A Green Renovation of a Historic Nantucket Building: *Mitchell's Book Corner*

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Background

The property at 54 Main Street, home to Mitchell's Book Corner since 1968, is a two-story, 150-year old brick building in the heart of downtown Nantucket. A beloved bookstore and community gathering spot, Mitchell's is a cornerstone of downtown Nantucket's social and architectural makeup.

Over the years, patchwork repairs and general maintenance had been ineffective in protecting the building from water damage, wood decay and structural deterioration; the building's longevity was in jeopardy. ReMain Nantucket recognized a wonderful opportunity to help strengthen and preserve a downtown Nantucket landmark.

Our vision in renovating this four-story historic structure was threefold: to **preserve and re-use** as much of the building's historic fabric as possible; to **improve the efficiency** of the building's envelope, energy and water systems; and to **re-use existing interior materials** or source environmentally sensitive alternatives. With these three goals in mind, ReMain sought to ensure that the new Mitchell's would have the same look and feel as the old Mitchell's. Environmentally thoughtful renovation and historic preservation can go hand in hand.

Original Building Condition – Areas of Concern:

- *The basement was in poor condition due to water intrusion during heavy rainfalls and occasional sewer overflows.*
- *Various floor joists had decayed and had been retrofitted with a ledger beam perched on brick pilasters.*
- *The foundation wall that supported the internal bearing walls had a pronounced lateral bow.*
- *The interior masonry walls displayed gaps and cracks in the mortar, which had led to deterioration.*
- *There was no insulation in the walls leaving a cavity space between the existing plaster and the masonry.*
- *The floor joists were undersized for current bookstore loading standards and the ends of several joists had rotted away at the masonry walls.*
- *Previous repairs to the timber truss roof system had resulted in joists pulling away from the truss tie beams without the ability to resist horizontal spread. The ridge had noticeable sag.*
- *Water stains were visible in the attic due to the poor condition of the roof where there were gaps in the flashing and missing roof shingles.*

On the exterior, the building lacked an overhang at the gable end as the shingles were cut flush with the masonry - leaving the brick wall exposed to moisture infiltration. Additionally, some of the single-paned windows were allowing water into the masonry walls; in some cases daylight was visible between the masonry walls and wooden window sills.

Mechanically, the previous systems included an oil-burning furnace, which fed a baseboard heating system, and several wall-mounted air conditioning units cut through brick walls. With little building insulation, heating and cooling the building was very inefficient.

Structural Preservation

With preservation and restoration of the original building fabric at the core of the renovation strategy, addressing structural deficiencies and protecting the wood and brick from further decay were crucial.

To reinforce the existing structure:

- *Supportive steel beams were introduced along the east and west walls perpendicular to the floor joists to properly bear the 150-pound per square foot load of books. Alternatives were considered, but each would have resulted in much deeper beams, many more posts, and a significant number of additional footings in the basement of the structure, leading to alteration of the interior spaces. All but one of the steel beams is hidden in the basement ceiling minimizing the visual impact of reinforcing the floors.*
- *In the attic plywood gussets were added and engineered lumber sistered to the existing purlins.*
- *At the second ceiling level, metal joist hangers were added.*
- *The roof truss structure, joists and sheathing remain intact.*

Mitigating water infiltration required thoughtful consideration as space and regulatory constraints prevented retrofitting any drainage details on the exterior of the building. To ensure that water drained away from the building:

- *the perimeter sidewalk was re-built with the existing bricks;*
- *the overhang on the gable end wall was increased by 4";*
- *a gravel pit was installed at the foot of the exterior stairs behind the building to allow water to drain into the soil, preventing water build-up at the back door.*

Re-using the Historic Fabric

Restoring and reusing the historic and character-defining features of 54 Main Street was central to the design philosophy. To preserve the look and feel of Mitchell's, the renovation team went to great lengths to improve but not significantly alter the interior and exterior appearance by reusing 96 percent of the building's original fabric, despite the installation of an elevator to make the second floor handicap accessible.

For the interior, the basic layout of the first floor space was maintained.

- *Only eight percent of the three floor systems were removed to allow for the passage of a new stair and elevator accessing the second floor.*
- *Nearly seventy-five percent of the historic horsehair plaster was preserved, and the plaster that required removal was reused in the lime mortar required to repoint and repair the existing exterior brick walls.*
- *The trademark shelving, checkout counter and wall mural were carefully dismantled, refurbished and put back in place after the renovation.*

The renovation included converting the second floor apartment to bookstore use. To accommodate the use of the second floor as a gathering space for author events and community use, movable bookcases were installed so that the large, open floor plan and the majority of the plaster on the second floor would not be altered.

