

# Exterior Restoration of the Country Club Christian Church

Kansas City, MO

Submitted by Concrete & Masonry Restoration Company, Inc.

**T**he Country Club Christian Church is the most prominent architectural cast stone structure on Kansas City, Missouri's upscale Ward Parkway, near the nationally famous Country Club Plaza. The original church structure was constructed in 1922 and was designed by one of the great architects of this country, Walter Clarke Root. The church architecture is English Gothic including a central tower, ornate pinnacle finishes, intricate cast stone tracery, and numerous ornamental cast stone units around the perimeter of the church. The exterior façade is clad in architectural cast and cut stone.

When the restoration contractor was contacted in 2009, the structure was at a critical crossroad, as advanced deterioration of cast and cut stone elements was prevalent. The cast stone was severely decomposed and presented safety concerns. Many years of freezing-and-thawing cycles had taken their toll. The restoration contractor encouraged the owner to seek a long-term restoration program and incorporate the services of a restoration consultant. The owner agreed to the long-term comprehensive repair approach. The restoration contractor and consultant began work together in September 2011 to remove dangerous and unstable cast stone elements.



*Advanced deterioration of cast stone elements was prevalent*



*Severely deteriorated stone and mortar presented safety concerns*

## INVESTIGATION AND FINDINGS

The restoration consultant performed testing and analysis of the original cast stone mixture design, including petrographic analysis and carbonation testing. New cast stone mixture designs were evaluated and tested by the restoration consultant and an outside consultant until an optimum mixture design was approved.

The investigation revealed some exciting findings. The original cast stone ornaments were gravity set. As such, no mechanical ties or steel anchorage were holding together major components. Ornamental cast stone finials that did have existing dowels were fabricated from ferrous metal, which had experienced significant corrosion and rust pack.

Predominant findings of the petrographic study were:

1. Surface cracking was due to initial drying shrinkage of the thin outer layer of the cast stone;

2. Some of the cracking penetrated the surface layer, but most did not; and
3. Internal cracking of the cast stone was due to alkali-silica reaction (ASR), which had long since ceased.

Carbonation of the old cast stone was full depth, but was irrelevant to the deterioration of those units. The predominant mechanism of failure was freezing-and-thawing degradation. Severe deterioration of cast stone units was also caused by a non-breathable coating application in 1987. Other factors contributing to deterioration of cast and cut stone had resulted from localized areas of

nonexistent flashing, inadequate flashing, and lack of sufficient drainage.

## RESTORATION PROGRAM

The selected repair program included removal and reconstruction of large cast stone pinnacle structures at the base of the tower, around the perimeter of the sanctuary and the north wing, with new cast stone. Repair and maintenance of cut stone included repointing of deteriorated mortar joints and removal and replacement of cracked and deteriorated cut stone with units to match the existing stonework. Several hundred cut stones were removed and replaced.

Where original cast stone could not be reasonably removed and replaced, the repair of deteriorated cast stone units included:

1. 235 ft (72 m) of epoxy injection at numerous cracks on interior and exterior cast stone surfaces;
2. 127 ft<sup>2</sup> (12 m<sup>2</sup>) of delicate patching of cast stone units; and



*Reconstruction of cast stone pinnacle structures*



*Scaffolding, lifts, and a crane were used on the project*

3. Installation of new flashing and water deflection systems.

Maintenance of original cast stone units that did not require replacement included removal of existing paint with abrasive corncob media blasting, grinding, and repointing of deteriorated mortar joints, and grinding to remove sound and deteriorated mortar from upward-facing mortar joints and replacement with backer rod and sealant. The cast stone units then received a new water repellent and coating system to match the color of the coating systems on adjacent elements.

## PROJECT DETAILS

The project, located on the east side of Ward Parkway between 61st Street and 61st Street Terrace, used all property within the described boundary, excluding interior space, egress space, and the children's playground area. The project continued through church operations, funerals, and weddings. Aside from storage and laydown areas, the site was very congested, accommodating system scaffold, swing stage scaffold, up to five man lifts, one crane, a telescoping fork lift and several other large pieces of equipment.

Pinnacle assemblies, decorative pieces, coping, and cut stone were removed piece by piece using man lifts and cranes. Each individual unit was carefully unrestrained from surrounding elements, strapped, balanced, and hoisted to a laydown area. Many of the units were shipped to the cast stone manufacturer for mold making and shop drawings. After all of the cast stone pieces and assemblies were dismantled, the parapet walls and openings were flashed with sheet metal or membrane to prevent moisture intrusion into the structure.

As the new cast stone pieces were received on site, parapet walls and cavities were rebuilt and flashed to receive the new units and assemblies. All new units and assemblies were inspected, compared



*Telescoping lift used to access repair areas*



*New cast stone pieces were received on site and hoisted into place*



*Final assembly of some of the cast stone pieces*

to the shop drawings, and pre-constructed on the ground to be certain they would fit in position during final assembly.

Over 600 pieces of cast stone were replaced. Cast stone replacement included 12 pinnacle assemblies weighing 6100 to 18,000 lb (2767 to 8165 kg) each. Numerous other cast stones were replaced.

The central tower wood roof deck was removed and replaced with structural steel framing and steel decking. Ready mixed concrete was placed over the new steel roof decking. Other restoration work included new supports for corroded steel roof beams, modifications to roof drainage systems, and repair of the lightning protection system. In addition, new stainless steel and copper flashing was installed, three corroded steel lintels were removed and replaced, and 12 unique restoration anchors were installed at pinnacle bases.



*Completed exterior restoration project*

## CONCLUSIONS

The restoration consultant required and was present to verify conformity with all aspects of the project design. These requirements included mockups, on-site testing, regular inspections, weekly meetings, and documentation. As a result of the pre-project investigation, there were very few unforeseen conditions. The entire project allowance for unforeseen conditions was unused at project completion.

The Country Club Christian Church project is designed as a long-term restoration. The new cast stone is intended to be a 50-year-plus product. The cast stone mixture design was extensively tested to meet this objective. Reinforcement within the new cast stone units and all anchorage elements are stainless steel. Attention to detail was incorporated into all restoration aspects of the project. The Country Club Christian Church has been restored to its original prominence, thanks to the extreme care, training, and dedication of the project team.

## Country Club Christian Church

### OWNER

**Country Club Christian Church**  
Kansas City, MO

### PROJECT ENGINEER/DESIGNER

**Thos. Rewerts Company, LLC**  
Kansas City, MO

### REPAIR CONTRACTOR

**Concrete & Masonry Restoration  
Company, Inc.**  
Kansas City, MO

### MATERIAL SUPPLIER/MANUFACTURER

**BASF Building Systems**  
Florham Park, NJ

**Sika Corporation**  
Lyndhurst, NJ