SWR INSTITUTE TRINITY AWARD SUBMISSION

Project Title:

Exterior Wall and Roof Repairs, The 1717 Rhode Island Avenue Building, Washington, DC

Location:

1717 Rhode Island Avenue NW, Washington, DC

Entry Classification:

Restoration

Project Cost:

$6,700,000

Duration:

250 Days

Start/Completion Date:

May 1, 2010 through January 7, 2011

Work Scope *(500 word maximum)*:

The 1717 Rhode Island Avenue Building is a 10-story Class A office building located in the historic DuPont Circle neighborhood of Washington, DC (Figure 1). Original construction of the building in 2004 included historic preservation and integration of four 4-story townhomes originally built between 1877 and 1886. The building also abuts historically significant St. Matthew's Cathedral.

The exterior walls of the building are clad in brick and limestone masonry, and were designed to function as a cavity wall system. However, the building experienced chronic water leakage resulting in significant interior damage starting shortly after original construction.

The original scope of repair work for this project was developed to address ongoing water leakage and facade distress. The scope of repair work consisted of the following:

1. Replacement of through-wall flashing at existing shelf angles, lintels, terrace parapet coping caps, base of rising walls above terraces, gable wall coping caps, and window sills to address deficiencies in original through-wall flashing (Figures 2 through 4).

2. Providing insulation and flashing window jambs to address condensation and water penetration at windows.

3. Providing weather-resistive barrier (WRB) over back-up masonry at penthouse level gable walls where none was originally installed.

4. Providing new galvanized steel shelf angles where original shelf angles were discontinuous around building corners or were missing entirely.

5. Providing new pre-finished aluminum coping caps over existing limestone coping caps to address deficiencies in underlying through-wall flashing without disturbing roof components that terminated on limestone coping caps.

6. Providing metal sill caps over rowlock brick sills at glass block and transom windows.

7. Providing new vertical masonry expansion joints where missing.

8. Repairing existing gutter liners to address water penetration through deficiencies in liners.

9. Removing and resetting limestone units in full mortar beds.

10. Replacing cracked or otherwise deteriorated brick and limestone units.

11. Replacing damaged metal roofing components.

12. Providing additional shelf angle anchors where missing from existing holes or where excessively spaced.

13. Providing exterior wall sheathing where missing.

14. Sealing exterior wall penetrations, including light fixtures, pipe and conduit penetrations, fire alarms, speakers, etc.

Alternates selected by the Owner to be included in the project consisted of the following:

1. Providing lipped brick and drip edges to more closely match the original appearance of the building.

2. Repointing 100% of brick and limestone masonry to blend repair areas with existing masonry.

3. Providing a penetrating water repellent at masonry surfaces.

4. Accessing work entirely from the exterior of the building via stairs, fixed scaffold, mast climbers, swing stages, etc.

5. Providing insulation and closure plates at skylights to minimize ongoing condensation.

Abstract *(100 words maximum):*

The 1717 Rhode Island Avenue exterior wall and roof repair project was a very complex project prior to the start of any work, due to logistical challenges, coordination with tenants and neighbors, and schedule constraints. Unforeseen conditions that affected the scope of the project and the interior tenant environment significantly magnified the complexity of the project.

Since completion of the project in January 2011, there have been no water leaks despite many wind-driven rainstorms, including the effects from hurricane Irene. Successfully overcoming these challenges to meet the project objectives is why we believe this project is worthy of an award.

Unforeseen Conditions:

A few significant unforeseen conditions greatly magnified the complexity of this project as follows:

1. Based on the required repairs, removal of the brick and limestone masonry was originally only required above the shelf angles and window lintels, at the window jambs, below the window sills, and at the terrace parapet walls. However, during the initial phases of demolition, it became clear that there were significant deficiencies with the existing WRB. At many locations the WRB was missing, not continuous, sagging away from the exterior sheathing, included holes, or was reversed lapped (Figures 5 and 6). These deficiencies were observed throughout the facade wherever masonry was removed. The deficiencies in the WRB also caused deterioration of the underlying exterior wall sheathing and metal studs at many locations (Figure 7). For these reasons, it was decided to remove 100% of the

brick and limestone masonry from the exterior walls so that the existing WRB could be completely replaced with a continuous and properly installed WRB (Figure 8). Although this added a significant amount of work to the project, the overall impact on cost and schedule was minimal due to thorough and efficient planning.

