

# MATERIALITY AND THE REIMAGINING OF HISTORIC BUILDINGS

## LEARNING OBJECTIVES

After reading this article, you should be able to:

- + UNDERSTAND how materials contribute to the unique character of existing buildings.
- + DETERMINE the most important aspects of an existing building and how to prioritize these in reuse.
- + EXPLORE strategies to make change in a culturally sensitive and sustainable way.
- + LEARN about particular resources to empower architects, including technical tools and supporting communities.

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**T**hick. Heavy. Delicate. Beautiful. Confident. These intangible qualities emanate from existing buildings, embodied in their unique material palettes, construction, craft, and design. Our firm believes that if you listen carefully, a structure reveals its character. And once you understand, you can transform.

## TRANSFORMATIVE RE-USE

Re-use projects demand a nuanced approach to design to create spaces for today without discarding the value of existing building fabric.

Remnants of paint, patched brickwork, and equipment rails in the lightwell at MASS MoCA's Building 6 in North Adams, Mass., give the new space texture and historic context.



As the climate crisis escalates, finding creative ways to transform these buildings becomes increasingly critical.

Opportunity abounds: There are billions of extant square feet nearing the end of useful life and a near-constant demand for space to accommodate new offices, community spaces, housing, and more. Architects are in a position to make these existing places useful again for the benefit of their communities and the planet.

“Just to preserve and clean up historical buildings is not sufficient,” says Bruner/Cott Principal Jason Forney. “We really must breathe new and creative life into them.” Adapting old buildings to new use and identities is vital to our craft—and materiality is key to these transformations.

### **MATERIALITY IN EXISTING BUILDINGS**

The value and design potential of extant buildings is in many ways rooted in their materiality. In addition to their aesthetic or structural properties, their materials are imbued with meaning related to their use, origin, context, and impact. The sensitive, considered use of materials plays a central role in the successful interpretation and transformation of these buildings, especially if they have historical significance.

**Historic value** – A major aspect of the significance of existing materials is their intrinsic historic value. This may be an association with a noteworthy historical figure, a time period or event, or a particularly fine example of an important style or period in design. The materials are sometimes all that remains of a structure’s former use, time, culture, and context. This connection has cultural value, and its continued existence provides a bridge between the past and present. As early preservationist Wendell Phillips said, regarding the fate of Boston’s Old South Meeting House: “Shall we tear in pieces the roof that actually trembled the words that made us a nation?”<sup>1</sup>

**Authenticity** – There is a sense of authenticity and craft in historic materials that makes them innately appealing. Older materials often reveal the hand of their maker, showing the time, craft, and skill invested in their creation and assembly—think imperfect hand-molded bricks, board-finished concrete, carved stone blocks, or hewn beams with mortise-and-tenon joinery. Even if the average passerby doesn’t know why, they feel the mystique of these materials.

**Time and place** – These materials are also a

product of the resources and technology available at the time and place of their construction. This lends an innate sense of “belonging-ness,” as the materials often reflect the local landscape, region, and vernacular (for example, local stone used in masonry construction).

Through research on biophilic design principles conducted by Stephen Kellert and others, we know that this sense of place is an important aspect of creating positive spaces for people.<sup>2</sup>

Original craftspeople often knew their local materials in a way we have largely lost—how to cut and lay the hardest stone for the foundation, or the most rot- and pest-resistant wood species. When considering new materials for a re-use project, it is important to think about how they reflect context and the technological capabilities of today.

**Patina** – A related characteristic of historic materials is patina—the physical signs of use and change over time. Wear marks in an original limestone stairtread show the imprint of those that have come before. Water-stained timbers or charring from a past fire tell the story of the building without words. These significant indicators of the passage of time are valuable reminders that our current context is part of the greater arc of time.

**Rarity** – Original materials are singular specimens that simply cannot be recreated. We may lack the skilled labor, natural resources, or financial means to make a faithful reproduction, and new material will lack the patina and authentic associations of the original. It may also be the case that the process of making a historic material is no longer acceptable from a health, sustainability, or human rights perspective; for example, lead plumbing soldering, or materials made on the basis of slave labor. When recreating existing material is impossible, the original becomes all the more valuable.

**Sustainability** – Carl Elefante, AIA, famously said: “The greenest building is one that is already built.”<sup>3</sup> Existing buildings represent significant embodied material, energy, and carbon; any re-use should take this “sunk” value into careful consideration.

