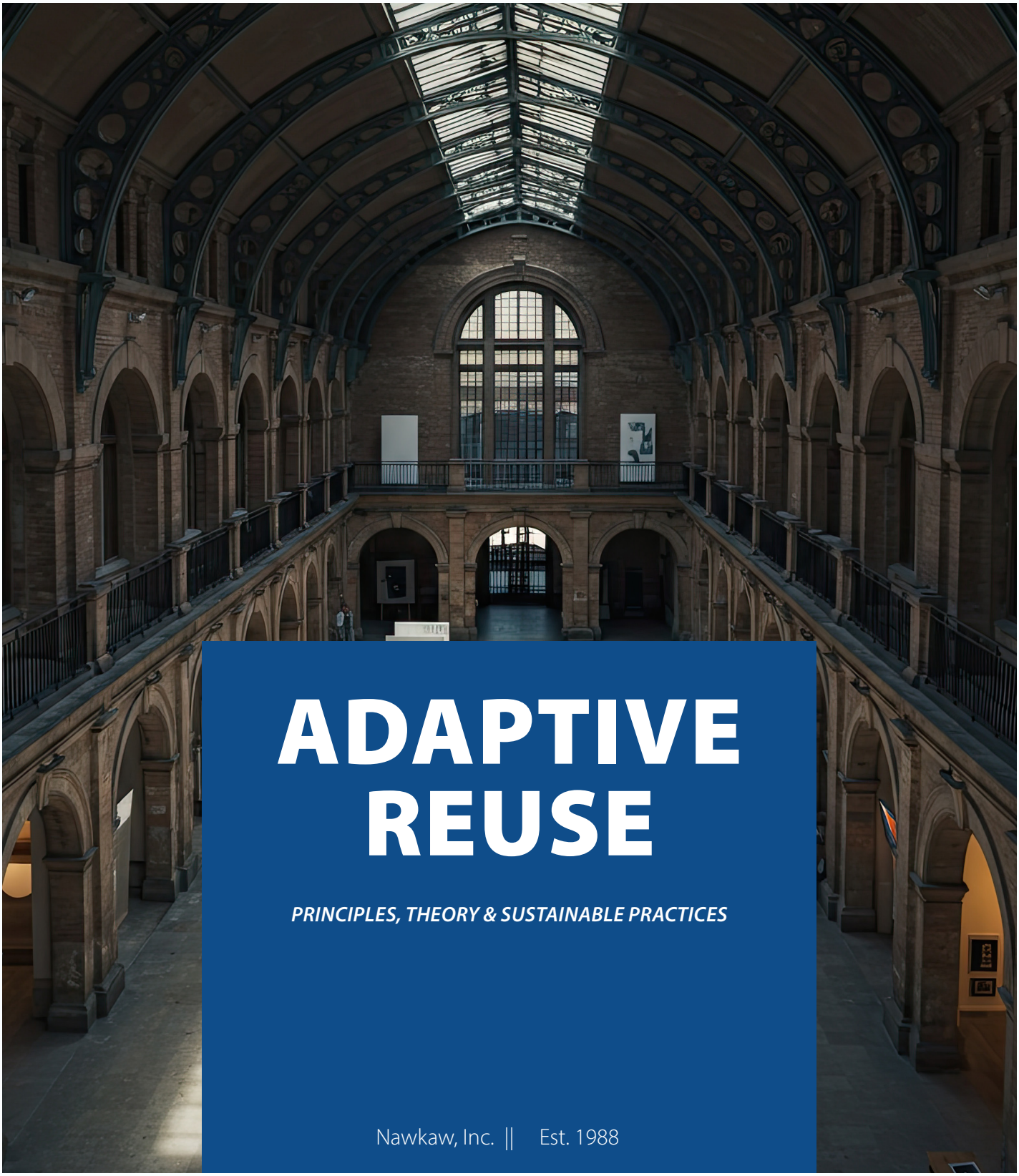

# ADAPTIVE REUSE

*PRINCIPLES, THEORY & SUSTAINABLE PRACTICES*

Nawkaw, Inc. || Est. 1988


**Phone**

1 (866) 462 - 9529

info@nawkaw.com

**Address**

170 Whitetail Way

Bogart, GA 30622

# What is Adaptive Reuse?

## Despite the best intentions of designers and engineers to create livable structures that last lifetimes, building obsolescence is inevitable.

