for increased circular use of building materials. Although reusing materials helps to close the loop, slowing the loop is just as important. That is achieved by good maintenance, however, maintenance is often neglected because of costs and in some cases designs that are inherently difficult to service.

Serviceability and maintainability is a characteristic that supports the "Design of Longevity and Durability", one of the four currently identified CB-strategies (Asker et al., 2021). These CB-strategies are design tools used to approach adaptable building design, they are supported by some of the 10 common determinants identified by Hamida et al. (2022) and can be related to different characteristic concepts of permanence.

Design of Longevity and Durability – is based on a long-life structure that can change in response to new emerging needs. This strategy is supported by determinants such as *flexibility or adjustability* (the possibility to alter spatial configurations); *generality or multifunctionality* (the possibility to use spaces for different purposes without any change); *elasticity or expandability* (ability to expand the building volume, this requires a certain design redundancy); *convertibility or transformability* (having the option to give the building a new function); *refit-ability* (the capacity to improve performance components of the building to adapt to technological improvements); and *accessibility or availability* (this relates to the ease of access to building components which allows servicing and maintaining). – This strategy can have the characteristics of **relative static permanence**, a location-bound long-life structure in which eventual material deterioration is accepted. The design answers the difference in deterioration times of different materials.

Design for Deconstruction and Disassembly – assumes that all building elements, both materials and products, can be disassembled and recovered for reuse. This strategy is supported by *moveability or relocate-ability* (ease of change of the location of building assets); *dismantlability* (to be able to remove materials and products easily and effectively); *convertibility* (the possibility to give the disassembled elements new functions); and *recyclability or reusability* (facilitating the recycling or reuse of building elements). – **Relative dynamic permanence** is the fitting concept of permanence in this situation, it implies that all components of the building to the entire building itself are not location bound.

Standardisation and Modularity – enables and promotes the reuse of building elements, from screws to rooms, in different structures while maintaining the same inherent quality. This strategy is supported by *moveability* (modular components must be moveable, to be able to be reused in a different location); *dismantlability* (if modular components cannot be dismantled to be reused or repaired, it loses their effectiveness); and *modularity or regularity* (the quality of being able to increase the regularity in the building design). – The use of the standardisation and modularity strategy could in a certain sense implies an **absolute dynamic permanence** as "the standard" which is applied is not subject to deterioration, and the materials produced according to the standard can be used in any location.

Material passports for facilitated reuse – even though the current market cannot yet support this strategy this is an important concept to collect information on available materials and components to make reuse easier. Implementation of this strategy will also further stimulate the use of recent concepts such as urban mining and buildings as material banks (BAMB). Urban mining efforts in the built environment currently focus on extracting materials from construction and demolition waste when a building reaches its end-of-life. This greatly limits the positive effect the strategy can have (Koutamanis et al., 2018). BAMB tries to enable a systematic shift through design and circular value chains by using, among other strategies, material passports (BAMB, 2019a). This strategy has many of the same supporting determinants as the standardisation and modularity strategy that can help with its application. The more bolts there are that fit a certain nut the higher the chance the nut will be reused but if no one knows the nut is available it will not be reused. – A registry of information able to exist for infinite duration and the

information is bound to a certain object in a certain location, this is **absolute static permanence**. One could argue that the information is only of use as long as the object it is bound to remains in existence, but strictly speaking, the information will continue to exist and might even be useful for further research purposes.

3.3 The adaptability, circularity, and permanence framework

By plotting the CB-strategies and their determinants in the permanence graph (Fig. 3), a framework which establishes the correlation between permanence and adaptable design in the built environment is obtained. This framework will be used to evaluate five case studies according to their adaptable and circular design qualities.

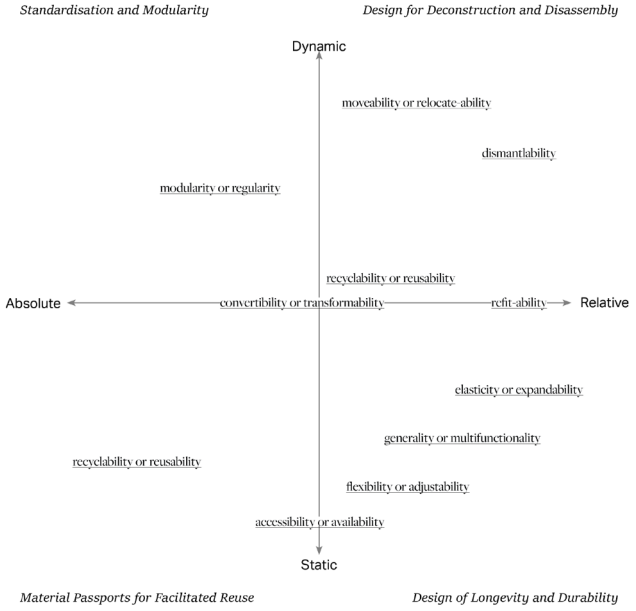

Figure 3 Permanence graph with CB-strategy determinants

4 Case studies

Five case study projects have been chosen to be investigated. The first four projects were each designed with a focus on one of the CB-strategies. The last project, the Ise Grand Shrine, is incorporated into the case studies because the building was originally designed in a certain way to continue a tradition, as a monument, and not as a way to achieve adaptable or circular design. However, it has many of the determinants identified in the previous chapter.