Another crucial value is longevity. “Older buildings have already proven their durability,” says engineer and preservation specialist Matthew Bronski, Principal with Simpson Gumpertz & Heger. “If we can keep buildings going for hundreds of years and keep them out of the



BRUNER/COTT ARCHITECTS (BEFORE)



**New black-framed windows at the renovated Swift Factory in Hartford, Conn., present a more welcoming aspect to the surrounding neighborhood.**

landfill, that's a good thing, and should inform our material recommendations in design."

**Contrast** – Part of the unique design opportunity of existing buildings is the contrast between new and old. Their material duality allows for added design interest, both in juxtaposing new and old materials (for instance, patinated brick against modern steel and glass), and in carving new spaces and programs out of the fabric of original materials. This crossover is a source of richness in re-use work. "There is something magical about old buildings," says Forney. "And the contrast between old and new makes this magic felt more intensely."

### PROCESS

Though all historic buildings are different, the essential materials considerations are the same for each. A thoughtful approach generally includes these steps:

- Identify basic characteristics, requirements, and constraints of the building
- Assess the building materials' condition, value, and meaning

- Interpret what you've learned about what's important to the unique identity of the building
- Intervene with a new design that bridges the existing building and its new use.

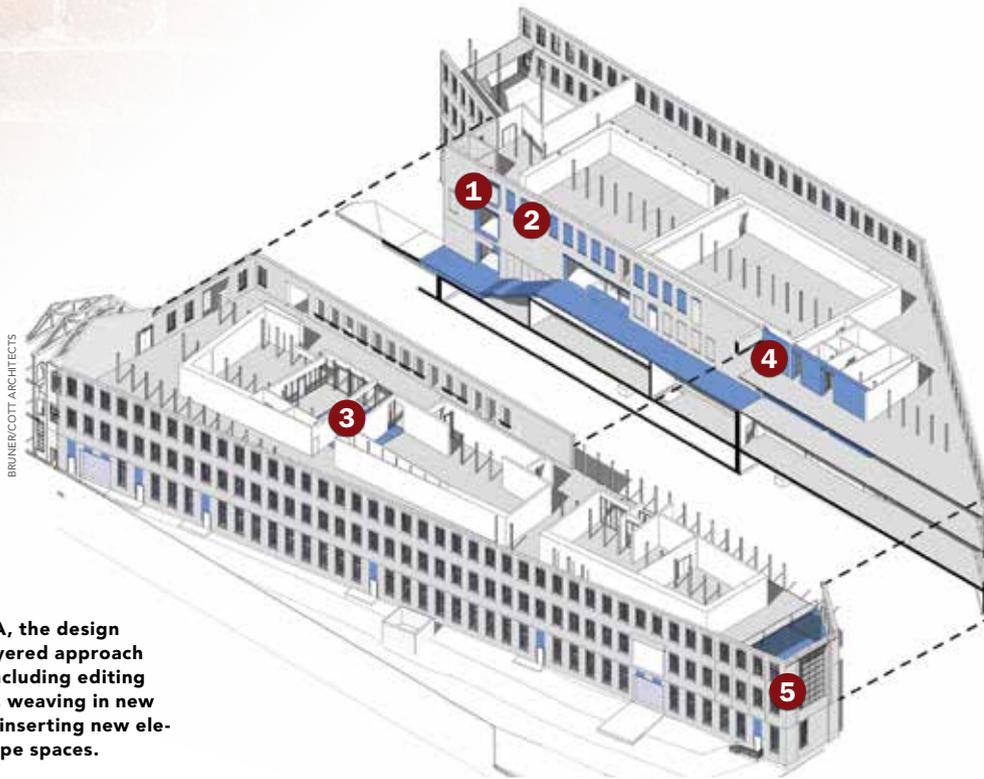
### IDENTIFY + DECODE

The first step is to identify the basic characteristics of the building: type, location, age, and use. The design team should take thorough stock of the materials, paying close attention to potential issues common to the particular building typology. This is also the time to determine the proposed program, project timeline, budget, potential material sourcing, and site or region-specific design constraints. Think of this identification stage as the scaffolding on which to build a comprehensive picture of the building as it is—what do we have, what do we know, and what is still to be determined?