Foot traffic and heavy furniture take a toll on internal load-bearing structures while the elements pound on a building's exterior. Maintenance may extend a building's lifespan years or even decades, but more profound solutions must be sought to keep a structure around for generations.

Other structures may be in good condition but have been rendered economically inviable due to cultural and social progress. American textile mills, equestrian facilities, and similar structures may fall into this category.

The idea of preservation and restoration of historic properties is no nascent art. Still, the concept of adaptive reuse has only recently been seen as a viable solution for properties which no longer need to serve their original function.

Adaptive reuse preserves a structure while changing its function, as well as adding the necessary infrastructure to keep the building functioning for decades to come.

In this manner, architects and urban planners can preserve the aspects of constructed history most cherished by local communities—whilst still working to create economically viable spaces that benefit everyone.

Through an exploration of the principles, theory, and sustainable practices surrounding adaptive reuse, we can see why this practice has taken root worldwide and contributed to the creation of equitable infrastructure and living spaces.

## Adaptive reuse at its core is the process of taking a legacy structure and modifying it—reshaping it as necessary to create a building, structure, and space with a different purpose than the original.

Adaptive reuse is most compared to preservative and restorative techniques that have been in use for far longer and are often misattributed to adaptive reuse projects. Therefore, it is necessary to clearly define the similarities and differences between the principles.

# Preservation & Restoration

Preservation, which is sometimes referred to as conservation, is the process of utilizing original materials and replication to bring a structure back to its original form.

Similar to (but not the same as) preservation is restoration, which is the process of utilizing new materials and construction methodologies to ensure structures operate as originally intended through more contemporary and efficient means.

Adaptive reuse projects may utilize aspects of preservation and restoration, but it's end result is fundamentally different—as adaptive reuse projects aim to change the intended function of a structure to better meet the needs of the surrounding population.

Projects based upon the principles of adaptive reuse are often seen in downtown corridors or within larger neighborhood revitalization projects. Specific to the United States, adaptive reuse projects have been positioned as possible solutions to rising building vacancy rates.[1] In many cases, these vacant structures are legacy buildings which no longer meet energy codes but are otherwise suitable for use.[2]

While some development projects call for razing vacant legacy structures to make way for new construction, adaptive reuse offers designers the ability to preserve these structures, maintain the character and culture of a region, and reduce vacancy rates.

This is all accomplished while contributing to a more circular economy and maintaining more sustainable construction practices.

First developed by Hugo Chan at the University of Sydney, the five principles of adaptive reuse highlight the themes of architecture utilized in most adaptive reuse projects.[3] Consider these principles as tenets of adaptive reuse projects that are utilized various ways and to varying degrees.

# The Five Principles

**Integrity** deals with an architect's approach to a project—examining the condition of the existing fabric, and considering which aspects of a structure may be retained, and which may be removed.

**Memory** involves the recognition of the sociocultural significance of a structure. Architects acknowledge the emotional attachment residents of a community have with the structure before beginning work.

**Authenticity** is when architects express abstraction and interpretation of the original building, avoiding mimicry and replication of similar projects, and creating a wholly unique structure unlike any before it—including the original building.

**Flexibility** involves embracing the inevitable functional change of the structure not just from its preceding use, but towards its future succeeding use. In short, this theme highlights the functional essence of adaptive reuse by challenging designers to create future-proof designs.

| Integrity | Memory | Authenticity | Flexibility |
| --- | --- | --- | --- |

**Sustainability,** the final theme, involves breaking the cycle of demolition and reconstruction through the use of sustainable ancillary materials as well as responsible design to meet current (and potential future) performance standards.

## Sustainability

# Adaptive Reuse Theory

Taking a step back in time for a moment, we can see that adaptive reuse as well as restorative property work has its roots based in a post-industrial mindset and the ever-changing relationship we have with our creations.