The case studies' use of CB-strategies and determinants will be investigated and plotted on the graph to reflect where they are positioned within the domains of permanence.

The buildings will be evaluated on two periods in time (Fig. 4): the first being the building during its service life and the second being what happens with it after its end-of-life (EOL). The building's end-of-life is identified when the building no longer serves its intended function.

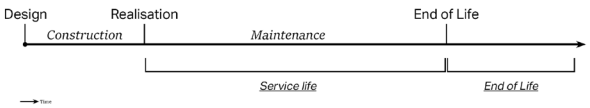

Figure 4 Building life timeline

4.1 The Bullitt Center

Located in Seattle, Washington, the Bullitt Center (Fig. 5) is a green commercial office building designed by Miller Hull Partnership, and completed in 2013. It is six stories tall with 4800 m2 of office space and designed to be the greenest commercial building in the world (Berton, 2015). One of the main characteristics of the building is the fact that it was designed to last 250 years (Bullitt Foundation, 2013).

Figure 5 The Bullitt Center

To achieve these goals the building made use of a strategy similar to the Shearing Layers strategy (National Institute of Building Sciences, 2016), the hybrid structure of concrete for the foundation, steel for the parts exposed to outdoor environments, and heavy timber structure for the rest is made to last 250 years. The high-performance envelope is designed to last 50-75 years and all the technology implemented to reduce the building's footprint will last around 25 years (Fig. 6).

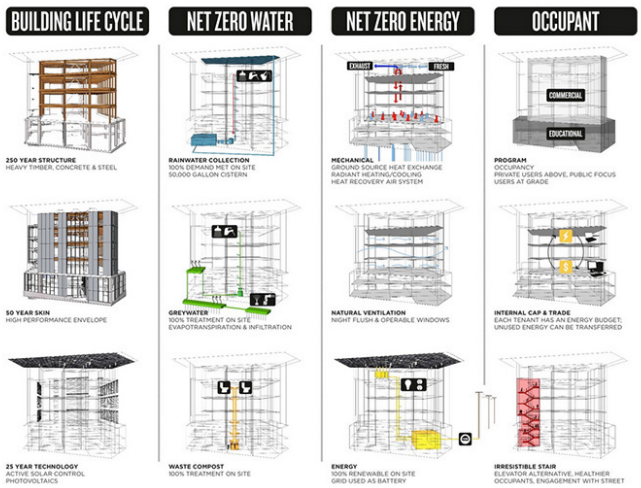

Figure 6 The Bullitt Center Layers

Next to the literal design for longevity and durability which is reflected in the structure the building also utilizes multiple determinants which support this strategy. The first one is flexibility, the building is designed with open floor plans which can easily be configured to the tenants' needs and technological innovations (National Institute of Building Sciences, 2016). The Bullitt Center also focused on exposing as

Figure 7 The Bullitt Center timber beams

many functional parts and details as possible such as the timber beams (Fig. 7) and steel support for PV panels, this will increase the building's accessibility for maintenance and replacement as well as its refit-ability to update the building with new and improved technologies (National Institute of Building Sciences, 2016). The building also has over-dimensioned ceiling heights (3.4m – 4m compared to a typical 2.7m height) which increases the building's generality and convertibility (Berton, 2015). Achieving the goals of the design required a lot of effort in convincing officials to adapt permits and banks to finance such a long-term business plan which in turn again increased the costs of the building (Bullitt Foundation, 2013). The foundation hopes that showing the fact that such a building is possible will spur other investors to design similar buildings and as a result decrease the costs associated with such ambitious designs (Bullitt Foundation, 2013).

Looking at the determinants which can be found in the building's design the Bullitt Center can be classified into the quadrant of relative static permanence (red hatch in Fig. 8). When considering what will happen at the building's EOL the Bullitt Center is unique in the case studies. First of all, it is designed to last at least 250 years, far more than any other case study. Secondly, it is designed to be accessible and convertible, allowing major maintenance works or new functions to occupy the building. At the EOL the Bullitt Center is still a design which is aimed at longevity and durability (blue hatch in Fig. 8).

