Bethel Park Restoration

Houston, TX

Submitted by Walter P Moore

Bethel Missionary Baptist Church was founded in the late 19th century by Reverend Jack Yates, an early leader of Houston's African-American community. The church is located in Freedmen's Town, a post-Civil-War Houston neighborhood founded by freed slaves, and was the first constructed by former slaves, with the earliest portion constructed in the 1890s.

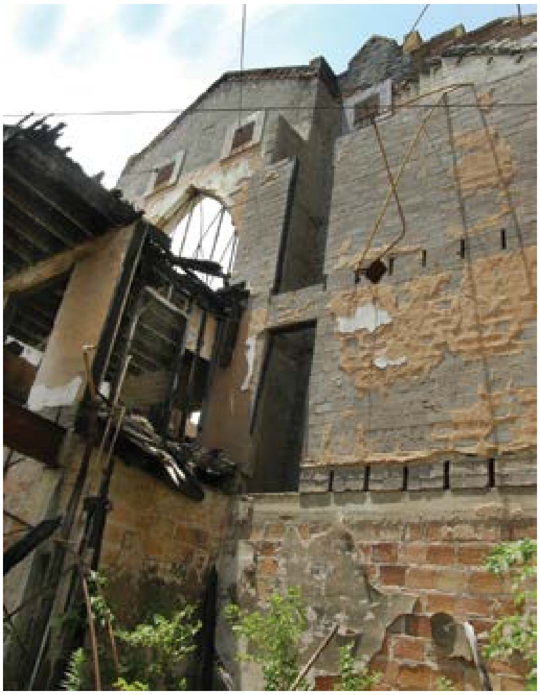

Fig. 1: Masonry wall prior to restoration

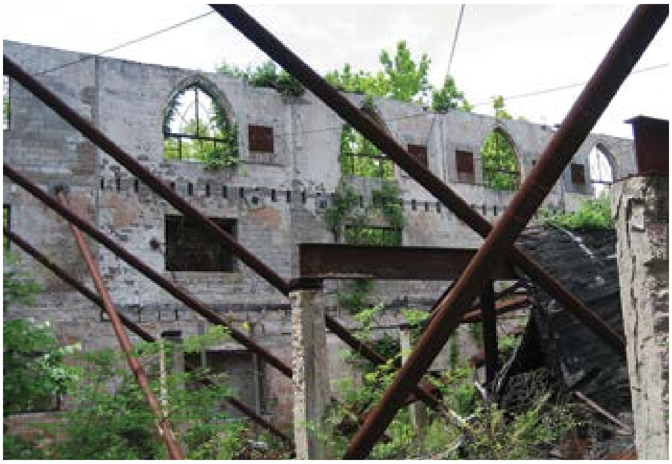

Fig. 2: Interior of gutted church

After the first two church buildings were destroyed, a third, single-floor church building was erected in 1923. Second and third floors were added in a 1950 renovation. The sanctuary was designed by James M. Thomas, a prominent architect of African-American churches. In January 2005, a fire gutted the interior of the historic structure, collapsing the interior framing and roof, leaving only the exterior masonry walls in place. The structure sat exposed and abandoned until 2009, when the City of Houston purchased the property to convert the former church into a community park (Fig. 1 and 2).

The remaining walls consisted of two distinct constructions. The 1923 single story was a reinforced concrete frame infilled with structural clay tile with a brick veneer. These walls were present at the base of the east, west, and south walls. In 1950, when the second and third floors were added to the church, the north wall of the building was reclad with a concrete masonry unit (CMU) and brick cavity wall system, and the new north façade was enlarged to a height of 50 ft (15 m). The CMU and brick cavity walls were also constructed on top of the existing 1923 walls on the east, west, and south elevations during the 1950 renovation.

BEFORE RESTORATION, PROTECTION

The engineer was initially retained to provide nondestructive testing services to evaluate the conditions of the existing masonry walls and develop strengthening solutions if needed. The initial site visit, however, revealed some immediate issues:

- Difficult site access and possibly dangerous conditions due to collapsed framing and debris that remained from the 2005 fire; and
- Public safety risk due to deteriorating conditions—a large crack that ran from the base to the top of the 50 ft (15 m) brick veneer façade (adjacent to pedestrian sidewalk) indicated imminent collapse (Fig. 3).

Before any evaluations could be performed, the engineering team made recommendations to the City to immediately close the street to traffic and temporarily brace the existing walls. Emergency shoring and bracing was designed and installed within a 24-hour period to protect the public and the structure (Fig. 4).