### ASSESS + RESEARCH

From this framework, the team can begin to build a full "character sketch" of the building that includes both its physical characteristics and cultural meaning. A well-researched "character sketch" allows you to measure potential design ideas against how well they preserve, enhance, or transform the essential quality of the place.

**Integrity + Quality** – Take stock of the existing materials. What condition are they in? What is intact, what may need repair, what must be replaced or demolished? Also look for the root causes of material damage or degradation. Common causes



## EDITING

Modifying the shell of the existing building – opening up, filling in, restoring.

- 1 Openings in brick wall
- 2 Brick or masonry infill
- 3 Floor infill
- 4 Brick wall continuation
- 5 Floor removal



At MASS MoCA, the design team took a layered approach to materials, including editing existing fabric, weaving in new materials, and inserting new elements to reshape spaces.

are lack of maintenance, inappropriate material use, or water infiltration resulting in cracking, spalling, or interior finish damage. Interventions should address these issues to prevent further damage and avoid introducing new weaknesses for future failures.

**Human and environmental health** – A thorough health and safety assessment should be done to determine if there are dangerous, illegal, or unhealthy chemical compounds present in the materials. A trained environmental engineer or hazardous materials specialist can help determine what poses a direct threat to human health and must be removed, what may be remediated or stabilized in place, and what may be acceptable as is.

Remember: not all potentially hazardous materials are regulated under current building codes, and the definition of “safe” changes over time (asbestos and lead paint were once considered safe and effective). Proactively investigating potential health and environmental risks can help prevent future regrettable material choices. Resources such as the Living Building Challenge Red List Declare Database, Green Science Policy Institute, Building Green, and the Healthy Building Network can help develop a more comprehensive assessment of the health impacts of existing or potential materials. A re-use project

presents an important opportunity to not only address indoor air quality and toxicity issues but to improve the health impacts of a building.

**Sustainability** – Examine materials for sustainability concerns and opportunities. Energy efficiency improvements in historic buildings are possible with careful design. Safely increasing thermal performance or reducing air infiltration in historic structures requires analysis and testing prior to developing design strategies. Engineers may use a hygrothermal model to make sure new interventions don’t create condensation issues, or a freeze-thaw model to examine how seasonal water damage might occur in the building envelope. An energy model can help the team walk through different insulation or envelope options to find the best balance of low-carbon materials, energy efficiency, and preserving historic character. For instance, in the renovation and re-use of a venerable brick powerhouse at Amherst College in Massachusetts, our firm used energy modeling to determine that a combination of additional roof insulation and radiant heating systems provided thermal comfort without sacrificing the building’s bare-brick aesthetic.

It is also critical to understand the embodied value of existing materials. Even if an existing building has a high energy use intensity (EUI, a measure of energy use per square foot), the



additional carbon emissions associated with energy efficiency upgrades may make it more prudent to leave the building as-is.

Life cycle analyses (LCA) can help determine a building's embodied carbon footprint and how this might be conserved to reduce additional carbon output. Software and plug-ins like Tally, the Athena Impact Calculator, and the new EC3 Embodied Carbon in Construction Calculator are popular LCA tools.<sup>4</sup> An LCA can also look at ecosystem impacts, resource depletion, human health impacts, and cost to provide hard data on which to base material choices, efficiency improvements, and conservation strategy. Where possible, LCAs should reference climate or carbon neutrality timelines to assess how the project will impact climate goals (for instance, the AIA's challenge to reach carbon neutrality by 2050).<sup>5</sup>

Also consider minimizing waste via material conservation in re-use work: the more the design can employ existing materials to accommodate the new program and needs, the lower the project's environmental impact from new material harvesting, extraction, manufacture, transport, and construction.

**Cultural context** – Just as important as the physical properties of materials is their cultural importance. Talk to the building owners, community members, and neighbors to cultivate context. Are there stories related to certain materials, features, or time periods? Keep an ear out for “emotional baggage” associated with the building's history. What are people's

perceptions of it? Are they positive or negative? How do they relate to the space and surrounding context and landscape? All of this will inform decisions about which material qualities are important to keep, and which need to adapt to meet current needs and expectations.

**Historic value** – Another critical component of re-use projects is a historic value assessment. Is the building associated with a significant person, event, time period, or architectural style? Does it contain a particularly unique material or feature? There are some buildings that merit “pure” preservation based on their historic or aesthetic significance. These may demand a conservative materials approach, with an emphasis on preserving original material and design intent, and faithfully recreating original details whenever possible.

