SUSTAINABLE STRATEGIES FOR THE REHABILITATION OF AN HISTORIC STATE OFFICE BUILDING

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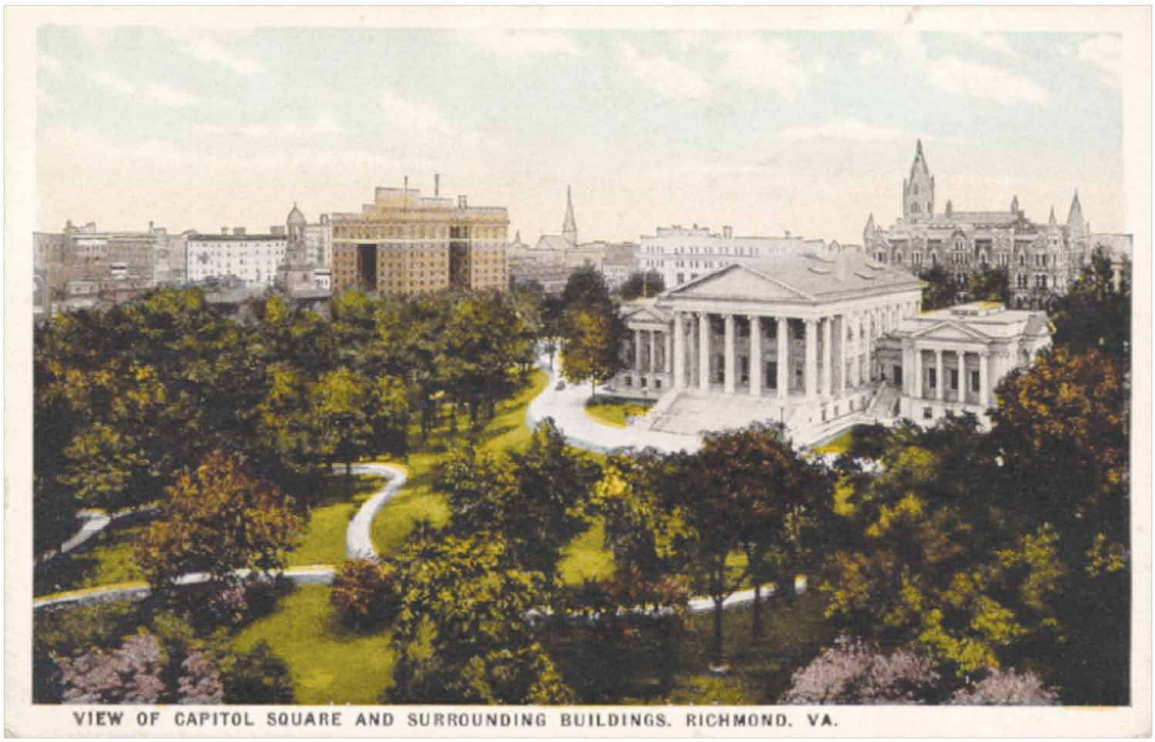
FIGURE 1. View across Richmond's Capitol Square toward the Hotel Richmond, now the Ninth Street Office Building. Post card c.1930s.



INTRODUCTION

When the Commonwealth of Virginia determined to renovate the Ninth Street Office Building for continued use as badly needed office space, it was confronted with many challenges. Not only does the prime location of the 11-story building on Richmond's Capitol Square come into play, but also the complications inherent in the rehabilitation of any iconic 110-year old building for contemporary life. Overlay the Commonwealth's mandate to meet a minimum threshold for sustainability, and we have the recipe for a challenging, but ultimately rewarding, project.

This article will describe the historic evolution of the project along with a discussion of the process necessary to design and implement a sustainable building solution within the context of an historic building, including identification of potential sustainable strategies and the implementation of an appropriate approach to arrive at the final solution.

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SUSTAINABLE HISTORIC REHABILITATION
The rehabilitation of our existing buildings is by definition a fundamentally sustainable and "green" endeavor. From the recapture of the embodied energy found in our existing buildings, to the repurposing of historic and perhaps functionally obsolete buildings and structures, to the maintenance of the architectural heritage of our communities, the rehabilitation of our existing buildings is by necessity a critical component in any long term strategy for sustainable design and development. In a social context, it can also be argued that both the basic rehabilitation of our architectural heritage and the design of those rehabilitation projects using sustainable strategies is the most socially responsible approach.

Despite this basic agreement that the ultimate goal of the project should be the rehabilitation of our historic buildings, historicists will naturally emphasize those aspects of the project that favor historic preservation and sustainability advocates for their part will emphasize sustainability related issues as the primary drivers for project decisions. Sometimes these varying points of emphasis may seem mutually exclusive and negotiation will be required.

The story of the Ninth Street Office Building project is a study of the delicate balance between these sometimes competing interests. A balance that is critical to achieve if the ultimate goal of repurposing this iconic building for continued service is to be met.

EVOLUTION OF THE PROJECT

History of the Site: The Hotel Richmond
The building now known as the Commonwealth of Virginia's Ninth Street Office Building began its life in grand style as The Hotel Richmond.

The prosperity of the United States and the Commonwealth of Virginia in the late 19th and early 20th centuries drove the decision of prominent local businesswoman, Mrs. Adeline Detroit (Addie) Atkinson, to develop a first rate high-rise hotel to accommodate politicians, lobbyists, salesmen and tourists doing business at the State Capitol. In the 1880s and 1890s, Mrs. Atkinson and her husband John owned and operated the Lexington Hotel in downtown Richmond; however, the turn of the century brought a new beginning and in 1902 Mrs. Atkinson, by then a widow, sold the Lexington and purchased the St. Claire Hotel on Capitol Square, facing the Washington Monument and Mr. Jefferson's Capitol Building. She then demolished the St. Claire in short order to make way for the construction of her new luxury hotel.