WALL STRENGTHENING IN PLAIN SIGHT

Once the walls were stabilized, the engineers devised a plan to provide safe site access to evaluate the building. The south wall, portions of which had collapsed, was demolished and the interior of the site was cleared. The design team was then able to enter the facility to perform a condition assessment program of the existing walls. This program included ground-penetrating radar (GPR) scans to assess the wall reinforcement, flat-jack testing to develop information for design, and a visual assessment to document distress conditions for repair (Fig. 5).

The assessment program determined that the CMU backup walls and structural clay tiles were in poor condition, contributing to dangerous conditions. Significant cracking was evident throughout the backup wall system, and large portions of the wall were unreinforced, including the 50 ft (15 m) north wall. At several locations, the brick ties installed during the 1950 construction had corroded and failed, and the veneer was deflecting away from the backup.

Maintaining the historic integrity of the walls required a minimally invasive strengthening solution that did not alter the existing aesthetics and would minimize the extent of replacement in the building veneer. The design team proposed a galvanized steel frame that would visually recall the original gabled roof lines of the church and polyresin glass panels that mimic stained glass to be installed in the existing windows and door openings.

The existing walls had to be strengthened to span between the girts of the new frame when potentially exposed to 110 mph (177 km/h) hurricane wind speeds (as required by Houston's building code). This design requirement alone would be challenging enough for a heavily damaged masonry structure, yet because the walls themselves would be exposed and without interior finishes, this made it all the more challenging. The design team determined the strengthening would need to be "hidden in plain sight" to not visibly alter the appearance of the walls. The engineer developed a repair solution that strengthened the backup wall and then pinned the existing brick veneer to the strengthened backup. With this strengthening accomplished, a ferrocement finish was applied for additional strengthening and to provide a clean appearance for the interior of the park.

At the base of the 1923-era walls, a new reinforced CMU backup wall was constructed to "sandwich" the existing structural clay tile infill, as removing this infill could have potentially compromised portions of the wall supported above it. Stainless steel helical anchors were then driven through the existing veneer, the existing structural clay tile, and into the new backup wall beyond.

In the 1950-era construction, the existing CMU backup walls were reinforced by removing the interior shell of the CMU and grouting in new

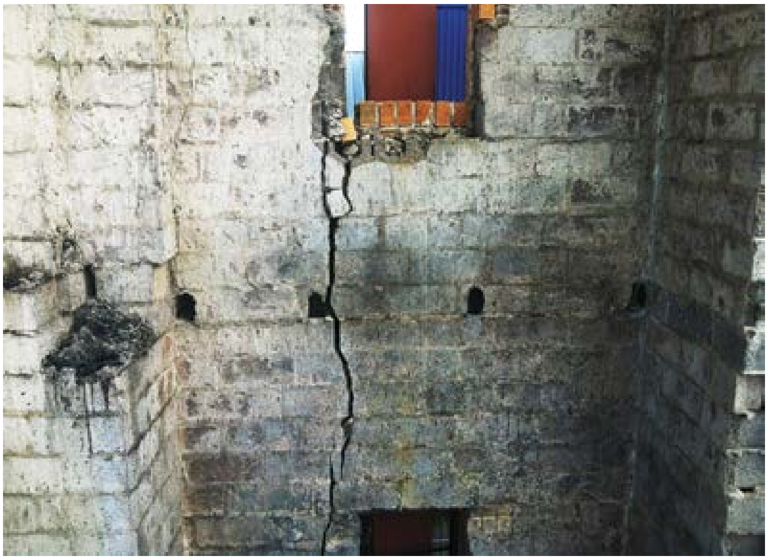

Fig. 3: A large crack that ran from the base to the top of the 50 ft (15 m) brick veneer façade (adjacent to the pedestrian sidewalk) indicated imminent collapse