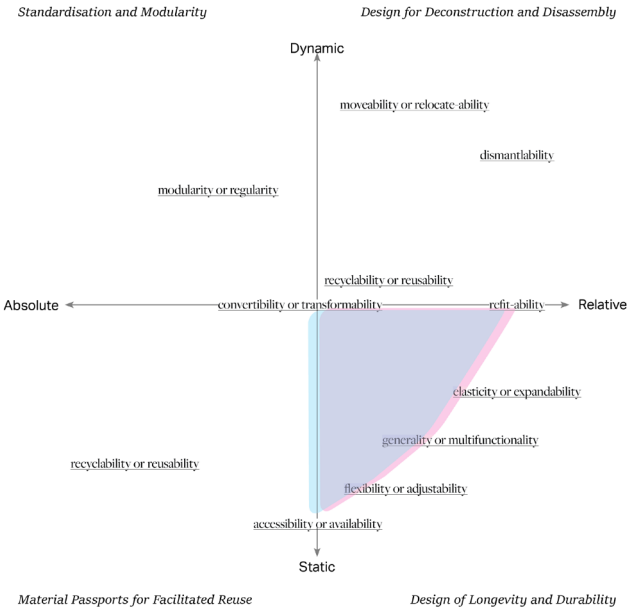

Figure 8 The Bullitt Center permanence graph

4.2 Temporary Courthouse Amsterdam

The Temporary Courthouse Amsterdam by Cepezed (Fig. 9) was designed to be an interim courthouse while part of the old complex was being renovated. The interesting thing about the project was that, from the beginning, all parties involved already knew that the interim building would only be in use for five years after which it would be removed. Being built in 2016, the building does not exist anymore and most of it has been moved to Enschede to be reassembled and rebuilt as an office and research facility.

Figure 9 Temporary Courthouse Amsterdam

The design by Cepezed is completely dismountable and re-constructable (Cepezed, n.d.). The building has also already proved that it contains every determinant associated with the design for deconstruction and disassembly strategy. The building has been *dismantled* (Fig. 10) and is being *moved or relocated* (Fig. 11 & Fig. 12) to Enschede. It will be *converted* into a new function and most of the materials will be *reused* in the Enschede project or other construction sites, and a minimal amount will be *recycled* in a high-quality manner (Cepezed, 2021).

Figure 10 Dismantling of Temporary Courthouse Amsterdam

Figure 11 Moved elements Temporary Courthouse Amsterdam

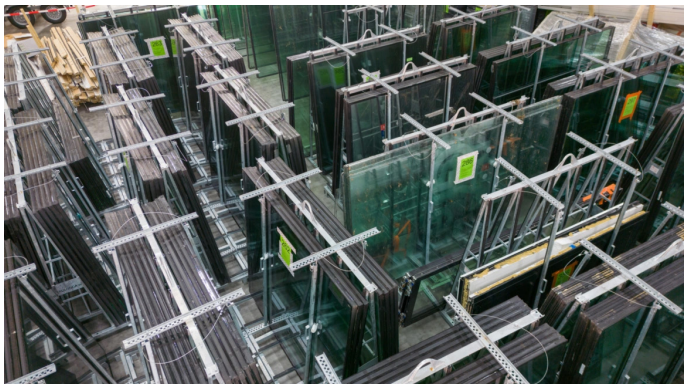

Figure 12 Moved glass elements Temporary Courthouse Amsterdam

Consequently the Temporary Courthouse Amsterdam as well as the office and research facility in Enschede under construction position themselves in the relative dynamic permanence quadrant. Even though the building has also proven to have the multifunctional determinant it mainly has the determinants of design for deconstruction and disassembly (red hatch in Fig. 13). After the building's EOL the building is designed to be dismounted and relocated for the most part, the minority that cannot be reused will be recycled, in the EOL phase the building is in the relative dynamic permanence quadrant (blue hatch in Fig. 13).

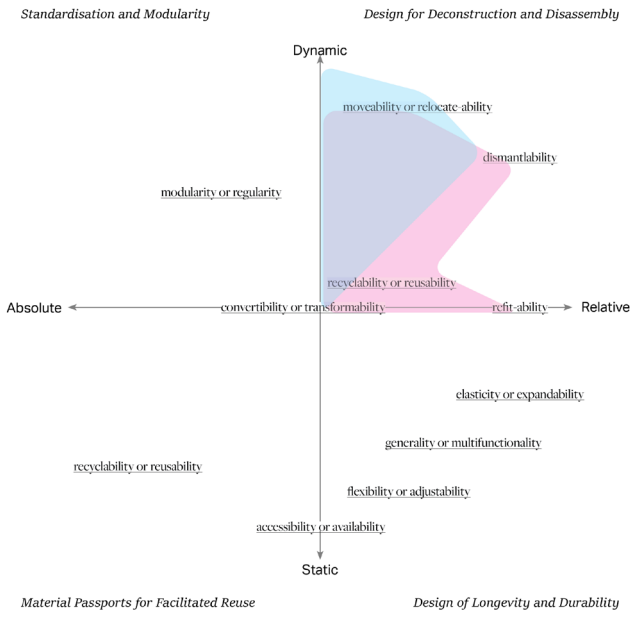

Figure 13 Temporary Courthouse Amsterdam permanence graph

4.3 The NEST Toolkit

The NEST Toolkit developed by Brooks + Scarpa Architects together with Plant Prefab was initially designed in 2019 to address Los Angeles' shortage of supportive housing for the homeless community (Brooks and Scarpa Architects, n.d.).

It is explicitly described as a kit of parts and not a 'home model', as can be seen in Figure 14 the kit offers different options to compose a unit which assembles into a larger structure fit for the specific site. This kit is also being further developed by Plant Prefab to not only cater towards the homeless community but to different types of housing needs, as can be seen on their website (Plant Prefab, n.d.-b). The toolkit is *modular*, all kit parts are of the same dimensions adding to its customisability (Fig. 14). The toolkit is both *adjustable* to its environment and *expandable* in size thanks to the uniform base size (Fig. 15). Spaces can also be designed to operate without direct utility connections (Plant Prefab, n.d.-a) which makes the units *moveable* and *dismantlable* to facilitate temporary use and the ability to be set up in a different location after its first EOL.