2. During the initial phases of demolition, dust penetration into interior areas of the building was significant. The cause for dust penetration was due to lack of a continuous air barrier and negative differential pressure generated by HVAC equipment. To address this issue, the perimeters and joints of every window in the building were sealed with tape to minimize dust penetration. However, the interior gypsum sheathing did not extend completely up to the floor slabs above the drop ceilings. Gaps between the exterior wall sheathing and the adjacent columns and slabs would allow dust to penetrate into the wall stud spaces and up into the plenum space above the drop ceilings. Therefore, all gaps above the drop ceilings had to be closed. These measures effectively minimized additional dust penetration.

3. During the initial phases of material installation, odor penetration into the building was significant. This caused many complaints of nausea and headaches. As with the dust penetration, the odor penetration was due to the lack of a continuous air barrier and negative interior differential pressure. Although interior joints and gaps had been sealed effectively against dust penetration, these measures were not adequate for odor penetration. In addition, alternate non-odorous materials were not available to provide an equally durable repair solution. Therefore, prior to using the necessary repair materials, all joints and gaps in the exterior building envelope had to be sealed with non-odorous materials. In addition, operation of the HVAC system was modified to minimize the negative interior differential pressure as much as possible. These measures effectively minimized additional odor penetrations.

Problems/Challenges/Solutions:

Throughout the design and construction phases of the project many technical and logistical challenges were encountered. Some of these challenges included the following:

1. The window frames were "C" shaped, open to the masonry wall cavity, and not configured to easily receive new jamb flashing. As such, a new backup plate was required to be tucked into the window frame and attached to the adjacent backup materials to provide an adequate surface to support the new jamb flashing (Figures 9 and 10).

2. Missing and improperly configured through-wall flashing adjacent to roofs, skylights, and waterproofing membranes required special detailing to minimize water penetration while ensuring compatibility between, and integration of these systems. In particular, termination of copper roof and skylight components on the coping caps required details that would allow the coping caps to remain in place, to minimize disruption to the roofs and skylights.

3. Access to work areas was difficult and onsite storage was limited. A combination of fixed scaffold, swing stages, and mast climbers were used to access the work (Figure 11 and 12). Support of much of this equipment was by the existing structure, since much of the work was above building terraces or adjacent properties. The roofs of the historic townhomes and St. Matthew's Cathedral had no capacity to support any construction load. As such, evaluation of several structural components of the building was necessary to ensure they were adequate to support the anticipated construction loads.

4. Work on every elevation was over adjacent private property or a public ally. Coordination of the work required several meetings with the managers, engineers, architects, and attorneys representing those properties, to develop detailed work and protection protocols. Meetings were held throughout the project to address concerns and revise the protocols as necessary. Even a meeting with the U.S. Marshals Service was required when the justices of the Supreme Court attended Red Mass at St. Matthew's Cathedral prior to the start of their judicial term in October of 2010.

5. As a fully-occupied Class A office building with high-end tenants, coordination with the tenants on nearly a daily basis was critical to manage disruptions to their daily activities. Due to the local noise ordinance that prohibited noisy work prior to 7:00 am and on weekends, it was clear that the tenants would be subjected to significant demolition noise throughout the project. Meetings were held with the tenants prior to the start of construction to discuss anticipated impacts on their daily office activities and procedures to address time periods where tenants could request that only quiet work be performed. Several meetings were also required throughout the duration of the project to address tenant concerns. In addition, weekly updates were provided to tenants, to report on anticipated work that would impact them on a week-by-week basis.

6. Due to specific provisions in tenant lease agreements, it was necessary to limit the project duration to 8 months. The amount of work to be completed in this timeframe required a crew of around 70 workers for most of the duration of the project. This resulted in an extremely fast-paced project, placing extreme

importance on quick responses to submittals, change orders, and requests for information.