However, many existing buildings are prime candidates for re-interpretation and re-use. For these, transformation strategies can be more dramatic. The U.S. Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings is a good guide for determining historic significance.<sup>6</sup>

**Project goals** – As with all design work, make sure there is a clear understanding of the project goals and values. What does success look like for the building owner, design team, occupants, etc.? These goals will help frame the decision-making process and align expectations with stakeholders.

## INTERPRET (AND RE-INTERPRET)

Interpreting all of this information is no small feat. Design teams must ask themselves,

## CARBON IN EXISTING BUILDINGS

■ Embodied carbon refers to the greenhouse gas emissions associated with the extraction, manufacturing, transportation, and construction of building materials. Operational carbon is the emissions-related building operation, including heating, cooling, and lighting. Significantly, new embodied carbon from

buildings accounts for 11% of annual global greenhouse gas emissions; as our overall building stock becomes more efficient, embodied carbon accounts for a larger percentage of the industry's overall carbon footprint.<sup>9</sup> The Carbon Leadership Forum and Building Green estimate that by 2050, materials will comprise 90% of

carbon emissions from new construction, compared to 10% associated with building operations.<sup>10</sup> This context dramatically increases the value of existing materials. A seminal study from the Preservation Green Lab of the National Trust for Historic Preservation showed that “building re-use almost always yields fewer

environmental impacts than new construction of similar size and use type.”<sup>11</sup> Because existing buildings already represent a significant carbon “investment,” a smart sustainable design approach considers the value of this embodied carbon versus the potential carbon emissions of demolition and new construction.



Former factory buildings, such as the Waltham Watch Factory in Waltham, Mass., with their large windows, open floor plans, and patinated surfaces, make for flexible and characterful re-use projects.



RICHARD MANDELKORN PHOTOGRAPHY, COURTESY OF BRUNER/COTT ARCHITECTS

considering the full context of the assessment, what is truly important? It's crucial to cast a critical eye; despite the prevalence of conservatism in preservation work, nothing is off-limits just because it's old. Remember, materials help tell the story of the building over time, including today.

- What are the most important aspects of the building's materiality—its overall form? A certain set of materials? A particular significant architectural or spatial element? Get clear about why they are important. Conserving the overall form or appearance of a building can accommodate a wider range of interventions than preserving original materials.

- Are there elements that must be preserved in order to comply with Historic Commission requirements or in order to receive Historic Tax Credits? Bronski recommends color-coding plans to clarify possibilities for intervention: red for elements or spaces that must be conserved, yellow for areas where some intervention is acceptable, and green for areas of low historic significance open to radical transformation.

- How important is it that the building retain some reference to its historic use or context? Preserving material reference to the original building use—perhaps in the form of conserved industrial equipment, displays of artifacts, or old signage—can help ground the project in its past.

In some cases, however, it may be desirable to “start fresh” and simply use the building for its existing physical properties or location.

- Is the proposed new use/program a good fit for this building type? Or, if the program has not yet been determined, what might be a natural fit? Some typologies, like former 18th- and 19th-century factory buildings, can be successfully re-used for a wide range of programs because of their slender columns, regular grid, narrow floor plates, and large windows. Others, like mid-century cast-in-place concrete buildings, can be harder to repurpose without significant expense.

### INTERVENE: PRESERVE, REMOVE, EDIT, ADD

Design interventions in re-use work can include a wide range of strategies, from light-touch conservation to total transformation, and most projects will employ several types.

**Remediate** – Obviously, it is important to address the root causes of deterioration. Consider the necessity of repair work in the context of the new use; for example, if a formerly enclosed building is being re-purposed as a seasonal performance venue, full-scale repair of windows and openings may not be necessary, and work can be limited to simple stabilization.

**Preserve** – When preserving the building's original appearance is important, it's often best

to conserve as much material as possible. For important materials, ask: How deteriorated is each element?

What would it look like if it was patched? Replaced with new? If we had to replace this element, how would we do that within the project timeline and budget? Consider the life span of the material after restoration compared to a replacement. For example, a wood window sash can be repaired and restored almost indefinitely, whereas a modern double-glazed window sash has a lifespan of about 30 years, after which it goes to landfill. If energy efficiency is a concern, it may be better to restore wood windows and add storm windows rather than changing them out for newer models.