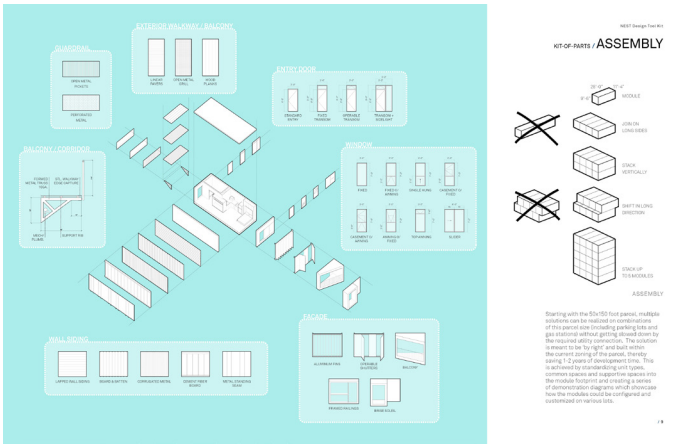

Figure 14 Customisability Nest Toolkit

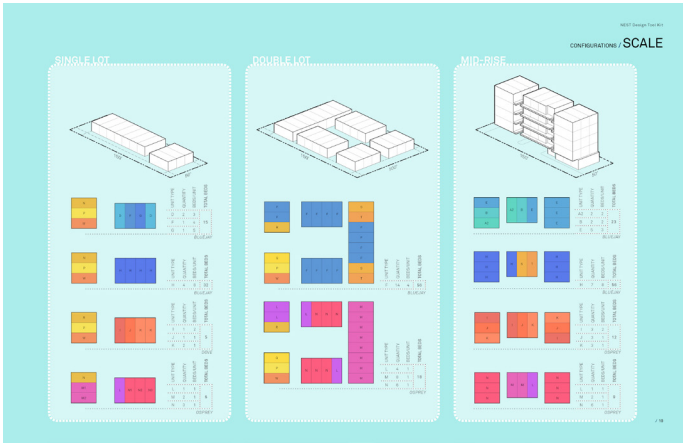

Figure 15 Modules Nest Toolkit

The NEST Toolkit is a standardisation and modularity strategy with certain elements of design for flexibility which would put it in the quadrant of absolute dynamic permanence during its design, production, and service life (red hatch in Fig. 16). However when the building reaches EOL is can be dismantled and relocated or certain elements can be reused, this puts the building in the quadrant of relative dynamic permanence in this phase (blue hatch in Fig. 16).

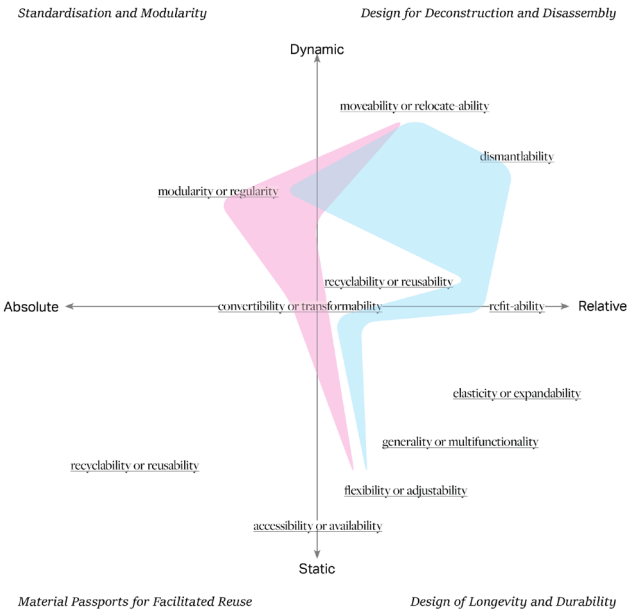

Figure 16 Nest Toolkit permanence graph

4.4 The New Office Building

The New Office Building designed by Kada Wittfeld Architektur was built in 2017 for the RAG Group on the Zeche Zollverein UNESCO world heritage site (Fig. 17). The project was based on the Cradle to Cradle concept and was also designed as a pilot project for BAMB (Kada Wittfeld Architektur, n.d.).

Figure 17 The New Office Building

The façade (Fig. 18) is zero-waste, which means that it can be completely *recycled*, the C2C concept also means that it should be possible for all materials used in the construction of this building to be fed back into the natural or technical cycle when the building reaches the end of its lifespan (Schüco, n.d.).

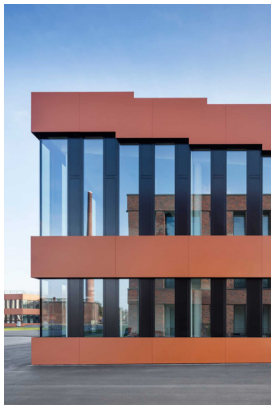

Figure 18 Façade of The New Office Building

To facilitate the *reuse* or *recycling* of the materials a material passport is used (BAMB, 2019b). It is a detailed documentation of all materials integrated into the building (Fig. 19) including information about their material health, recyclability, reuse potential, recycling potential, and resource value potential (Fig. 20) (BAMB, 2019b).