Safety Considerations:

Safety considerations were a very important part of the project for the following reasons:

1. Work over adjacent properties and the public way required significant overhead protection and scaffold netting to protect the public, building tenants, and neighbors from potential falling objects, particularly during demolition work.

2. Installation of fixed scaffold for the full height of the building required particular attention and care to mitigate fall hazards during installation.

3. Due to the number of workers on site and the volume of materials to be removed and reinstalled required specific plans to ensure materials were removed and transported in a safe manner.

The project team work closely together to ensure all federal safety requirements were followed.

Community/Environmental Impact:

Potential impacts to the neighboring community and building tenants included dust, noise, and odors. Methods to mitigate noise, dust, and odors within the building are as previously discussed above. Weekly meetings were held with neighboring properties, including a restaurant with primarily outdoor seating, on a weekly basis to discuss schedule of work. Hours of demolition were modified as necessary on a daily basis to accommodate Mass or other special events at St. Matthew's Cathedral. Dustless grinders were used to minimize dust on and around the project site.

Installation of a continuous weather-resistive barrier/air barrier significantly improved thermal performance of the building, and resistance to air and water infiltration. Installation of insulation and jamb flashing at windows significantly improved their condensation and water penetration resistance. These improvements resulted in a significant reduction in wasted energy.

Site Constraints:

Constraints at the site were significant and included the following:

1. The building was required to remain fully occupied during repairs. As such, daily communication with tenants was required regarding noise, dust, and odor producing work.

2. St. Matthews Cathedral held daily Mass and the priests' primary residences were within the adjacent rectory that abutted 1717 Rhode Island Avenue. As such, daily communication with St. Matthews regarding noise producing work was required.

3. Access to St. Matthews Cathedral roofs were required to complete repairs to the exterior walls over those roofs on the west elevation of the building. Substantial roof protection was required to prevent damage to those roofs. However, since the roofs were not capable of supporting any significant weight, a platform system had to be constructed above the roofs and attached only to the 1717 building structure to support fixed scaffold (Figure 13).

4. Work on the north elevation of the building was over a public alley that was required to remain open to the public, as well as delivery and garbage trucks. As such, a tall heavy-duty canopy was required over the full width of the alley (Figure 14).

5. Work over the east elevation of the building was over a private driveway that was required to remain operational. Significant negotiation was required with the property owner regarding use of the driveway and overhead protection.

6. The 1717 building included several skylights with masonry walls above them. Access to the masonry walls required cantilevered beams from within the building to support fixed scaffold. All skylights were required to be protected from falling debris.

7. The windows in the building were not replaced as part of the project. As such, they needed to be protected from damage by throughout the project. Window coverings adversely affected tenants by blocking light while the coverings were in place.

Quality Control/Field Testing:

Prior to initiation of repairs, a mock-up phase was implemented to ensure the specified repairs were practical to perform. Material color matching was performed to ensure the general appearance of the building did not change once repairs were complete (Figure 15).

During the repairs, the Engineer was on site 3 to 4 days per week for the duration of the project to observe ongoing work. Mortar compressive strength testing was performed

throughout the project. In addition, sealant joints were subjected to random adhesion testing to ensure proper installation.

Rigging Approach:

All work was required to be accessed from the exterior of the building. Transportation of material, equipment, and personnel through the building at any time during construction was not allowed. The contractor used a combination of fixed scaffolding, hanging catwalks, mast climbers, and swing stages to access the work. Exterior elevators were used to transport materials and equipment to upper levels of the building.

Sustainment:

Original construction was obviously not sustainable due to deficiencies in the exterior wall system that required repairs to return the exterior walls to a serviceable condition. This repair project has provided a sustainable building envelope by properly installing and integrating a weather-resistive barrier/ air barrier, through-wall flashing, and jamb flashing. With proper maintenance, the service life of the repaired building envelope should exceed 50 to 75 years.