Mrs. Atkinson first engaged prominent West Virginia Architect, Harrison Albright, who was becoming widely known following the recent completion of his innovative landmark West Baden Springs Hotel in Indiana. The original Hotel Richmond building was built to a height of eight stories with an entrance fronting East Grace Street to the south and opened in April 1904 with 100 modern, new guest rooms. By 1910, business was booming and Mrs. Atkinson made the decision to expand her hotel. An addition of three more floors atop the original building plus a second 11-story tower to the north were built, increasing the floor plan area of the building to over 164,000 gross square feet. These additions, designed by Virginia architect John Kevan Peebles, were connected with a new two-story Grand Entrance

Lobby, creating a new hotel entrance now fronting Capitol Square to the east across North Ninth Street. The "new" Hotel Richmond now included the city's only roof garden for dining and dancing, and from 1933 until 1968 was the home to WRVA, Richmond's first radio station, which had the most powerful broadcast signal along the southeast coast between Washington, DC, and Atlanta.

FIGURE 2. Original 1904 configuration of the Hotel Richmond.

Over the course of time, the Hotel Richmond became a home to Virginia politics second only to the State Capitol itself. The hotel was used as headquarters for the Democratic Party's gubernatorial candidates and the campaigns of no fewer than five Virginia governors were managed out of a third floor room overlooking Capitol Square.

The hotel continued to flourish, and by 1936 included some 420 hotel rooms and 60 individual apartments, making it the second largest hotel in the City. The hotel continued to be known as a convenient and elegant stopping place for legislators and other travelers in Richmond on state business.

The architecture of the Hotel Richmond is as distinctive as its social history. The original eight-story 1904 Albright work is an elegant brick Italianate structure, featuring a dressed ashlar foundation and rusticated first and second stories, and formed a perfect basis for the

subsequent 1911 additions by Norfolk, VA, based architect John Kevan Peebles. Peebles' career spanned the late 19th and early 20th centuries and included important work for many prominent public buildings in Virginia, such as the two 1906 wings of the Virginia State Capitol and the 1932-36 Virginia Museum of Fine Arts.

FIGURE 3. Post-1911 configuration of the Hotel Richmond, photo c. mid-1920s.

Peebles' design for the Hotel Richmond created a complete and fine example of the Neoclassical, high-rise hotel prevalent in the early 20th-century Unites States. Through the use of such elements as contrasting brick, stone and terra cotta masonry, and highly detailed copper cornice work, Peebles created a striking and distinctive architectural composition, while his interior elements, including the grand double-height Ninth Street Grand Entrance Lobby and the Ninth Floor Ballroom "Winter Garden" provided both monumental and welcoming public spaces. Original construction drawings and photographs from the building's history clearly document the high quality of the Hotel Richmond's interior and exterior spaces during their heyday, and much of this detail survives in the existing Ninth Street Office Building today.

In 1966 the Commonwealth of Virginia acquired the Hotel Richmond and moved five state agencies into the building, renaming it, somewhat innocuously, the Ninth Street Office Building. The glory days of the Hotel Richmond were in the past, but the building still had a bright future in its new life as a servant to the people of the Commonwealth.

History of the Site: The Ninth Street Office Building

Shortly after purchase of the Hotel Richmond building, the Commonwealth of Virginia embarked upon a "modernization" project that was intended to transform the hotel into a modern state office building. Over the course of the next few years, the Commonwealth undertook the removal of the aging single-pane glazed painted wood windows and replaced them with new insulated glass units in "maintenance-free" aluminum frames. Outdated mechanical systems were replaced with more efficient through-wall fan-coil units and exterior brick and stone masonry was painted to help retard the advance of water and moisture infiltration. Many of these repairs were undertaken with an eye toward improving the insulation value or energy efficiency of the aging building, and thus could be seen as an early effort at "greening" of the building within the technological limitations of the day. Like many such projects of that era, however, the best intentions combined with the prevalent technology from that day did not necessarily translate into the best architectural solutions.

Description of the Current Project

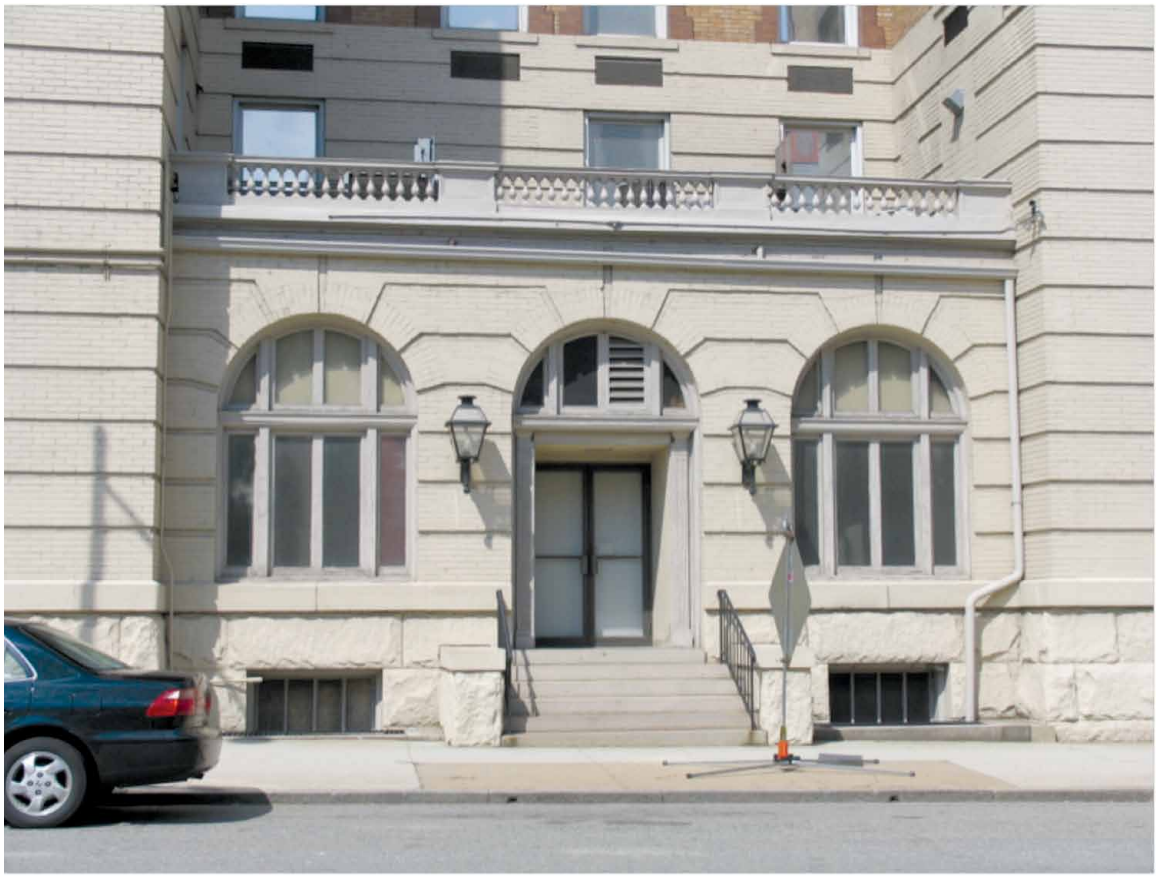
Fast forward forty years to 2006. Despite various partial renovations over the years, along with reasonable maintenance under state stewardship, the Ninth Street Office Building is showing every bit of its 102 years and is ready for a full building renovation. Design standards for contemporary office space layout and design have evolved continuously in the past decades and a complete reevaluation of the way the building is being utilized is required.