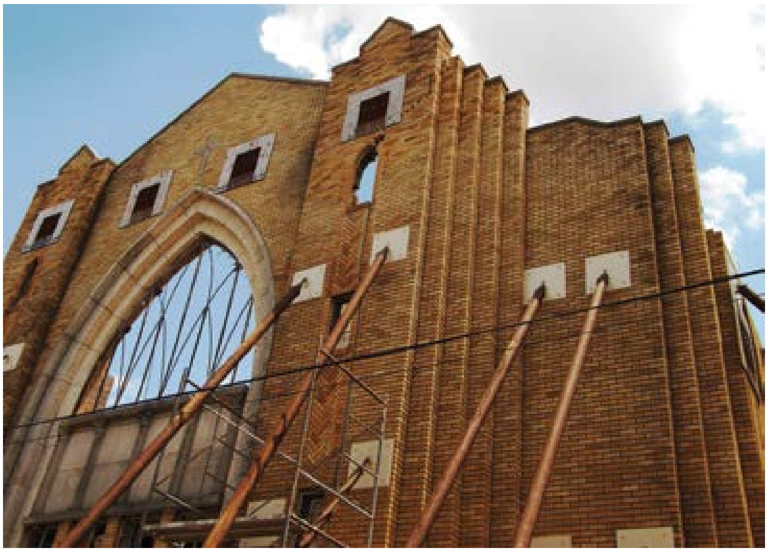

Fig. 4: Emergency shoring and bracing

Fig. 5: Part of condition assessment program on existing walls

vertical reinforcing bars doweled into the existing grade beams. Large cracks in the existing CMU backup were reinforced by routing out the horizontal grout and installing stainless steel helical ties across the crack. Once this crack reinforcement was installed, the grout line was repointed and the crack itself was then grouted. Cracks through the exterior brick were also treated in this manner. Helical anchors then pinned the brick veneer back to the strengthened backup wall.

A ferrocement coating provided lateral reinforcement to the CMU backup wall and provided a uniform finish to the interior of the park walls (Fig. 6). Galvanized welded wire reinforcement was pinned to the interior faces of the walls, and a 2 in. (51 mm) thick shotcrete coating was applied. The ferrocement coating extended around the edges of window openings and at the tops of walls to provide clean, aesthetically pleasing terminations. It was then given a drag finish for a relatively smooth wall surface that resembled a stucco finish. A cream-colored elastomeric coating was then specified to brighten the interior finish and contrast against the new multicolored fenestrations (Fig. 7).

Fig. 6: A ferrocement coating provided lateral reinforcement to the CMU backup wall and provided a uniform finish to the interior of the park walls

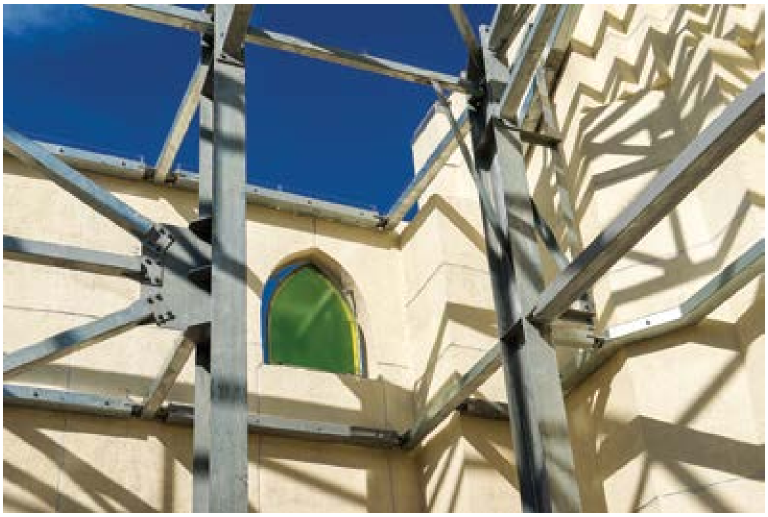

Fig. 7: A cream-colored elastomeric coating brightened the interior finish

While this strengthening ensured that the historic walls would withstand hurricanes common to the area, a number of other details were required to enhance the appearance of the park and preserve key architectural elements of the walls. Cast stone panels installed in the north wall required patches to repair spalls and restore these panels. Existing lintels over door and window openings in the 1923-era construction were removed and replaced because corrosion of the original lintels had resulted in rust-jacking and cracking (Fig. 8).

Coordination with the City, the design team, and the contractor was a fundamental component in successfully delivering this project. Once construction began, it became evident that each opening through the wall varied from the next. Each new fenestration required special detailing to connect to the existing walls. To anchor the new window and door panels, structural clay tile was removed between the new CMU backup wall and the existing brick veneer. Helical anchors were then installed between the brick and the CMU backup and the cavity was filled as a part of the ferrocement construction. This provided a solid substrate into which anchors for the new panels could be installed.