The earliest known examples of adaptive reuse can be found in France during the 18th century, involving the adaptation of religious structures for industrial and military use. However, it is worth noting that these adaptations were perceived by the French government at the time as purely functional. As such, this example alongside many others in the early-to-mid 18th century are seen as existing beyond the five principles of adaptive reuse.[4]

In the United States, preservative actions can be seen as early as a few decades after the country's founding, as the City of Philadelphia made moves to purchase Independence Hall to prevent an untimely demolition.[5]

However, on a global scale, the ever-growing demand for innovation and advancement superseded any real progress in restorative and preservative movements until the late 19th century.

**On the brink of the 20th century, two schools of thought that would eventually lead to adaptive reuse as a concept were beginning to take form. Two men founded similar—yet oppositional—views on the preservation of historic structures.**

**Their work would build the foundation for a prolific growth of adaptive reuse over one hundred years later.**

## Conservationism V. Restorationism

**John Ruskin** was an architect best known for The Seven Lamps of Architecture. In this work and throughout his career, Ruskin argued that buildings must maintain their original design and honor the intent of the original architect. In this way, future generations and architects act as conduits of the past, ensuring that a building remain as intended without modernization or alteration.

Ruskin's ideas laid the groundwork for what was to be known as the Conservation Movement. However, a contemporary of his would work from similar roots to come up with a demonstrably different idea.

**Eugène Viollet-le-Duc**, a French architect known for his work Discourses on Architecture, made the argument that buildings should not be perceived through a lens of original intent, but of modern sensibility. His approach was a holistic consideration of a structure, its environment, and it's community in contemporary life.

Viollet-le-Duc believed that architecture was an expression of modern materials, technologies, and functional needs. Buildings should therefore be restored rather than preserved—brought to use for the modern day's needs using the modern day's materials and constructional approach.

**Ruskin's conservationism and Viollet-le-Duc's restorationism would interplay throughout the next century and beyond.**

**However, it was only after two major world wars would the environment be ripe for the proliferation of both ideals, as well as the ideals foundational to adaptive reuse.[4]**

# Post-War Modernization & Changing Minds

Between two global conflicts and a half-century after Ruskin and Viollet-le-Duc's collective work, the international community would lay the groundwork for adaptive reuse with the Athens Charter—the first international document designed to promote modern conservation policy.

The Athen's Charter approached the idea of conservation and restoration as a means to protect isolated structures—not necessarily out of a need to preserve community legacy. Specific and lofty requirements needed to be meet for a building or structure to be protected, which was often reserved for national icons and assets.

However, conservation policy would only grow from this place, and by the 1960s, architects began to show interest in working on historic buildings rather than pursue new construction. Architects of the time write about the latent sense of place inherent in historic properties, and began to approach these structures with a sense of social responsibility to translate original intent into future work.

This approach naturally gave way to the idea of adaptive reuse as architects continued to advance towards the translation of former meaning to newer structures with newer uses.

> *"It is through an understanding and interpretation of the spirit of place and the particular contextual setting within which a building exists that the designer or architect can heighten, change and reactivate a space. An existing structure is bound to its setting; it has certain qualities that are unique only to that particular situation. The designer can analyse [sic] and use these found qualities as the starting point or basis for the next layer of construction."*
>
> Booker, G and Stone, S. "Context+Environment" [4]

# The Issue of Ordinance

Today, a boom in adaptive reuse work is limited solely by an antiquated approach to zoning and ordinance work. This is a problem with particular severity in the United States.

Most modern land use and rezoning regulations do not consider their application to historic properties, and thus mandate difficult or impossible-to-meet standards for older buildings. The standards which often result in highest number of difficulties for adaptive reuse projects in the United States involve parking requirements.

Thankfully, the issue of ordinance is slowly being resolved as local municipalities work towards preserving their downtown corridors and legacy structures through the adoption of historic property ordinances.