Several years were spent planning the rehabilitation while funding for the project was obtained. A project budget was set and a suitable tenant was selected. In 2009, the building was listed on the *National Register of Historic Places* and *The Virginia Landmarks Register*. Separate document packages, designed to streamline the rehabilitation process wherever possible, were developed for the Exterior Masonry Rehabilitation, Selective Interior Demolition, and the Building Shell & Core construction, and a construction manager was selected. Construction on the building exterior and selective interior demolition was commenced in September 2013 and work on the building Shell & Core started in August 2014.

FIGURE 4. Ninth & Grace Street Corner showing Pre-Project Existing Conditions, 2006. Note painted stone and brick masonry base floors and through-wall fan coil units under deteriorated aluminum replacement windows.

As of this date, tenant programming has been completed and development of the Interior Tenant Design and Construction documents package is under way, with receipt of the interior building permit approval anticipated Spring 2015. Occupancy of the completed project is currently scheduled for 2016, and the project remains within the allotted budget.

FIGURE 5. Grace Street Entrance showing Pre-Project Existing Conditions, 2006. Note painted stone and brick masonry at lower base floors and deteriorated wood and aluminum windows.



Sustainable Project Requirements

As issues of energy conservation, sustainability, and related topics to the built environment came to the forefront of public awareness, the Commonwealth of Virginia determined in the best interest of its citizens that energy efficient design and sustainability should be the watchwords and requirement for all state projects moving forward. In this light, the Commonwealth dictated that all state projects should be designed to a minimum LEED standard Silver (or the equivalent). The challenges inherent in rehabilitating an existing historic building to meet these green standards quickly became apparent.

Historic Project Requirements

As with the requirements for energy efficient green design, the Commonwealth of Virginia, as good stewards of public historic and cultural assets, also mandates that all state projects

FIGURE 6. Ninth Street Courtyard Upper Floors and Rooftop showing Pre-Project Existing Conditions, 2006. Note deteriorated brick masonry joints, mismatched masonry infill, outdated rooftop mechanical equipment, deteriorated aluminum replacement windows, and incompatible rooftop structures to be removed.

involving historic buildings be developed with an eye toward maintaining the historic integrity of state owned public buildings. The current rehabilitation of the Ninth Street Office Building falls neatly into that program, both as a cultural asset and also a significant piece of architectural history. As a result, the project falls under the review authority of the Virginia Department of Historic Resources (VDHR), which is tasked with review of all historic work associated with the project. As with private sector historic rehabilitation projects, the VDHR reviews state projects for compliance with the federal Secretary of the Interior's *Standards for Rehabilitation*, which is the recognized standard for guidance in the proper means and methods for the rehabilitation of historic buildings (see http://www.nps.gov/tps/standards/rehabilitation/rehab/index.htm).

THE BALANCE BETWEEN SUSTAINABLE AND HISTORIC ARCHITECTURE

Determination of Sustainable Strategies in an Historic Context

The historicist approach that the existing historic fabric and built form should be preserved wherever possible, and the environmentalist approach that new energy efficient systems and other sustainable principles should be incorporated into the project as part of a new

sustainable design, are sometimes in conflict with each other. The question, though, is not whether these concepts are mutually exclusive, but rather how the project design team can take advantage of and incorporate the best of each of these approaches into a cohesive and holistic design that is environmentally, socially, and fiscally responsible. As with any project, it should be understood at the outset that not all sustainable strategies may be available or appropriate and that flexibility on both the historic and sustainable sides is necessary. Remember that an integrated design approach offers the best chance for a successful solution. This is the approach that formed the basis of the project team's strategy for the rehabilitation of the Ninth Street Office Building.

The Ninth Street Office Building project is currently tracking per state mandate at a minimum LEED Silver level and, depending on various decisions remaining to be made during the course of the ongoing Tenant Interior Build-Out design process, may approach or reach LEED Gold certification.

Urban Projects

Historic preservation and rehabilitation projects are often found in areas that have long been developed. Rehabilitation of buildings within these areas is responsible development at its most basic level. Generally, sustainable opportunities eligible for points in the LEED ratings system in the Sustainable Site category, include such credits as Site Selection, Development Density & Community Connectivity, and Access to Public Transportation. These are often readily achievable for this sort of project and should generally be pursued. Of course, we should all recognize that these opportunities are sensible whether or not a project is pursuing LEED certification or is historic in nature.