“Fabrication of materials has changed drastically over the past three centuries,” notes Bruner/Cott architect Adrienne Cali. “Stone, brick, steel, wood, and glass were sourced, fabricated, and constructed differently than they are now. New wood siding is smoother, without saw marks; bricks are flatter and lack large inclusions; glass is clearer and doesn’t have bubbles or waves; mortar is smoother and more uniform. And only a handful of manufacturers make convincing restoration products.”

A good alternative option is to “harvest” material from elsewhere on site for use in high-visibility areas. This retains original craftsmanship and limits the need to manufacture new materials.

**Edit** – It’s also important to determine how important patina is to the desired building character. For buildings of historic significance or where a sense of time and texture is important, careful consideration must be given to how much materials are cleaned to remove dirt or remnants of past repairs. This cannot be undone, and over-cleaning runs the risk of erasing the building’s charm. Unless the new design demands it, leave those layers of paint, filled-in windows, and lingering hardware. Conversely, it might sometimes be appropriate to employ techniques to artificially age materials so that new fabric does not call too much attention to itself. This approach will never result in perfect replication, but it may allow the original materials to take center stage.

Sometimes what’s important is not the exact material, but its overall form and composition. This may be the case with large-scale architectural details like steeple finials which are only ever seen from afar. In these cases, it

might be better to replace deteriorated original elements with a hardier material, taking the opportunity to reduce the building’s maintenance burden. On a conservation project at Dartmouth College’s Baker Tower in Hanover, N.H., our firm replaced failing plaster decorative columns with fiberglass reproductions. Similarly, we replaced rotted wood balustrades with spun copper replicas. These mediations will last much longer and are suitably convincing from a distance.

**Add** – Contrary to traditional preservation thinking, new additions to existing buildings need not fade into the background. Bold material interventions can help visually transition the building into its new program use and offer an opportunity to improve elements that never really worked, or which don’t support the new use.

Take your cue from historic building stock and strive to work with enduring materials; wood, stone, and concrete offer longevity and purity of form that have been proven to create high-quality spaces over centuries. Also consider the human emotional response to potential new materials, especially those that will be seen up close or touched by building occupants.

At our MASS MoCA project in North Adams, Mass., a large-scale transformation of a former factory complex into contemporary art galleries, an early strategy was to avoid bland “commercial interior standard” materials that elicited zero response—“think painted sheetrock, vinyl flooring, subway tiles,” says preservation expert and Bruner/Cott Principal Henry Moss. Instead, new materials with evocative textures and finishes hold their own against the dramatic scale and patina of the original building elements.

**Remove** – Effective re-use can be just as much about removing building fabric as adding. Forney describes this at MASS MoCA: “[MoCA] was a massive undertaking—we removed existing floors, walls, and façades. By taking things away, we allowed spaces to be sculpted and reconnected in artistic ways that are energetic and powerful.”

## IN PRACTICE

Let’s examine these material considerations through three types and time periods of buildings: wood-framed cultural buildings, masonry industrial buildings, and Modernist/Brutalist concrete buildings.

## WOOD CULTURAL BUILDINGS

As a typology, wood cultural buildings cover a wide range of building types, including churches, community meeting spaces, and early educational buildings. They typically share a common material language: large structural timbers, dimensional infill framing and decking, clapboard or shingle siding, steel connectors and fasteners, and stone rubble or brick foundations/piers. Many of these buildings feature wood sash windows and plaster or wood-carved ornamentation and detailing. Their timbers bear the marks of their construction, showing sawn texture, axe marks, or carved letters and numbers used to guide assembly. They are a window into the technologies, timber resources, and skills of their makers. This evidence of the hand is a large part of their cultural value, as it connects buildings to their original time and place.

regularly, are more susceptible to decay over time. Wood siding and shakes will rot without sufficient ventilation behind them; this condition may be seen in buildings that have been poorly retrofitted previously. It's not always easy to identify problems, especially dry rot or insect infestation hidden within timbers. Only a thorough condition assessment can determine their current structural integrity; hands-on investigation with a screwdriver or awl will reveal the difference between superficial peeling paint and dangerously deteriorated or infested wood members.

**Intervention** – Historic timber has value as an irreplaceable resource, and should be saved whenever possible. Unlike stone or concrete, wood retains its embodied carbon only as long as it is intact and protected from decomposition. Old-growth wood is also harder and more durable than its modern counterparts. If intact wood elements cannot be used in-situ or repurposed on site, they should at least be removed carefully for architectural salvage.