The best example of historic property ordinances in action are the 1999 Los Angeles adaptive reuse ordinances, which revitalized the city's downtown corridor and gave those in the surrounding area the ability to embrace the history of Los Angeles first-hand.[6]

Aside from Los Angeles, the following cities and states in the United States have adopted some form of existing building code or rehabilitation code designed to ease regulatory strain on adaptive reuse projects:[7]

**Massachusetts | New Jersey | Maryland Minnesota | New York | Rhode Island**
**Kansas City, Missouri | Wichita, Kansas | Wilmington, Delaware**

# Sustainability in Adaptive Reuse

## Adaptive reuse projects are often praised for their sustainability through the preservation of existing structures.

Sustainability is a complex pursuit which requires interdisciplinary collaboration. However, in the realm of architecture, sustainability in adaptive reuse comes down to commonly used materials such as concrete and masonry, as well as a wholistic approach to carbon mindfulness, provided in large part through associative resources.

Adaptive reuse projects are inherently sustainable— avoiding the use of carbon-emitting processes such as the creation of virgin concrete or new masonry.

However, developments in concrete and masonry design have made marked improvements to the environmental impact of new construction that may be of use to architects and designers when working on adaptive reuse projects.

In concrete, portland cement is the primary carbon emitter in the concrete production process, and new developments are currently working to replace portland cement in new production entirely. However, supplementary cementitious materials (SCMs) available today can partially replace portland cement usage in concrete and reduce total emissions by up to 50%.[8]

Recycled demolition materials can also serve as aggregates in the production of new concrete. In studies, concrete produced with 75% recycled aggregates and 5% recycled cement performed strongly during absorption and durability tests.[9]

As for masonry, various tools are available for architects and designers to use older or recycled masonry materials while matching their aesthetic appearance to the rest of the project. Mineral and acrylic stains can make it easier for architects to transform buildings without requiring new masonry to make their design choices.

# AIA 2030 & LEED

Adaptive reuse efforts may be benefited not only through the use of sustainable materials but via association support. The American Institute of Architect's 2030 Commitment (AIA 2030) is perhaps the most visible private-sector example of associative support.

AIA 2030 is designed to facilitate and encourage sustainable architectural design standards to incorporate net-zero construction as an expectation in future products. The commitment does this by supporting architectural firms to ensure carbon neutrality as a design standard by 2030, which will demonstrably reduce carbon emissions in total building construction—responsible for 40% of total human carbon emissions.

Hundreds of firms today are voluntarily reporting their carbon emissions portfolio-wide each year in an effort to remain accountable to net-zero emissions by 2030.

AIA 2030 also offers a variety of resources and networking opportunities to support firms in their adaptive reuse projects, resulting in a portfolio-wide commitment to sustainability.

AIA 2030's impact has already been felt, as carbon emissions in the United States are down 21% since 2005 despite the creation of 47 billion square feet of space in that same time frame.

In the public sector, the U.S. Green Building Council's LEED Program remains the most visible sustainability initiative in the United States. LEED (Leadership in Energy and Environmental Design) certifications span four levels and contribute to the overall industry-wide goal of net-zero carbon emissions.

Specific to adaptive reuse, such structures are heavily encouraged by the U.S. Green Building Council, with several points awarded to projects which utilize pre-existing structures.

Adaptive reuse projects can also use ancillary materials which contribute towards the attainment of LEED credits, such as sustainable insulation, high-quality mineral stain, and other such products.[10]

# Applications of Adaptive Reuse

While adaptive reuse theory maintains a more homogenous implication of the practice at work, real-world examples of adaptive reuse appear far more incongruent.

However, by examining just a few of the many applications of adaptive reuse, we can begin to see Hugo's five themes exemplify themselves in each work and understand how each project impacted the surrounding community.

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## Gas Works Park

Located centrally in Seattle, Washington, just north of the downtown corridor, Gas Works Park is one of the first modern adaptive reuse projects completed in the United States.

Gas Works Park began its life as a gasification plant in 1906, which operated until 1956. The location sat dormant for another eight years before the City of Seattle purchased the land and all assets still remaining from the plant.

Architect Richard Haag redesigned the space—working to preserve large sections of the original plant as a backdrop for a new city park. The land was bioremediated and terraformed to create the green space and trails located in the park today.[11]

# 837 Washington Street

The meatpacking district of New York City has transformed in recent decades thanks in large part to the transformational High Line project[12].