The Ninth Street Office Building lends itself neatly into this strategy. With its prime urban location, central to the heart of the city and the center of the state government in Richmond, the building is on local bus lines and is within walking distance to all of the amenities that the capital city has to offer. The very same attributes that made the Hotel Richmond so popular and successful in its day will continue to serve the building in its new life moving forward.

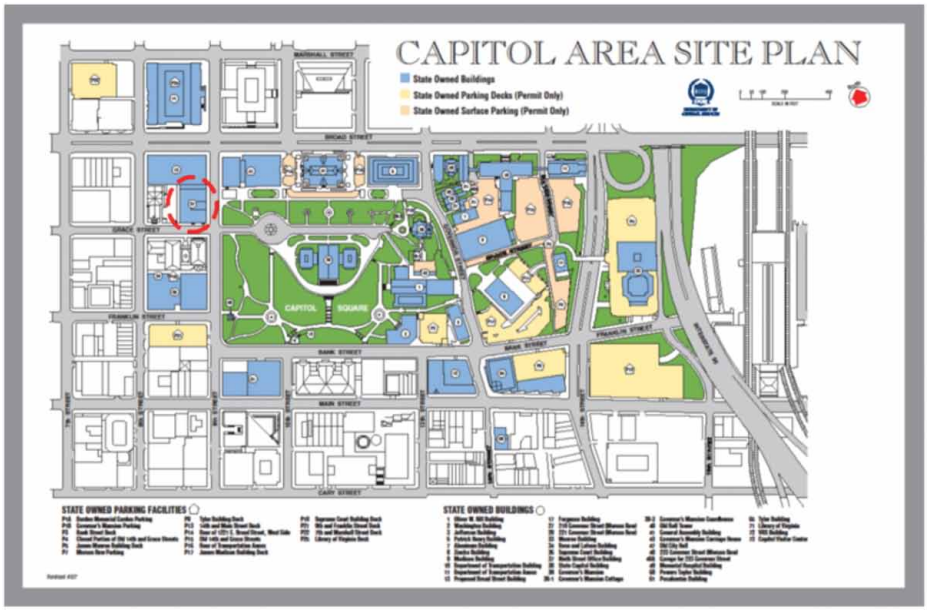
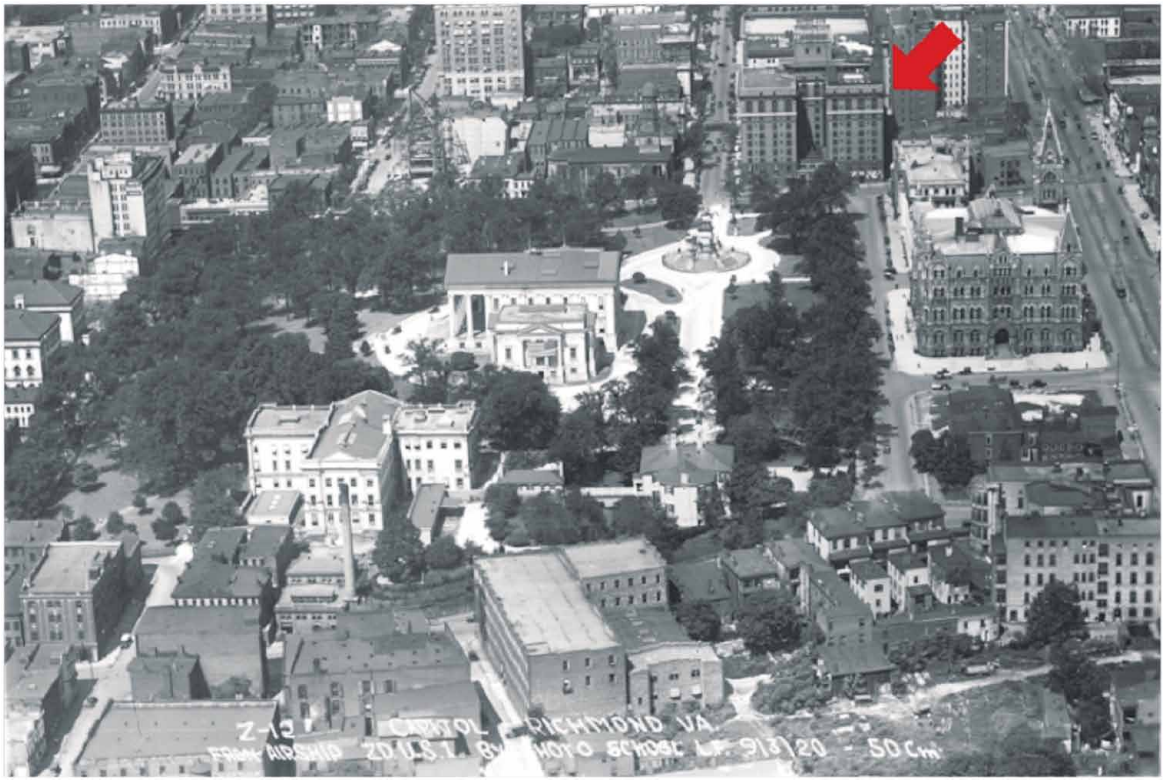


FIGURE 7. Capitol Square Site Plan. Ninth Street Office Building is shown in the red circle. Site Plan courtesy of the Virginia Department of General Services.

FIGURE 8. Aerial View of the Hotel Richmond (Identified by red arrow) across Richmond's Capitol Square, September 3, 1920.



Restoration of the Historic Fabric

The guidelines for historic preservation and rehabilitation projects as outlined in the Secretary's *Standards for Rehabilitation* generally will require preservation and maintenance of any existing historic fabric that contributes to the historic character of the building. This requirement is completely in agreement with a sustainable design approach, contributing to sustainability opportunities for Building and Materials Reuse, and even Construction Waste Management. The one challenging issue in this context is the potential for the addition of thermal insulation to the existing exterior enclosure assembly. Where this is desirable, thermal insulation can often be unobtrusively added as part of the exterior wall renovation portions of the project, which will result in an overall increased energy efficiency of the building envelope.