There is also a hierarchy directly associated with nearness—if you can walk up and touch it, then the craftsmanship and authenticity of the original material becomes more important and should be conserved. In other cases, structural integrity may demand replacement, partial replacement, or addition of new materials; this is most acceptable in locations removed from direct access.

A recent renovation of Harvard Hall at Harvard University in Cambridge, Mass., found significant damage to the original solid chestnut columns supporting its cupola. In consultation with the Cambridge Historical Commission, our design team decided to replace the columns with modern cross-laminated-timber painted to match the surrounding woodwork. This was a major intervention, but closer to the material identity of the original building than inserting steel supports. Modern composite timbers also have high strength to volume and have a lower carbon footprint than many structural alternatives.

One strategy unique to wood-framed buildings is that they can be moved relatively easily with proper planning, logistics, and stabilization. This mobility opens up possibilities for more radical design interventions and new ways of thinking about site planning. As part of a renovation and addition project for the Lunder Arts Center at Lesley University in Cambridge, Mass., the historic North Prospect Congregational Church was jacked up and moved several hundred feet to accommodate a new building on site. This allowed the new addition, with its

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**Rough wooden shingles at the Charles River Speedway in Boston are a hallmark of its Arts & Crafts style.**

**Common problems** – The greatest threats to wood buildings are fire and water. Many older wood buildings have faced fire at some point in their history, resulting in loss of original material and evidence of past patching and repair. Water infiltration from neglected roofing, flashing, gutter, or coping details also threatens the structural integrity of timber buildings.

Wooden sill plates may rot from damp conditions or from insect infestation of softened wood, as debris-filled gutters spill over and create a splash zone at the building base. The north sides of buildings, where the wood does not dry out

more contemporary materials palette and form, to ease the transition between the traditional church structure and the surrounding urban fabric.



**Portable moisture sensors are one way to evaluate the current condition of masonry structures. Damp walls show evidence of damaging water infiltration.**

**Transformation in Action** – The 1899 Charles River Speedway is a former racing complex in Boston that our firm is converting into mixed-use space with restaurants, retail, and a locally-owned brewery. Its single-story timber-framed structures occupy a site between the Charles River and an adjacent semi-urban commercial neighborhood. Its most characteristic feature is its rough wood shingle siding, a hallmark of the picturesque Arts & Crafts style. The condition of these shingles at the beginning of the project was poor, with large areas of rot or missing pieces. Our team determined that the most important design priority was not spotty preservation of original material but the uniformity of the cladding as a whole. Considering several strategies for replacement, the team tested mock-ups with different material sources and stains to most closely approximate the original appearance. Full replacement of the cladding allows the re-imagined complex to stand out from the typical commercial structures surrounding it and assert itself as a shingle building.

### INDUSTRIAL BUILDINGS

Brick industrial buildings are a common site in most American cities and towns. Their sprawling scale, solid masonry façades, and long rows of windows make them stand out against the residential areas that often surround them. Many were the town's economic heart in their heyday and may carry associations of a more prosperous time or lingering resentment toward their collapse. Often built over the span of several decades or even centuries, these factory complexes can contain a range of structural types, reflecting changes in use, labor practices, material resources, and construction technology over time. Their prime central locations, solid construction, and flexible interior spaces make them excellent candidates for adaptive reuse and transformation.

**Common Problems** – As a group, these buildings often face deterioration from lack of maintenance after they close. Water infiltration is a common root cause, either from rising ground moisture at



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the base of the building or leaks at the cornices from inadequate flashing or roof disrepair. This water then causes freeze-thaw cycles that damage masonry, spalling brick faces or wearing away at soft mortar joints. Sometimes, previous repairs with high-cement content mortars can exacerbate spalling, as water works its way into the brick instead of into a sacrificial mortar. From a sustainability perspective, thermal bridging of the solid structure is often a real challenge.

**Repair and Remediation** – These buildings may also be contaminated with hazardous chemicals associated with their age and former industrial use (lead paint, heavy metals, or solvents). If so, soil remediation, material removal (of slabs etc.), or simple encapsulation may be required depending on the intended end use. For example, a residential conversion where children may be playing on interior floors might require more thorough removal of hazardous materials than a museum or business setting. Each project presents its own challenges for removing toxins to ensure the health and wellness of occupants.