FIGURE APPENDIX

Figure 1

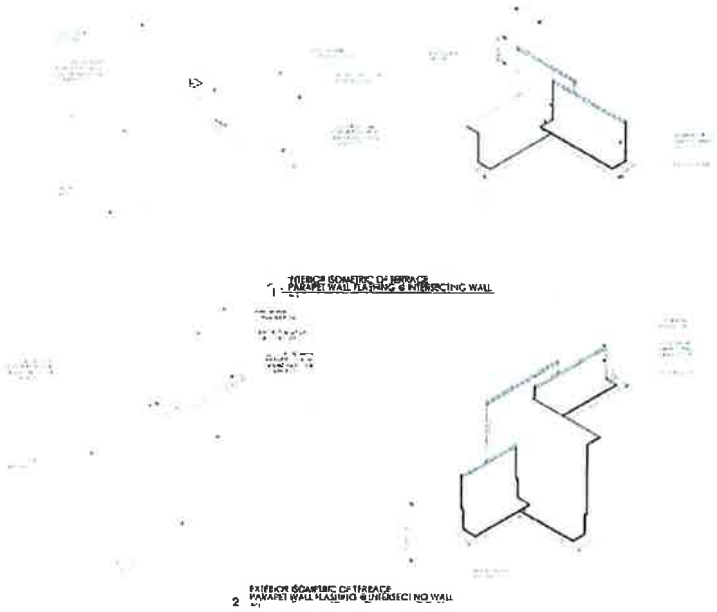

Figure 2

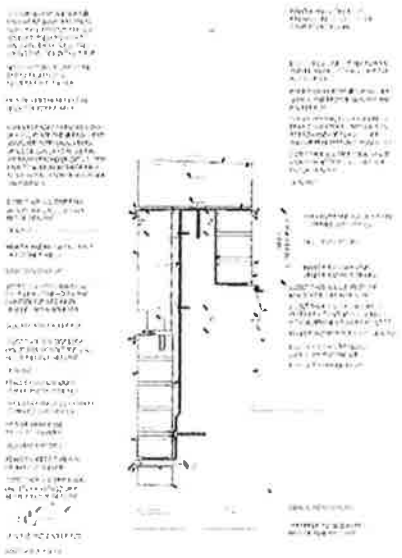

Figure 3

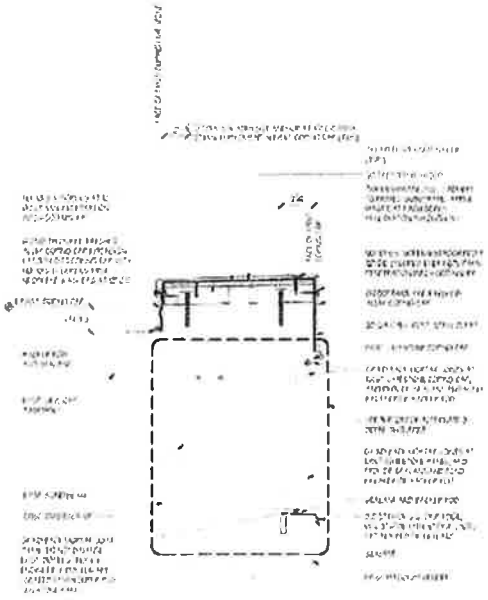

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

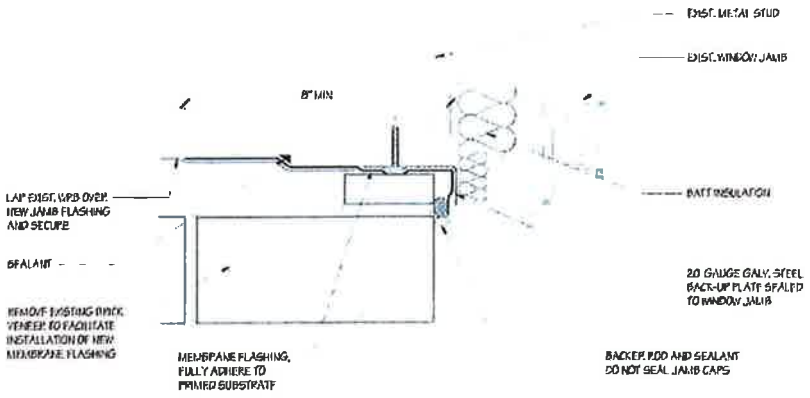

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

IMAGE FOR AWARD PLAQUE


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