On the Ninth Street Office Building, the existing building envelope offers great opportunities for sustainable upgrades. As discussed above, the existing masonry exterior construction is one of the primary historic character defining systems of the building and so removal and replacement of the exterior masonry is neither desirable nor practical. The condition of the existing brick and terra cotta masonry and mortar was carefully evaluated and repointed where necessary, resulting in an improved exterior skin. The problem of how to improve the thermal resistance of the envelope was solved through the use of additional thermal insulation at the interior of the enclosure. Since the existing interior plaster walls were deteriorated beyond repair and required replacement in any case, a new metal stud furring cavity was added to the interior of the solid brick masonry exterior wall

and closed-cell polyurethane foam insulation was sprayed into the cavity. By this method, a total minimum R-value of 21 was achieved for the exterior wall. The spray-on applied insulation also provides a far superior air and moisture barrier for the interior space than the original historic solid masonry and interior plaster construction. New high quality aluminum clad wood insulated window units (U value = 0.4) were installed to replace the existing 1970's retrofit aluminum windows to complete the thermal wall enclosure and provide an improved historic appearance to replicate the original (long gone) historic wood windows. The existing black single-ply membrane roof was at the end of its useful life, so the addition of new polyisocyanurate rigid insulation (R value = 30) under a new light colored, reflective, thermoplastic polyolefin (TPO) membrane roof was an easy task.

FIGURE 9. Repair of existing exterior enclosure work in progress. Note CMU infill at former through-wall HVAC unit locations, installation of new replacement insulated window units and associated window flashings, and water barrier.

FIGURE 10. Insulation of exterior enclosure work in progress. Note existing plaster and brick masonry wall condition at left, metal stud cavity with spray foam insulation at new window, and purple moisture resistant gypsum board at right.

FIGURE 11. Grace Street Entrance showing rehabilitated condition, 2014. Compare with pre-construction photo above. Note paint coatings removed from stone and brick masonry at lower floors, along with restored brick masonry. Deteriorated historic wood windows have not yet been restored.

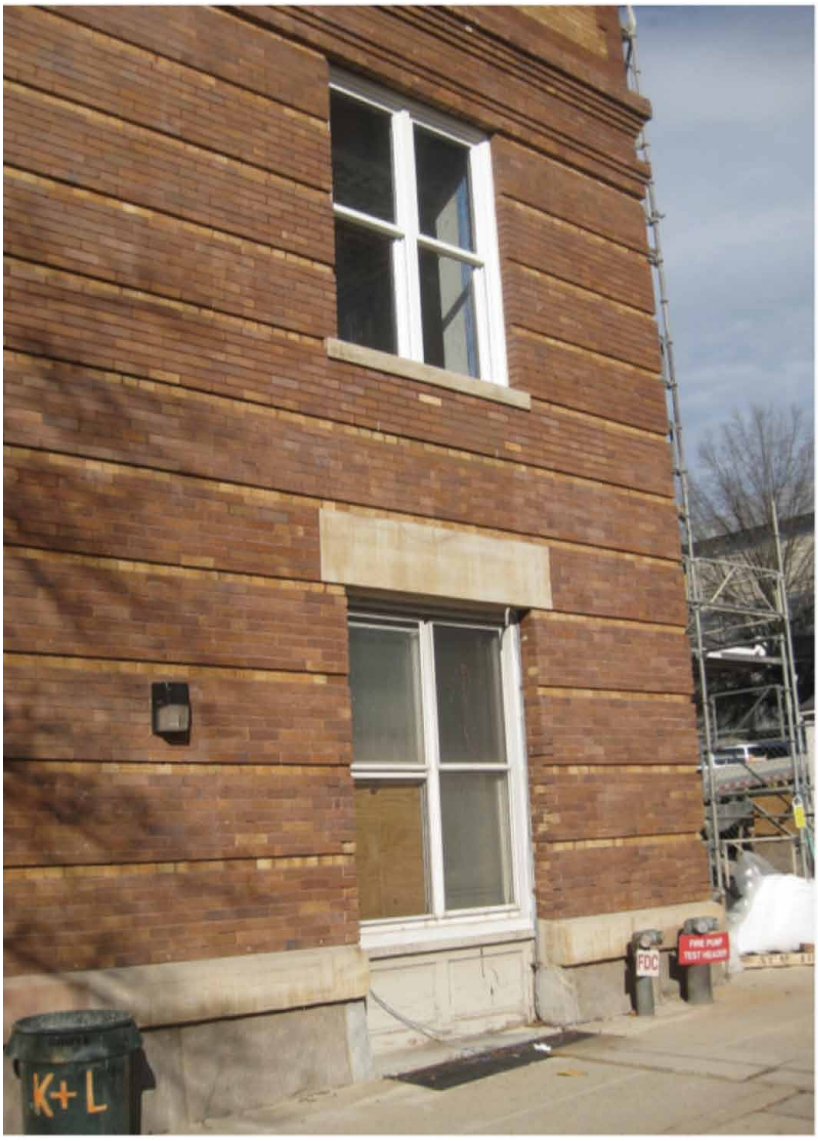


FIGURE 12. Northeast corner of the Ninth Street Façade showing restored brick and stone masonry and new replacement window at Second Floor. The First Floor window is a pre-existing deteriorated aluminum window that has yet to be replaced. The light fixture on the wall is a temporary construction fixture.

SELECTION OF MATERIALS

As with any sustainable project, whether new construction or rehabilitation, the selection of materials will play an important role in the project's overall success and can be pursued with complete consistency between sustainable and historic preservation goals. Ecologically friendly, local and renewable materials can easily be selected, as can low VOC materials. In the reroofing portion of the project, high reflectivity roof materials can usually be specified without compromising the historic nature of the building. All of these opportunities are in play in the Ninth Street Office Building rehabilitation project.