Material repair and preservation strategies must take resiliency into account. Moss has seen the impact of climate change escalate over the course of his career: “Forty years ago, you could re-point an existing brick wall, leave it bare, and not have water penetration; now, more intense and longer storms mean that the brick is more often pushed past its capacity to dry between weather events.” Unlike older consolidants and polymers which can trap moisture inside, today's silane siloxane water repellants allow moisture to travel outwards, encouraging drying. These can help protect vulnerable areas in splash zones and underneath windows in increasingly wet conditions.

**Transformation in Action** – Our Swift Factory project is a former gold-leafing facility in Hartford,

Connecticut, with a variety of domestic and manufacturing structures dating from 1890-1948. Previously a major source of employment for the area, the factory closed in 2005. The disadvantaged neighborhood has since struggled and is designated a HUD Promise Zone. Now, Community Solutions, a non-profit developer, is transforming the complex into a community and entrepreneurial hub, with commissary kitchens for local restaurants, incubator kitchen space for fledgling local businesses, aquaponics, growing spaces, a community health care clinic, and a shared office space for local start-ups. Some of the funding for the project comes from historic tax credits, meaning the design is subject to review by the Connecticut State Historic Preservation Office.

Materials are an important part of this project's successful transformation. Opaque fiberglass windows, which were originally installed to block views of the gold-leafing operation and resist shattering from projectiles, have been replaced with well-crafted black-framed glass windows. These are more fitting for the original aesthetic and send a message of transparency

and openness to the surrounding neighborhood.

Thoughtful repair and cleaning of the brick façades strikes a balance between maintaining historic patina and displaying a sense of care and pride in freshening up the exterior. Our design team conducted a thorough visual inspection before construction began and compared photos of brick cleaning and mortar repointing mockups against the existing bricks. These were reviewed and approved by the state historic preservation office, as were sample replacement bricks. Most of the brickwork was left untouched. Areas of high staining and efflorescence were brush cleaned with a cleaning solution. Areas of high mortar damage were repointed with a matching mortar, approximating the original color and texture. Areas of significant brick damage were removed and replaced with a closely matching new brick, though it is still possible to distinguish the historic brickwork. New steel awnings clearly mark entrances, and inside, new programs are identified with fresh signage among the old columns and wood floors. The reimagined complex helps write a new narrative for the neighborhood as a place worth investing in that deserves beautiful spaces.



**Waltham Watch  
Factory courtyard, in  
Waltham, Mass.**



RICHARD MANDELKORN

RICHARD MANDELKORN



**Boston University School of Law renovation and addition, in Boston.**

**MODERNISM/BRUTALISM**

A relative newcomer to the re-use scene, mid-century concrete buildings come with a unique set of challenges and opportunities. These buildings, including Brutalist and Modernist typologies, are most often constructed with a combination of reinforced cast-in-place and pre-cast concrete. Modernist concrete is characterized by purity of form, honesty in materials, and an expression of the making process in board-formed finishes, corrugation, or bush-hammering. Mark Pasnik, author of *Heroic: Concrete Architecture and the New Boston*, describes the design intent: “In many of these buildings, the inside and outside are meant to be of one unit, showcasing the simplicity of using one material for the structure, skin, and form. This ‘all-throughness’ is essential to the design ethos of the building.” Many of the most enduring examples of these building types were constructed for civic or institutional use as municipal offices, courthouses, or university buildings. Their monumental forms and materiality are intended to celebrate the strong cultural institutions that served the public good.

Despite their aspirational beginnings, these buildings are maligned by some, considered ugly, cold, or oppressive. They may also carry some emotional baggage for owners or occupants who have had to deal with thermal discomfort,

burdensome maintenance, or spaces that no longer fit their current use. However, public attitude towards Modernist concrete buildings is shifting, perhaps because they are getting older and becoming rarer. The iconic Brutalist Boston City Hall is now the subject of re-investment, a far cry from the frequent demolition discussions of decades past. Even the *New York Times* Style section says Brutalism is back!<sup>7</sup>

Even so, adaptive reuse of these concrete behemoths can be challenging. Many were designed for a very specific purpose, and with their solid concrete interiors, new spatial division can require considerable structural intervention and expense. As such, large-scale Modernist buildings can be less flexible than other building types and more difficult to radically re-program.