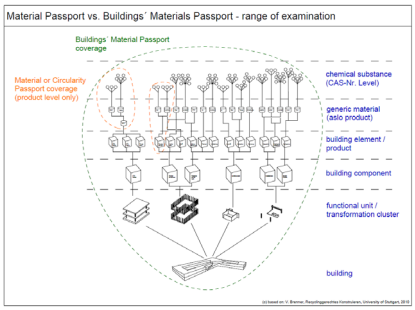

Figure 19 Material Passport documentation of all materials in The New Office Building

This tool will allow the materials of the building to be *relocated, reused, converted, or recycled* when the building's lifespan ends. This concept makes it interesting in terms of its position in the contemporary context of permanence.

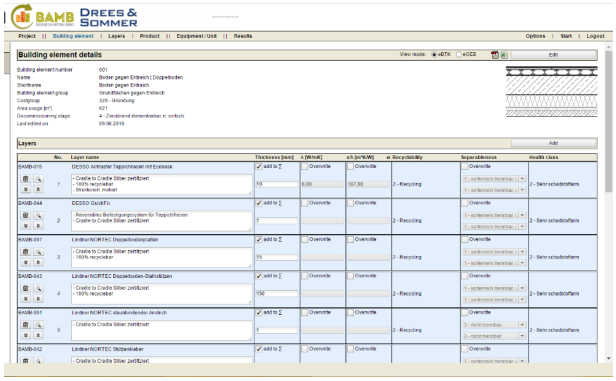

Figure 20 Material Passport circular use information The New Office Building

The concept of material passports falls into the quadrant of absolute static permanence, and thus so is The New Office Building which is designed with this concept in mind (red hatch in Fig. 21). However, when it comes to the building's EOL the materials are made to be extracted or dismounted and then reused or recycled, at this point the building falls into the quadrant of relative dynamic permanence (blue hatch in Fig. 21).

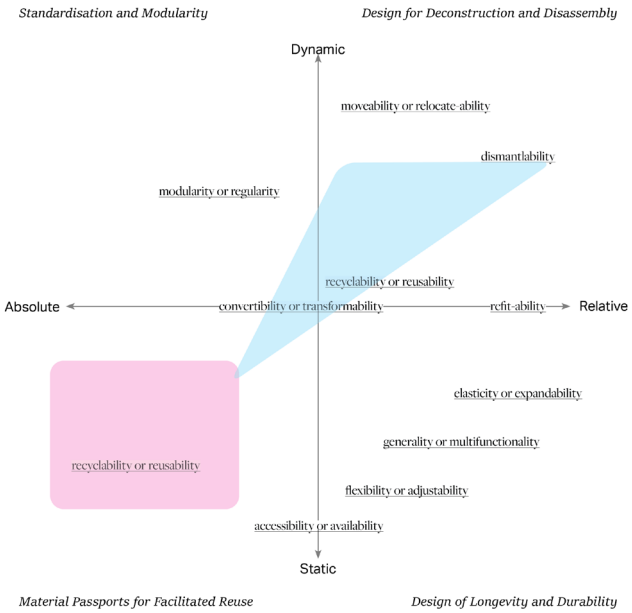

Figure 21 The New Office Building permanence graph

4.5 Ise Jingu

In the case of the Ise Jingu (Fig. 22), a Grand Shrine located in Ise, Japan, it is more difficult to determine where it falls within the realms and modes of permanence. The Shrine which is mainly built using massive Japanese cypress is disassembled every twenty years after which a replica is constructed on an adjacent lot using new materials but with the same traditional building techniques during the Shiniken Sengu ceremony (Jingushicho, n.d.).

Figure 22 Ise Jingu

The 30 rituals needed to build the new divine palace have been performed since 690 AD (Jingushicho, n.d.) and serve two purposes. The first one is to preserve the Shrine as a symbol of divine prestige and eternity and the second one is to preserve the traditional building techniques (Fig. 23) used in the Shrine's architecture by passing down the knowledge to new generations through the need of rebuilding every two decades (Reynolds, 2001). The only element that is brought over from the old site when the new one is built is the Holy Mirror (Jingushicho, n.d.). According to the Japan National Tourism Organisation (n.d.), the timber removed from the old Shrine is not reused in the building of the new Shrine but distributed to other shines across Japan where they are reused to repair damages most often caused by earthquakes.

Figure 23 One of the Shiniken Sengu ceremonies to build the Ise Jingu

The interesting thing about this case is that there is on the one hand reuse and dismantling of the old Shrine and the other hand the absolute continued existence of the Shrine in shape and idea while the materials used for the new Shrine are the same in type and processed using the same technique but newly sourced. The shrine itself also slightly changes in location. This is where the differentiation of service life and EOL comes into play again. The Grand Shrine's service life symbolises an idea that is forever present in the community of Ise or even the Japanese society in general which suggests an absolute static permanence (red hatch in Fig. 24). After twenty years, when the building reaches EOL the material used is dismounted and reused, which positions the Ise Jingu in the relative dynamic permanence quadrant (blue hatch in Fig. 24).