In addition, we were able to take advantage of the poor condition of some of the rooftop parapets where full reconstruction of the parapet was required. This existing condition allowed the construction team to remove the damaged brick masonry, repair the underlying water barriers, and reinstall the original brick in the reconstructed parapet. This allowed the project to take full advantage of LEED credits for minimizing construction waste/reuse of existing features materials and other related credits.

FIGURE 13. Ninth Street Courtyard Upper Floors showing rehabilitated condition. Compare with 2006 pre-construction photo above. Note replacement of mismatched masonry infill, removal of outdated rooftop mechanical equipment and corrugated metal addition, installation of new replacement windows and restored parapet coping stones.

FIGURE 14. Reconstruction of masonry parapet in progress. TPO flashing is being installed in preparation for new roofing and masonry work. Note newly restored and reinstalled terra cotta capstones at right.

Natural Ventilation and Daylighting

Historic buildings of a certain vintage, including the Ninth Street Office Building, were constructed before the advent of modern air conditioning systems and, in some cases, even electricity. As such, these buildings were designed to take full advantage of what we today consider to be fundamentally sustainable features such as natural passive building ventilation and daylighting.

Here again, the Ninth Street Office Building rehabilitation was able to blend historic rehabilitation criteria with modern sustainable principles as the new clad wood historic replica windows not only provide improved insulation value but also offer the same operability as the original double hung wood units from the early 20th century. The narrow floor plates for each of the building office wings, in combination with the interior programmatic requirements of the tenant, suggested an innovative floor plan arrangement where the private offices arranged at the perimeter of the building include full glass interior partitions. By taking this approach, despite the programmatic requirement for a very high proportion of private offices, daylight from the oversized perimeter windows is allowed to penetrate deep into the floor plate.

FIGURE 15. Daylight at Typical Office Floors. Full glass front walls (to be designed and built as part of the tenant interior phase) will define individual offices and the shallow floor plates will allow daylight and views to penetrate deep into the interior of the floors.

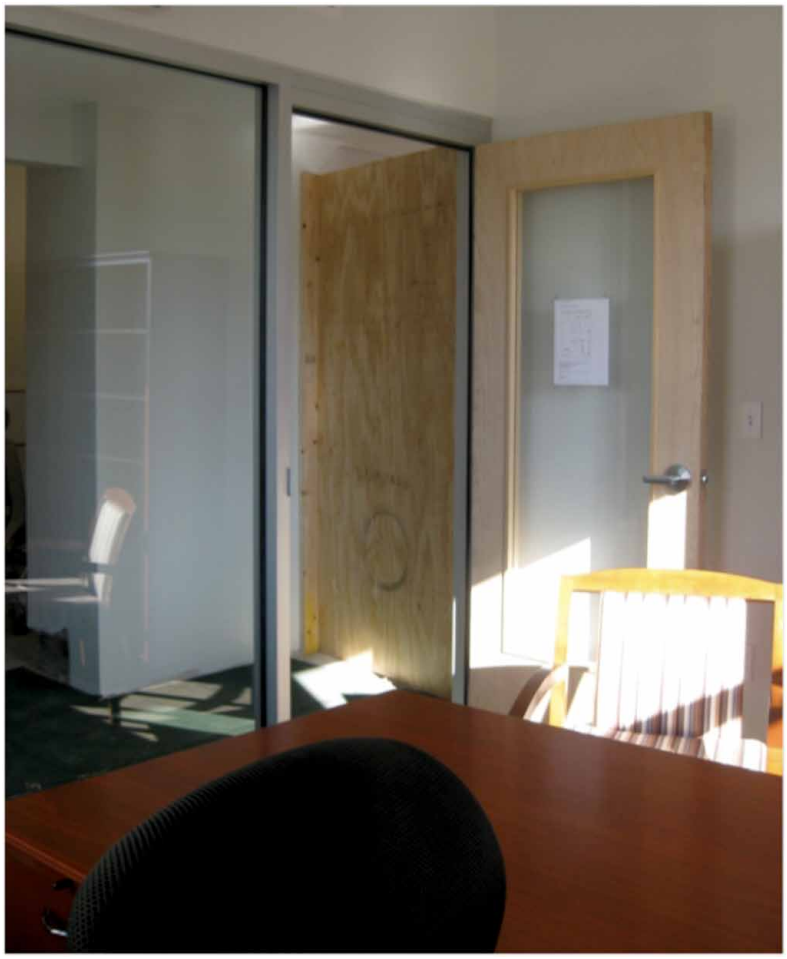


FIGURE 16. Mock Up showing full glass walls that will be used to define private offices to be built in tenant interior phase.

Mechanical / Electrical / Plumbing Systems

Although natural ventilation and daylighting are often effective "low tech" approaches in a sustainable historic rehabilitation project, there are also a number of opportunities for the incorporation of sustainable principles as part of the mechanical/electrical/plumbing portions of the project. Historic rehabilitation projects often present the opportunity for complete replacement of the M/E/P systems, which at minimum allows for the selection of new highly energy efficient systems and equipment. The use of solar, geothermal and other alternative energy supply sources can sometimes be incorporated into the project without affecting the historic aesthetic of the building. In fact, these new technologies are often developed to be unobtrusive and so not only allow for better energy usage and efficiency, but also allow for the ready incorporation of the new technology into the physical plant and systems of the rehabilitated historic building.

For the rehabilitation of the Ninth Street Office Building, the project team was able to take advantage of all new M/E/P systems, such as high efficiency LED light fixtures and low flow plumbing fixtures. The requirement for complete replacement of M/E/P systems also provided the project design team the opportunity to consider the use of new cutting edge technologies for the project.

In this project, the use of a state-of-the-art Variable Refrigerant Flow (VRF) HVAC system was selected for the office floors to provide not only the energy efficiencies and LEED credits associated with that technology, but also to minimize the space required for the system distribution runs (where we are running refrigerant piping in lieu of air ducts) throughout the historic building. This assists the design team with the insertion of the modern systems into the historic fabric, where limited overhead clearances are the norm. This is often a difficult task on historic rehabilitation projects, made easier in our case by the judicious selection of the new systems.