Washington Street maintains its original frontage and extends upward five stories to house the additional commercial space needed for the project. This twisting steel structure evokes the clash of city grids in the area that define the meatpacking district as a whole.

The completed project marries the materiality of new design elements with the existing historic property —giving reverence to the history of the community as well as its future.

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# The Mariners' House

In old Montréal, the expansion of Canada's largest archeological museum, Pointe-à-Callière (PAC), into the Montréal Archaeology and History Complex required the adaptive reuse of a historic building with a lengthy history.


The first building to occupy the space was owned by the Montréal Sailors' Institute, which welcomed merchant sailors until 1953.

The second structure, built in 1954, operated as a men's shelter before falling vacant and being purchased by the museum.

The space was transformed—incorporating a multi-story glass curtain wall and exterior façade embedded into the original masonry. This masonry was then brought into tonal harmony with rest of the renovations using Nawkaw masonry stain[13]. The final structure, named the Mariners' House, showcases how a structure can seamlessly blend old and new materiality to create something wholly unique.

# Ancillary Support of Adaptive Reuse

In the creation of adaptive reuse projects, ancillary support will be needed to ensure that the project's newer elements are not only blended into the original structure, but that the original structure's elements are able to withstand the intended reuse.

Furthermore, as adaptive reuse projects inherently strive for the preservation of an existing structure, and thus sustainability as a whole, a wide range of approaches, products, and services are available to designers to ensure their project contributes to a more circular economy.

In most cases, electricians, plumbers, landscapers HVAC technicians, and similar craft labor must re-work the structure's respective components from the ground up.

Adaptive reuse projects also marry old materiality with contemporary construction processes, which may necessitate the replication of materials that either no longer exist or are no longer suitable in construction.

## Concrete & Masonry Stain

As architects develop and transform legacy structures, the historical use of masonry and modern use of concrete necessitate color and finishing solutions that standard paints simply cannot provide.

In the case of masonry surfaces on old construction, adaptive reuse projects often seek either a full replication of the original color or colors for additional construction or a method of recoloring the original structure precisely to match new materials.

The issue with using paint in these cases is that paint sits on top of porous surfaces such as concrete and masonry–trapping air, dirt, water, and other debris between the surface of the concrete and the paint itself. These imperfections expand over time and often result in chipped or cracked paint.

Stain, conversely, penetrates the underlying surface and forms strong bonds with the porous material. This bond may also be chemical depending upon the stain used, which results in no functional distinction between the stain and the underlying substrate.

This phenomenon means that properly applied mineral stain will not crack or peel on either concrete or masonry. The high quality of pigments used in stain also enables it to retain colors far longer than paint.

## Photocatalytic Finishes

Concrete, masonry, glass, and other surfaces may be coated with a photocatalytic layer which yields air purifying and self-cleaning properties.

Photocatalytically active systems utilize light to activate chemical reactions that decompose pollutants, bacteria, viruses, and other harmful substances to release oxygen–alongside other harmless byproducts.

Studies have shown that photocatalytic finishing systems enable projects to appear newer for longer—protecting concrete against carbonation and enabling structures to reduce maintenance fees, as debris washes away before building up.

For more information specific to Nawkaw's photocatalytic finishing system, NawKote-PC, please see our supplementary white paper on the subject.

# Final Thoughts

Adaptive reuse has a long and unique history across the United States and around the world.

From its nascent development in the 18th century to the foundational movements which helped proliferate the ideals of building sustainably, the future of adaptive reuse seems brighter than ever.

This is thanks in no small part to a cultural and architectural awareness of the fundamental need to protect our planet. Adaptive reuse, within that context, represents only a small element of the global interdisciplinary and interpersonal efforts being undertaken to protect our communities from climate change. These efforts collectively aim to preserve our spaces for generations to come.

Through not only the preservation of our communities, but the protection of our environment, adaptive reuse projects transform the way we see our buildings, structures, and spaces.

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**Phone**

1 (866) 462 - 9529

**Location**

170 Whitetail Way
Bogart, GA 30622