All told, the park construction lasted just over 1 year, with the ribbon cutting for the new park on December 15, 2013. The completed Bethel Park features concrete and brick walkways; installation of an artificial turf interior courtyard; and site amenities including raised fountains, seat walls, benches, lighting, fencing, landscaping, and irrigation. A highlight of the park is the historic education panels mounted throughout the space.

CONCLUSIONS

Severely damaged by fire, abandoned, but not forgotten by its community and congregation, the Bethel Park project preserves an important part of Texas and African-American history. Restoring heavily damaged, unreinforced masonry walls, protecting the public safety, and creating a new community space in which the original church walls were integral were definite challenges for the design team. The resulting combination of strengthening techniques, however, resulted in exposed masonry walls where the strengthening contributes to the overall aesthetic (Fig. 9 and 10).

The total project cost with property acquisition, bracing, design, and park development was $4.7 million. The portion for strengthening the structure was $2.1 million—almost half the total construction cost. Bethel Park in Houston, TX, is a unique restoration effort that successfully preserved the history and architecture of Bethel Missionary Baptist Church and provided a new park in the city's fourth ward.

Fig. 8: Existing lintels over door and window openings in the 1923-era construction were removed and replaced

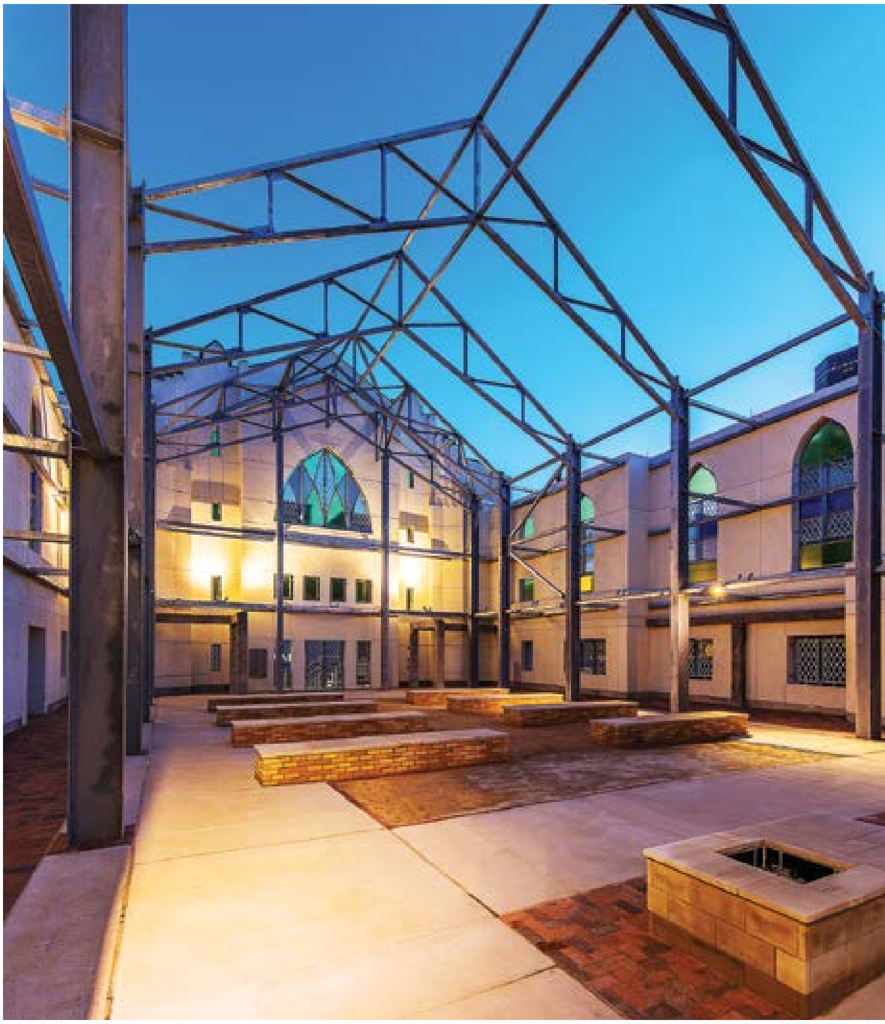

Fig. 9: Interior of finished project

Bethel Park

OWNER
City of Houston
Houston, TX

PROJECT ENGINEER/DESIGNER
Walter P Moore
Houston, TX

REPAIR CONTRACTOR
JE Dunn Construction
Houston, TX

Fig. 10: Rear of finished project and park