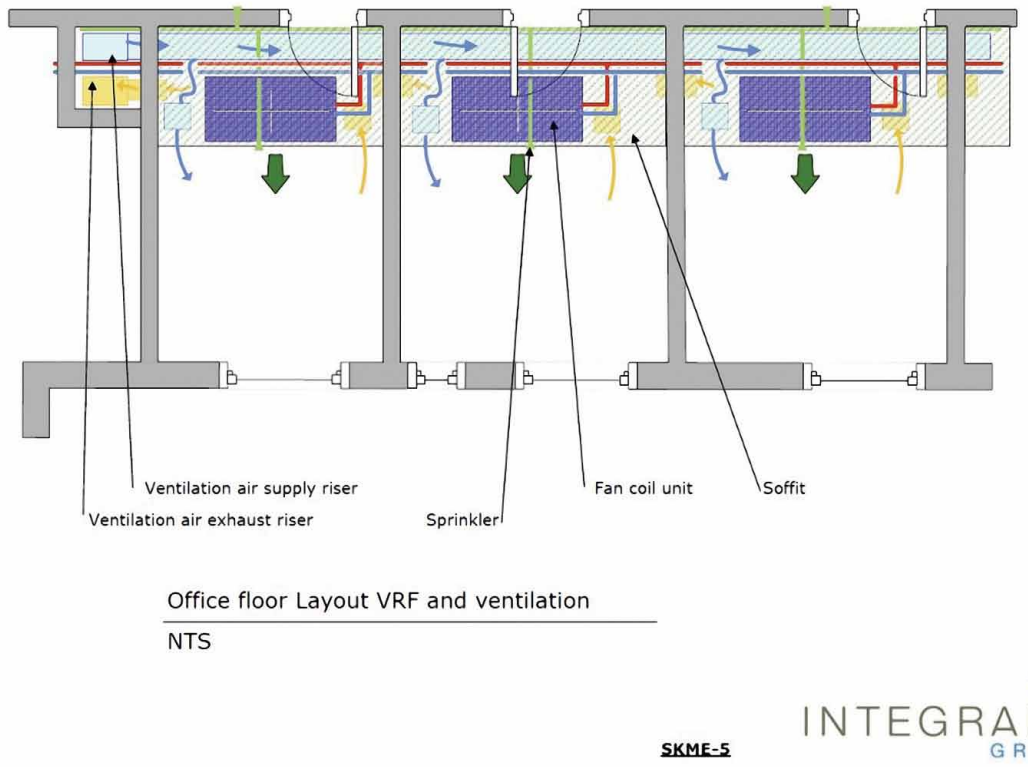


FIGURE 17. Variable Refrigerant Flow (VRF) typical system equipment and diagram. Equipment and refrigerant lines, along with fire sprinkler piping, electrical and data cable, and other building utilities are located in a dropped soffit along corridors to allow full unobstructed height within the office space, preserving the historic volume of the office space. Diagram by Integral Group.

Indoor Environmental Quality

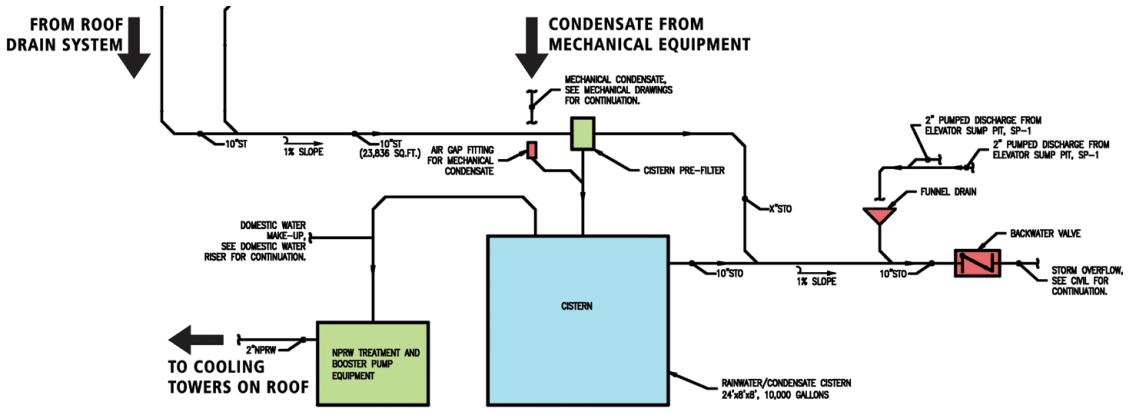
In addition to the many advantages obtained by the increased use of natural ventilation and daylighting inherent in many historic projects, there are a number of other opportunities related to the improvement of indoor environmental quality that can be pursued without compromise of the historic nature of the rehabilitated building. For example, the design and installation of CO^2 and outside air monitoring sensors, the introduction of daylight photo-sensors to monitor and control the output of artificial lighting sources, and the implementation of thermal comfort and lighting systems that allow user control are all types of advanced systems controls that can be readily incorporated into the renovated project without visual intrusion. All of the above are being considered for use at the Ninth Street Office Building as the interior tenant build-out documents are being prepared.

Water Conservation and Efficiency

Opportunities for sustainable design in the area of water efficiency that may also be pursued without discernable aesthetic effect on the historic project, include rainwater harvesting, gray water reuse, and the specification and use of reduced flow plumbing fixtures and waterless urinals. The goal, again, is to take advantage of technologies that can be used with minimal effect on the historic aesthetic of the building vs. what would normally be used in any given project.

Through the use of water savings strategies, such as low flow water fixtures and the use of diversion of rainwater and HVAC condensate drainage into a water collection cistern below our building's basement to provide make-up water for the rooftop cooling tower, it is anticipated that the Ninth Street project can enjoy 20% to 40% water savings per year.

FIGURE 18. Water Harvesting System Diagram. Rainwater from roof drains is diverted through a pre-filter into the 10,000 gallon water storage cistern located below the basement floor. Condensate is also collected from the mechanical equipment throughout the building. When called for, water is pumped out of the cistern through a water treatment/booster pump system to provide make-up water for the cooling towers on the roof.