To preserve the exterior appearance, the historic windows were disassembled and meticulously rehabilitated to improve weather-tightness and operability. The single-pane windows were reinstalled with their original sashes and in their original frame, with interior storm windows. Any paint that remained on the exterior bricks was left intact and damaged lintels were repaired with stone that matched the existing.

Building, Energy & Water Efficiency

The desire to improve the building's thermal resistance and mechanical efficiency had to be evaluated alongside several unique characteristics of the building including its masonry construction, location and space constraints.

Insulating masonry buildings requires careful consideration of the building's moisture dynamics to avoid freeze-thaw damage of the brickwork, decay of any embedded wood structural members and increased corrosion of steel components. After thorough research and review, closed-cell spray polyurethane foam was selected as the best insulation agent due to its:

- *air impermeability (reduction in its condensation potential),*
- *higher R-value (R-6.5/inch), and*
- *vapor control (thereby limiting diffusion of vapor into the wall assembly, however also permitting some drying of the assembly to the interior).*

The renovation team sprayed 3" of closed cell spray foam on the interior of the masonry wall and 6" to the underside of the roof. This amount and type of insulation allows for reduced air infiltration and heat transfer, but does not change the dew point in the wall structure, which would cause deterioration of the brick from the inside.

To update the building's mechanical systems, the first choice would have been to replace the existing oil-burning furnace with a more efficient propane boiler and to install solar panels that would generate a percentage of the building's required electricity. However, site constraints prevented the storage of propane and the Historic District Commission denied the request to install a solar system due to the visibility of the panels from nearby streets. While the rear roof's exposure is ideally suited to a solar installation, the small area available and certain technical limitations of the current generation of photovoltaic solar installations made justifying the capital cost of a solar power generation system difficult at this time in any event. Given these limitations, the next best option was to install a hydronic, variable volume air system with a heat recovery ventilator and back-up modulating boiler:

- *heat recovery ventilators connect to air purifiers that draw in fresh outdoor air;*
- *heat exchangers minimize energy losses from bringing in ambient air that differs from the interior air temperature;*
- *systems are zoned for maximum control and reduced usage with low occupancy;*
- *insulation in the attic roof, rather than the attic floor, allows the systems to operate far more efficiently inside conditioned space.*

The system is designed so that, should solar panels be implemented in the future, they will be able to be seamlessly integrated.

In addition to highly efficient mechanical systems, the project included the installation of:

- *fluorescent and LED lighting that reduce the building's overall electrical draw. The lighting is automatically controlled around planned use, room occupancy, and day lighting sensors.*
- *a low-flush toilet, low-flow gravity-fed faucets and water-efficient appliances. Though water requirements were minimal in the original structure, water usage was reduced by over 34 percent.*
- *interior storm windows. Condensation is allowed to escape through the exterior window frames, while the weather-tight interior storm windows increase the energy efficiency.*
- *machineroom-less elevator. The elevator preserves the maximum amount of basement space for inventory storage and requires three times less operating power than other models.*

To further offset the project's carbon footprint, renewable energy credits were purchased and Mitchell's Book Corner is participating in National Grid's Green Up program.

Material Selection and Design

The first approach to interior design was to honor the history of the building by reusing as much of the existing materials as possible and reclaimed wood when existing materials were insufficient. Where this was not possible, the design team was careful to select products with a low-environmental impact.

For all new materials, precedence was given to:

- *materials manufactured within a 500-mile radius of the site;*
- *new wood certified by the Forest Stewardship Council as harvested and handled sustainably from forest to job site;*
- *materials manufactured with reclaimed content, such as the breakroom's rubber flooring made from recycled tires and the 100-percent recycled glass for the bathroom sink and tiles; and*
- *rapidly renewable products, including the bamboo bathroom flooring and breakroom cabinetry.*

Interior design details quote from historic Nantucket homes, the marine environment that surrounds the Island, and on the second floor, the starry sky of a spring Nantucket night. Decorative features like the window treatments used eco-friendly materials and natural grasses and fibers. To improve the air quality of the entire building, low or no-VOC paints and sealants were utilized. The installed carpeting is Green Label Plus certified, designating it one of the lowest emitting carpet, adhesive and cushion products available. Additionally, the fabrics and upholstery were made of natural fibers or eco-intelligent polyester, and the fabric dyes were either vegetable-based or low-impact dyes meaning they contain no toxic chemicals or heavy metals.

ReMain Nantucket salutes and thanks its local design team of Rebecca Weld and Burr Tupper from Verde: Nantucket Green Build, Audrey Sterk Design, Josh Brown Construction and the many subcontractors who were involved, for all their hard work and creative energy. For more information, including videos of the project in process, visit our website, ***www.remainnantucket.org*** *and, of course, come to the bookstore at 54 Main Street.*