**Common Problems** – In colder climates, one of the most common problems in this typology is a combination of cracking, spalling, and rebar decay due to water infiltration. Small cracks in the concrete fill with water, which then freezes and expands, widening the crack. Over time, this freeze-thaw cycle can cause significant damage, as the structural integrity and rain-screening capacity of load-bearing exterior walls becomes compromised. A thorough envelope survey and structural analysis is necessary to determine which portions of the



PHOTOS: INC. LEHOUX



**Smith Campus Center  
façade and arcade, in  
Cambridge, Mass.**

façade are intact, repairable, or beyond repair.

Architectural losses from piecemeal maintenance and alterations are also common. At our Boston University School of Law project, part of a renovation of a 1960s Josep Lluís Sert complex, some of the original windows had been modified over time, and there were many areas of haphazard concrete patching, resulting in loss of cohesion that undermined the design integrity.

**Cleaning and Repair** – Modernist concrete is intended as a visually and structurally continuous wrapping of material. This makes repair

comparatively more difficult than patching brick or wood façades, where individual units can be singularly removed and replaced. Similarly, it is difficult to know where to draw the line when cleaning façades or elements. One strategy is intentional patching, first used at our renovation of Sert’s BU Law Tower and later on at the Harvard University Richard A. and Susan F. Smith Campus Center. Areas in need of concrete repair were cut out squarely and to a common depth; we found that uniform rectilinear patches were less visually intrusive and cured more evenly, resulting in a more even overall appearance. On both projects, the teams also decided to clean all cast-in-place concrete elements so they more closely matched new patches.

**Sustainability considerations** – Mid-century concrete buildings were designed at a time when energy supply seemed limitless; their designers did not prioritize energy performance. In colder climates, these buildings suffer from significant thermal bridging and condensation from exposed structural concrete and steel. Single-glazed windows, deteriorating sealants, and outdated mechanical systems exacerbate thermal discomfort; this is often the driver of

building renovation. Given the continuous structure-and-skin aesthetic of these buildings, external insulation may be considered inappropriate; designers must decide how essential this characteristic is to a particular project and find the right balance between energy performance and original design integrity.

Despite these challenges, concrete-and-steel buildings also contain significant embodied carbon, especially compared with timber construction. Their successful transformation and continued existence, even with modestly improved energy efficiency, is a net climate benefit compared to the carbon footprint of demolition and new construction. It is up to today's designers to help these challenging buildings

make the transition to meet current needs. "Being heroic at the expense of the environment and human experience was not a great choice," Forney observes. "But there's still something valuable and evocative about them. If we can intervene and make them better for people—more human with a better program fit—then it's worthwhile."

**Transformation in Action** – At the recent renovation of Sert's 1965 Holyoke Center as Harvard's new Smith Campus Center (Design Architect: Hopkins Architects, Executive Architect: Bruner/Cott), this transformation took the form of a dramatic re-imagining of the building interior while faithfully repairing the exterior and original materials to reflect the original design intent. The design strategy focused resources on the public spaces of the building. The first two floors were drastically modified and opened up, unlocking potential for strategic programming initiatives to create more open and welcoming public space on campus. The upper floors were reworked more subtly to accommodate modern administrative and student spaces. The design uses new biophilic materials to introduce warmth, greenery, human scale,

natural light, and views into the building: two-story green walls, wood flooring, wood cladding of the "Harvard Commons" space and arcade, and a new glazed entrance and internal, tree-lined vitrine. The resulting building is a dynamic center of community life for today's students and visitors alike.

## LOOKING AHEAD

The National Institute of Building Sciences states that "existing buildings, both commercial and residential, represent the single largest component of a community's infrastructure. It is estimated that upwards of two thirds or more of these buildings will be dysfunctional (for their current use) within the next ten years."<sup>8</sup> This represents a massive opportunity for designers to reinvent these spaces for renewed use. As time goes on, we will be challenged to apply transformational thinking to new building types and forms, including abandoned shopping malls, housing, and millennial architecture. We need to continue to make efficient use of these spaces to reduce new embodied carbon emissions and meet the goals of the Paris Climate Agreement. Using the lens of materiality, we can look forward to celebrating the successful reinvention of existing buildings for the well-being of both people and planet.+

## FOOTNOTES

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BRUNER/COTT ARCHITECTS



**At the Smith Campus Center renovation at Harvard University, the team tested dozens of potential concrete mixes to find the closest match to the existing façade.**