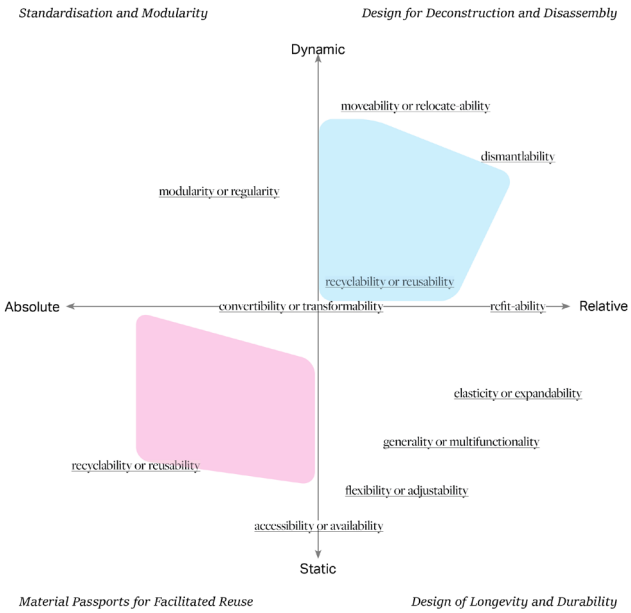

Figure 24 Ise Jingu permanence graph

5 The permanence of adaptable and circular design

To further understand the position of adaptable and circular building design in the discussion surrounding permanence, past publications by Alois Riegl (1903/1982), Edward Ford (1997), Luis Fernández-Galiano (1997), and Katrina Touw (2006) on permanence in the built environment will be discussed. These will be related to the case studies, which are deliberately chosen from buildings built in the past decade to evaluate recent developments.

Touw (2006) has described how the concept has evolved from the Vitruvian *firmitas* to her contemporary understanding of permanence. The term coined by Vitruvius in the first century BC in his *Ten Books on Architecture* provoked a notion that architecture can achieve absolute permanence by ways of material durability. Some current interpretations of his writings comment that Vitruvius did not plead for absolute permanence in every part of the building, only in the structure (Touw, 2006).

5.1 PERMANENCE PAST END-OF-LIFE

Nevertheless the romantic idea of everlasting structures caught on. Edward Ford addresses the "illusion" that is the absolute permanence of buildings in his essay *Theory and Practice of Impermanence: The Illusion of Durability* (1997). He observes a similarity between Eastern ideology in which form is not considered to be permanent, as it is portrayed by the Ise Grand Shrine; and Western Modernism in which "neither concepts nor forms are permanent, and that both are perhaps disposable." (Ford, 1997, p.3). Ford realised that the poor maintenance of modern architecture, which led to the rapid decay of many modernist buildings, was often a result of the fact that the concept of the design was not valued by its eventual users.
It is thus important that the design of a building is dictated by the needs of the end-user or by what they value. If this is not the case, users will not value the continued existence of the building and will not maintain it (Brand, 1994). When the building stops being maintained it reaches its EOL stage much faster (Brand, 1994) this is depicted in Figure 25.

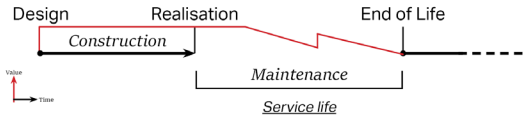

Figure 25 Non-adaptable and circular building value over time graph

On the contrary, if the users' values are reflected in the design the users will cherish the building and put in the effort to maintain it (Brand, 1994). This will extend the building's service life (Brand, 1994), as can be seen in Figure 26.

Figure 26 Adaptable and circular building value over time graph

Brand proposed for designers to use scenario planning as a strategy to be able to adapt to changing end-user needs (1994). This strategy will avoid rapid failure of a building and can extend the building's service life. However, it is difficult to predict the needs of future users to guarantee extended service life (Brand, 1994). Thus, in addition to prolonging service life, it is just as important to think about the building's EOL. If the building's EOL is not planned, buildings easily end up being vacant, falling into obsolescence, and being demolished producing useless demolition waste (Graham, 2005) as represented in Figure 27.

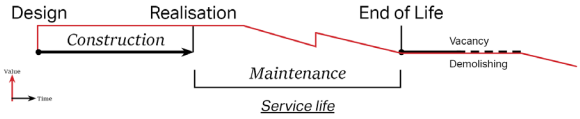

Figure 27 Failed building's value over time graph

One could argue that it is just as difficult to predict what will happen with a building after EOL making planning for it not worthwhile. The case studies proved otherwise, all the buildings were designed with an EOL strategy (blue hatches in their permanence evaluation). The designers determined what will happen with the building after EOL and designed it to enable these processes.