BEYOND DESIGN

Construction/Implementation Challenges and Lessons Learned

As the construction phase for the rehabilitation of the exterior building enclosure is wrapping up and the Building Shell & Core construction proceeds, we are in a position to evaluate some of the lessons learned on the project thus far.

The value of coordination between the design and construction teams, in conjunction with the participation of the owner, cannot be overemphasized. Daily interaction on the project site between all team members is critical as existing unknown conditions are uncovered. Flexibility in approach by all parties during this implementation phase is critical. For the Ninth Street project, the Construction Manager at Risk (CM@R) project procurement model mandated by the owner lent itself perfectly to this critical need for flexibility.

In major renovation projects, especially an historic rehabilitation project of our project's complexity, the CM@R procurement method is the only sensible approach to take. In the CM@R approach, the Construction Manager is selected early in the design process and is put under contract in a Guaranteed Maximum Price (GMP) arrangement with open book accounting. Appropriate cost allowances and contingencies are included within the GMP. Sub-contracts are still bid out to multiple bidders under the CM's umbrella, which maintains the benefits of competitive bidding. This approach allows for meaningful real-time input by the CM into constructability and budget issues while the design work is being completed, as well as important construction support, such as for selective forensic demolition, as may be needed to inform the ongoing design work. The use of a GMP

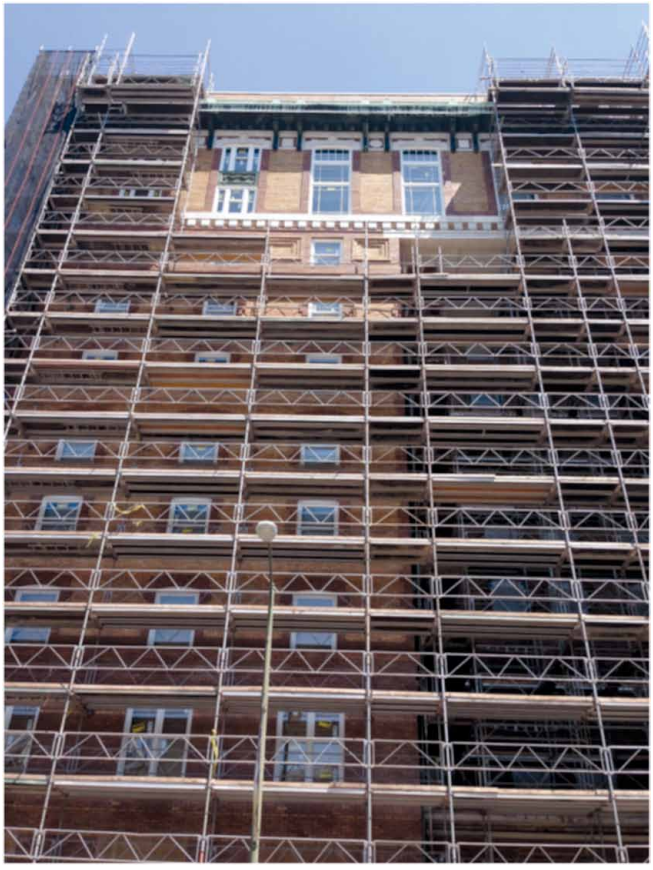


FIGURE 19. Scaffolding along Grace Street coming down to reveal the restored historic façade.

contract allows for flexibility in design approach as unknown conditions are uncovered without unnecessary construction cost change orders.

As conditions warrant variance from approved historic rehabilitation plans, ongoing follow up reviews with the VDHR are required to maintain the open dialogue of teamwork established over the course of the project and avoid surprises at the end of the project.

The state's supervisory and inspection protocols put in place for our project provide an extremely valuable service for quality control during construction, as a third-party inspector is engaged directly by the state to provide full-time on-site monitoring and inspection services with daily and weekly progress status reports. Bi-weekly Owner/Architect/Contractor meetings are held on-site as well, and issues are discussed and resolved in real time whenever possible.

CONCLUSION

The key to development of a successful sustainable historic rehabilitation project is striking the proper balance between the historic and sustainable project requirements. This balance is best achieved by examining those features inherent in the historic preservation/rehabilitation projects that are also fundamentally sustainable in nature.

While the historicist idea that the existing fabric and built form should be preserved wherever possible may sometimes be in conflict with the sustainability approach that says that new energy efficient systems and sustainable materials should be incorporated into the

FIGURE 20. The Ninth Street Office Building, December 2014.

project wherever possible, the question is not really whether these concepts are mutually exclusive, but rather how the project design team can take advantage of and incorporate the best of each of these approaches into a cohesive and holistic design that is environmentally, socially and fiscally responsible. Flexibility on both the historic and sustainable sides is necessary: an integrated design approach will often lead to a successful solution.

As we have seen, the Ninth Street Office Building project successfully negotiates this balance both in terms of the up-front development of the project design and documentation and also the subsequent implementation of appropriate systems during the ongoing construction phases. As the development of the interior tenant build-out design progresses, the project team will strive to make informed decisions in the best overall interest of the project. Ultimately, how the project performs after completion of construction and occupancy by the tenant will be the final gauge of the level of success that we are able to achieve. Enhanced building commissioning at the conclusion of construction, along with state mandated follow up site inspections and system performance evaluation at 6-month and 11-month intervals following occupancy, will allow us to make these determinations. We look forward to performing those analyses when the time comes, so that the case study of the Ninth Street Office Building project can be concluded and the efficacy of our approach for future projects can be determined. Ongoing evaluation, validation and adjustment of our approach is a continuous process.

ACKNOWLEDGMENTS

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The Project M/E/P Engineer is *Integral Group* (Richmond, VA office). The Sustainability Consultant is *Sustainable Design Consulting, LLC* (Richmond, VA office). The Construction Manager is *Kjellstrom + Lee Construction* of Richmond, VA.

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