WEST TOWER FAÇADE RESTORATION: FIRST NATIONAL BANK BUILDING

BY KURT BERGLUND

The West Tower of the First National Bank Building in St. Paul, MN, is an iconic building on the St. Paul skyline (Fig. 1). Built in 1931, the building is best known for the neon red "1st" sign that can be seen as far as 20 miles (32.2 km) away on a clear day. The tower was the tallest building in St. Paul for nearly six decades (1930 to 1986).

The 32-story tower rises 402 ft (122.5 m) above the surrounding sidewalk, with the support structure for the iconic "1st" sign rising an additional 100 ft (30.5 m). The Art Deco style of the building is similar to the Empire State Building in New York City. Both of these buildings were built at the same time and competed for many of the same building materials. The main building façade consists of Indiana limestone.

Fig. 1: North face of the First National Bank Building

The tower, being located in Minnesota, is exposed to one of the widest ranges of weather events in the country. With an average of 143.5 days below freezing and temperatures that reach above 100°F (38°C) in the summers, the building's façade experiences numerous freeze-thaw cycles annually.

CONDITION SURVEY AND RESTORATION DOCUMENTS

Upon the purchase of the building in 2012, the owner noticed many façade issues that raised concerns. Further investigation of the building's façade found that many of the building's mortar joints between the limestone panels had failed and a significant number of stones had delaminated (Fig. 2). Failed sealant joints were also observed around the spandrel panels that were located above and below the windows. The extent of the deterioration led to concerns that pieces of the stones would fall from the building's façade to the pedestrian sidewalk areas surrounding the building.

The observed deterioration, as well as the owner's concern for safety of the public around the building's perimeter, led to an extensive condition study performed on the building's façade. A laser scan of the entire façade was performed to locate repair locations and determine the appropriate repair quantities. Restoration documents were also created from the laser scan and the repair areas were clearly identified. Once the restoration documents were prepared, a construction cost estimate was provided to the owner.

The restoration documents outlined the entire façade to be tuck-pointed and the sealant around the spandrel panels to be replaced. The documents also specified approximately 1000 ft^2 (93 m^2) of stone repair and 100 ft (30.5 m) of stone crack repair. The owner also requested that the entire building's façade be washed after each drop of repairs had been completed.

RESTORATION PLAN

With the construction of the new light rail project at the front of the building nearing completion, the owner wanted to complete the restoration of the building's façade in one summer. The design team and restoration contractor collaborated to produce an aggressive schedule to accomplish the entire restoration in one summer. The plan called for 24 swing stage drops to be completed in just over 6 months.

Roof tie-offs had not been installed on the building, so plans included the installation of roof tie-offs before the work on the façade could begin. Twenty tie-off locations were installed prior to the commencement of the work. The tie-offs were installed at key locations so they could be used on multiple drops.

Specialized rigging was also required to access the difficult and varying roof tops for repairs. From a construction standpoint, this made the project all the more challenging.

RESTORATION PROCESS

Once the roof anchorages were installed, the restoration of the building's façade began. Primary restoration items included the replacement of the mortar between the limestone panels and the repair of damaged stones. While restoration work was being completed, caution was taken to ensure that materials did not fall onto the surrounding roof levels and sidewalks. Nets were attached to the swing stages and to the building to prevent falling debris. As a secondary precaution, walkthrough scaffolding was installed at all sidewalk levels to protect the public from any debris that did make it through the netting.

It was soon realized that the majority of the stone distress was located at the steel relief angles that were used to support the stone façade, and was caused by corrosion of the steel angles (Fig. 3). Saw cuts were made at the perimeter of the repair areas and chipping hammers were used to remove the unsound portions of the stones. The demolition of the stone exposed the steel relief angles, with varying stages of corrosion observed. The steel angles were cleaned and painted with a zinc-rich primer to prevent further corrosion. As soon as the steel relief angles were restored, the stones were repaired. Corrosion-resistant screws were installed into the stone within the repair areas to provide mechanical anchorage of the repair mortar (Fig. 4).

The mortar joints throughout the entire building façade were also tuck-pointed (Fig. 5). The owner requested that the dust and small debris from the grinders used to remove the mortar be collected and not be allowed to become airborne. Vacuums were placed on all swing stages where mortar removal for the tuck-pointing took place. The new mortar used to replace the existing mortar also needed to be similar in color and composition to the existing mortar to maintain the original appearance (Fig. 6). Multiple Type N mortar mixtures were tested and

Fig. 2: Spalled stone observed during condition survey of façade

Fig. 3: Corroded steel relief angle

Fig. 4: Corrosion-resistant screws installed for anchorage of repair material

Fig. 5: Existing mortar at stone panel joints was removed prior to tuck-pointing

an appropriate mixture was selected to create a similar look.

Cracks in the limestone panels were also repaired. The cracks often occurred in the stones above the window heads (Fig. 7). If the stone that was cracked did not show any other signs of distress, the crack was epoxy-injected. To hide the epoxy-injected crack, granular material was placed in the epoxy along the surface of the crack (Fig. 8).

PROJECT CHALLENGES

Many challenges were overcome in the restoration of the West Tower of the First National Bank Building. The first major challenge was the tight timeline in which the owner wanted the project completed, leaving only one summer to finish work before the light rail project adjacent to the building was finished. The second major challenge was the absence of appropriate tie-offs on the roofs of the building that would allow work to be performed from swing stages. The tie-offs were quickly designed and installed so the project would not be delayed. The last major challenge was dealing with the assortment of weather conditions throughout the progress of the project. The summer during which the project was completed was one of the hottest summers on record. This caused additional work to ensure the repair materials did not dry out too quickly. By the time the last two drops were completed, cold weather was starting to approach.

Fig. 6: Completed tuck-pointing of joints at stone panels

Fig. 7: Cracking in stone panel above window head

Fig. 8: Repaired crack shown in Fig. 7

Caution had to be taken to ensure that the building façade surface and ambient temperatures did not drop below freezing while the repair mortar was installed and cured.

Despite these challenges, the First National Bank Building West Tower restoration was completed in its entirety safely and on time. The building now appears as it did in 1930, providing both an attractive addition to the St. Paul skyline and presenting no danger to the pedestrians and other projects in development below. As of July 2015, the building has endured two typical Minnesota winters without any problems observed in the façade restoration.

West Tower Façade Restoration

SITE
First National Bank Building
St. Paul, MN

CONSULTING ENGINEER
Clark Engineering Corporation
Minneapolis, MN

GENERAL CONTRACTOR
Restoration Systems, Inc.
Chaska, MN

MATERIAL SUPPLIERS
Conproco Corporation
Dover, NH

Spec Mix
Eagan, MN

__Kurt Berglund__, PE, is a Senior Restoration Engineer with Clark Engineering Corporation, Minneapolis, MN. Berglund has over 25 years of structural and materials engineering experience. Berglund has expertise in building condition studies; restoration design; structural and site condition surveys; forensic studies; technical instrumentation for use with building condition and forensic surveys; and material testing. He is also skilled at analyzing the conditions of concrete, steel, wood, and masonry structures as well as identifying innovative restoration alternatives and expansion improvements while meeting fiscal and phasing considerations. Berglund is a member of ICRI.