Thinking about what happens with the material after the building's life span guarantees its continued existence be it in a maintained, recycled, reused, or repurposed form. The buildings in the case studies were designed to be maintained, reused, recycled, or repurposed. This means that the building keeps an inherent value at its EOL which can be taken

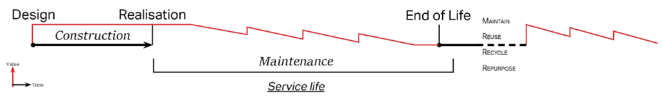

Figure 28 Building that used CB-strategies value over time graph

advantage of (Fig. 28). This strategy is already proven to work by the Temporary Courthouse by CEPEZED which is already being reused in Enschede. The Bullitt Center has also started generating positive cash flow providing more arguments for financial institutions to fund similar projects (Bullitt Foundation, 2013).

In he case studies the building itself has a clear lifespan, which allows designers to plan what happens to the used materials afterwards, making it by definition relatively permanent. Only in the case of the Bullitt Center, one could argue that the roles are reversed where the building itself is made to last a long time (more than 250 years) and the materials made to be able to be repaired or exchanged, nevertheless they each find themselves in a different realm of permanence. The similarity with the other case studies is that to achieve this seemingly absolute permanence in lifespan by giving the building inherent value at EOL, the architects also needed to come up with a plan for the EOL phase which can be carried out in the unpredictable future.

5.2 VALUE

In the same issue of the Harvard Design Magazine of fall 1997 where Edward Ford published *The Theory of Practice and Impermanence*, Luis Fernández-Galiano published *"It's the economy, stupid!"* in which he addresses Architecture and the Symbolic Economy. Galiano blames the confusion between material and symbolic economy for the inaccurate perception of the absolute permanence in buildings which was observed by Ford in 1997. Galiano argues that the diminishing value contemporary society places on permanence is a result of the fact that it values the symbolic more than the material. Which is in itself distorted because the symbolic economy is significantly smaller than the material economy. This is also the fact in the building industry, the amount of housing, offices, and industrial buildings in the buildings stock substantially outweighs the number of monuments or icons. Nevertheless, Galiano recognises that the symbolic can stimulate the material when what is determined to be symbolic influences the value people recognise in the material. This shift to a different definition of value is recognisable in the case studies. The architects held onto values related to adaptability and circularity which led to the design choices. One could argue that these projects serve a symbolic purpose in the transition to adaptable and circular design. In many of the projects the architects also recognise the symbolic value their novel design approach can have to spur similar designs. Miller Hull Partnership highlight this effort to be bold and lead by example in their description of the Bullitt Center (Miller Hull Partnership, n.d.). The shift is also reflected in the topics of recent exhibitions which highlight the efforts in working towards a sustainable future. Such as the two recent Venice Biennales of Architecture, all the International Architecture Biennales Rotterdam of the past decade, the 2022 Floriade Expo in Almere, and almost all the World Expos in the last two decades. The trend can also be seen in political initiatives like the New European Bauhaus. The initiative was launched by the EU in 2020 to inspire a movement valuing sustainability, aesthetics, and inclusion (European Union, n.d.). The definition of the symbols may be slowly shifting towards one that values sustainable development. One could identify this new value that prioritises the impact and relationship one has on others and their surroundings as ecological value.

Having established the influence of society's values on the built environment, it is important to understand the values people have for buildings and how that is changing. Not only because that influences what is built but also because it is reflected in their understanding of permanence. For example, Roman architecture reflects the Vitruvian permanence and the Ise Grand Shrine reflects how the Eastern ideology accepts the temporality of material. When trying to identify how modern appreciation of monuments has altered Alois Riegl (1903/1982) introduces three main categories of works which were already being distinguished in the late eighteenth century: intentional, historical, and age-value. In the appreciation for historical value, Riegl identifies that people value what the structure meant in its time of building and wish to preserve it in its original state. One would try to battle natural decay to achieve absolute permanence. The Parthenon, for instance, is valued for what it was in its time and what it meant for Greek architecture, people visit the ruins which have undergone many repairs and often refer to the illustrations of what it looked like shortly after it was built and not in a state of decay. Historical value stands in contrast to age value which appreciates the patina inflicted by time. The third category, intentional value, is attributed to iconography or inscription. Riegl observes that society has progressed from this absolute and objective valuation to a more relative way of valuation in which people have an affinity for newness value, these are objects showing no signs of decay. He also recognises that at the beginning of the 20th century, there is again a rising appreciation for age value but only to the extent that it does not conflict with use value, meaning its practical functionality. At the beginning of the 21st century

age value became even more popular and led to the rise of facadism where the fronts of old buildings are kept while the rest is demolished to make way for a modern structure. Touw (2006) identified this increasing appreciation for age value and adds a new value to the list: contrast value. Contrast value is achieved by combining newness value (the new structure) with age value or historical value (the old façade, preserved or restored).

With the increased appreciation for ecological value, contrast value could now also be associated with adaptive reuse projects. Ecological value may also change the context of use value, people may become to tolerate certain impracticalities if they value ecology above use. Ecological value can also be a new factor leading to new solutions, for instance, ecological value combined with newness value produces new buildings that are centred around adaptable and circular design using modern technologies. Ecological value combined with age value may increase the appreciation for reused materials which show minor signs of wear.

5.3 How permanence teaches history and architecture

If the building is planned to be adapted to new uses the building's history will be visible under the new parts or in the parts left untouched. If the materials are dismounted and reused in a different building the signs of wear will tell its history, only in a different location. In a sense, this is the essence of Stewart Brand's discourse in How Buildings Learn (1994). Buildings adapt and the adaptation allows the building to remain in use and tell its history. Consequently, adaptable and circular design for the building's end-of-life prolongs the existence of it or parts of it. Extending the building's life will allow it to tell the history of itself and of the people who use them (Patricia Waddy, 1990). Brand (1994) suggests that buildings adapt best when constantly refined and reshaped by their occupants. According to him, architects can become better by evolving from artists of space into artists of time. This means that instead of designing buildings as static objects, architects should consider how buildings will change and evolve. By embracing this approach, buildings can continue to serve their communities while also preserving their history and character.

6 Conclusion

The misguided idea of permanence in architecture has proven to be an illusion (Brand, 1994; Ford, 1997). Buildings are subject to mutations and change to satisfy the needs of users. These adaptations are happening more frequently in our transient society. The high turnover rate of the building industry, fuelled by technological advancements, money, and fashion produces too much construction and demolition waste for it to be a sustainable practice. Present-day solutions such as the adaptive and circular design of buildings strive to enable frequent changes in buildings and the built environment. This challenges the idea of permanence in architecture, a concept that people profoundly believe in (Ford, 1997).

Touw revisited the definition of permanence in our contemporary society and redefined it in two realms and two modes: absolute/relative + static/dynamic permanence (Fig. 2). Absolute permanence denies eventual material deterioration and sees the subject as something that can exist for an indefinite amount of time independent of entropy. Relative permanence considers material to be able to exist for an indefinite amount of time, but eventual deterioration is accepted. Static permanence produces stability and continuity as a result while dynamic permanence is flexible in both location and function.

Adaptable and circular building design strategies established over the past years (Design of Longevity and Durability, Design for Deconstruction and Disassembly, Standardisation and Modularity, and Material passports for facilitated reuse) and their determinants were positioned within the new definitions of permanence (Fig. 3). This formed a framework to evaluate five case studies (The Bullitt Center, the Temporary Courthouse Amsterdam, the NEST Toolkit, the New Office Building, and the Ise Grand Shrine) that were designed with adaptable and circular design characteristics.

The evaluation of the case studies on their adaptability and circularity together with their position in the new realms and modes of permanence provided results which could be discussed further. These results were then explored in the context of theories on how permanence has changed over time in the built environment written by Alois Riegl, Edward Ford, Luis Fernández-Galiano, and Katrina Touw.

The idea of absolute permanence was challenged, and it is argued that the design of a building should be dictated by the needs and values of its end-users. Scenario planning is proposed as a strategy to adapt to changing needs and prolong a building's service life. Additionally, it is important to consider a building's end-of-life (EOL) and design for its reuse, recycling, or repurposing. The case studies demonstrate the success of designing for EOL, as the buildings retain inherent value and can be repurposed after their lifespan.

In conclusion, by thinking about the inherent value of the building at its end-of-life whether it be to maintain, reuse, recycle, or repurpose, the stakeholders involved in the design process actively engage in achieving permanence. This can be the building in its entirety, its elements, or the raw materials used. By not engaging in that discussion we are undermining it, which leads to buildings becoming disposable, forgotten, and in the end, demolished. When no more inherent value can be extracted from the building, its life in the field of permanence ends. So by thinking about a building's end-of-life and planning for its end-of-life we are not actively undermining the permanence of our built environment but enabling it.

Figure list

Figure 15	From Brooks and Scarpa Architects. (n.d.). *Brooks + Scarpa - NEST Toolkit*. Brooksscarpa. Retrieved March 23, 2023, from https://cdn.myportfolio.com/4463c9937613d0935c67240351d53354/a488125f-eac5-4ea0-9209-f20b6f9a72f6_rw_3840.jpg?h=e28ac4c3b37d4a0a458278c886ae174d
Figure 16	Own work
Figure 17	From Kada Wittfeld Architektur. (n.d.). *RAG-Stiftung and RAG AG Zollverein	kadawittfeldarchitektur*. Kadawittfeldarchitektur. Retrieved March 23, 2023, from https://www.kadawittfeldarchitektur.de/wp-content/uploads/2019/01/RAG_Parkhaus_BENNER_002_Nikolai-Benner-1350x900.jpg
Figure 18	From Kada Wittfeld Architektur. (n.d.). *RAG-Stiftung and RAG AG Zollverein	kadawittfeldarchitektur*. Kadawittfeldarchitektur. Retrieved March 23, 2023, from https://www.kadawittfeldarchitektur.de/wp-content/uploads/2019/01/RAG_220_jk070118_JensKirchner-1350x2025.jpg
Figure 19	From BAMB. (2019b, March 13). *New Office Building - BAMB*. Retrieved March 23, 2023, from https://www.bamb2020.eu/wp-content/uploads/2016/03/nob_2.png
Figure 20	From BAMB. (2019b, March 13). *New Office Building - BAMB*. Retrieved March 23, 2023, from https://www.bamb2020.eu/wp-content/uploads/2017/09/figure2_screenshot_tool.png
Figure 21	Own work
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Figure 27	Own work
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