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Project Details

Project Title	Three Parkway Facade Repairs
Property Name	Three Parkway
Location	1601 Cherry Street Philadelphia PA
Entry Classification	Waterproofing
Project Cost (dollar amt)	832 000
Duration (calendar days)	158
Start Date (mm/dd/yy)	5/23/2011
End Date (mm/dd/yy)	10/27/2011

Scope of Work

Three Parkway is a 20-story commercial office building constructed in 1970 with a brick masonry facade. The building had gone under a series of repairs over the years to address a variety of issues particularly related to waterproofing. When Philadelphia enacted a façade inspection ordinance in 2010 a façade assessment was contracted with the thought of fulfilling the ordinance requirements as well as completing repairs needed at the building. Two issues in particular where the focus of the assessment and repairs. Previous assessments stated that retrofit brick ties should be installed across the entire façade due to a lack of ties. However observations showed that façade conditions after 40 years of service did not necessitate ties to that extent. 3D laser scanning technology was used to render models of each elevation plane to show where brick movement had occurred and pinpoint where ties might be needed. These locations were given to the contractor along with a tie pattern for concentrated installation. The second issues entailed a sloped parapet wall at the top of the building that had been a constant source of water infiltration. The existing configuration of the steel angle supporting the brick prevented water from exiting the brick cavity as it was installed with the slope. The engineer entertained several alternatives and ultimately designed openings through the lintel with flashing details. Conditions encountered in the field led to what we considered an even better solution at the sloped parapet wall. The solution was worked out with the contractor's input. The lintels were temporarily removed for flashing repairs and then reinstalled at an angle with several washers used to offset the back of the steel from the flashing behind it. This allowed water to pass behind the angle eliminate the need for holes in the angle and greatly reduce the amount of seams and sections of flashing.

Abstract

Design and implementation of repairs to buildings can present challenges when dealing with existing conditions. The presence of finishes access difficulties time and budget constraints etc. all hinder observations and understanding of conditions. This project led to innovative assessment and design approaches specifically focusing on two instances. 3D laser scanning technology was used to render models of elevation planes to detect brick movement and the need for retrofit masonry ties. Also the collaborative team process was used to address an atypical brick support and flashing issue that was a persistent source of water infiltration.

Unforeseen Conditions:

When the design was arrived at to installed waterproofing at an atypical brick support location the constructability and condition of the existing steel angles was an unknown condition. Removal of corroded angles was not anticipated but was necessitated by their condition. In order to remove the steel angles and improve constructability and production the contractor developed a solution where temporary steel angles were placed upside down from their typical configuration to support a sloped brick condition above. The temporary angles were then supported by small steel clips slid onto the existing angle fasteners after removal of the existing angles. This temporary support allowed large areas of the flashing condition to be addressed at once while permitting angle replacement as needed.

Problems/Challenges/Solutions:

There was speculation from past consultants that a perceived lack of wall ties necessitated widespread installation of retrofit masonry ties. Based on the height of the building and a perimeter length approaching 400 linear feet performing such repairs would be costly disruptive and time consuming. It was apparent that visual observations alone would not be sufficient for the project requirements related to masonry wall ties. While an educated estimate could be provided for the number of wall ties to be installed it had the potential to be somewhat or even largely inaccurate and the owner's budget could be exceeded. This wouldn't be confirmed until the project had already started and a swing stage was erected at each façade drop. Also the construction schedule could be adversely affected with an unexpected increase in quantity leading to unhappy tenants and extended closure of facility areas and public sidewalks. Finally the contractor would have little to no direction as to where to install the ties it would ultimately be left to their judgment in large part. A finite quantitative assessment was sought to alleviate these possible issues. The answer was found in three-dimensional laser scanning. Laser scanning involves the gathering of millions of data points from the surface under consideration (the brick façade) in order to manifest the data into lines and planes for documentation of as-built conditions. The process is similar to traditional surveying with a laser scanning device taking the place of the theodolite. Using traditional surveyor's methods a base line of reference is established. This baseline (or control) can be the sidewalk at the base of the building a nearby benchmark or another set point that will have a high likelihood of remaining fixed for future scans. The baseline is linked to GPS so that all points are linked to the global reference. Once the base line is set the scanning device is set-up on a tripod attached to a computer and takes a 360-degree view of the items around it. The device measures the "time of flight" of the laser from the time it leaves the device to the time it bounces off of a surface. With the speed of light being a known constant the time of flight is then converted to a distance that distance is then referenced to the baseline and in turn given a GPS position for every point on the surface. The scanning was used to establish a uniform plane at each elevation. Once a base plane was established limits could be placed on the point data to determine their location relative to the plane. For example an analysis could be performed to identify any point that is more than ½-inch away from the base plane. These points gathered together would represent brick movement away from the building and a possible area where retrofit masonry wall ties should be installed. With this data in hand locations where brick movement had occurred were identified on elevation drawings and included in the construction documents for repair. Detailing related to spacing for retrofit masonry ties was also included providing clear direction to the contractor as to where the ties should be installed. Ties were not unilaterally installed everywhere at unneeded locations and a contracted quantity of ties was established that was largely adhered to during the course of work. When the design was arrived at to installed waterproofing at an atypical brick support location the constructability and condition of the existing steel angles was an unknown condition. Removal of corroded angles was not anticipated but was necessitated by their condition. In order to remove the steel angles and improve constructability and production the contractor developed a solution where temporary steel angles were placed upside down from

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Safety Considerations (public/property/hours accident free, etc):

Overhead protection was placed above public sidewalks and over an entrance to an adjacent private school. Fencing was also placed within a portion of the school's athletic fields directly adjacent to the building in a downtown urban setting. These were maintained throughout the project to keep pedestrians safe during the work. No safety incidents occurred on the project.

Technology/Innovation:

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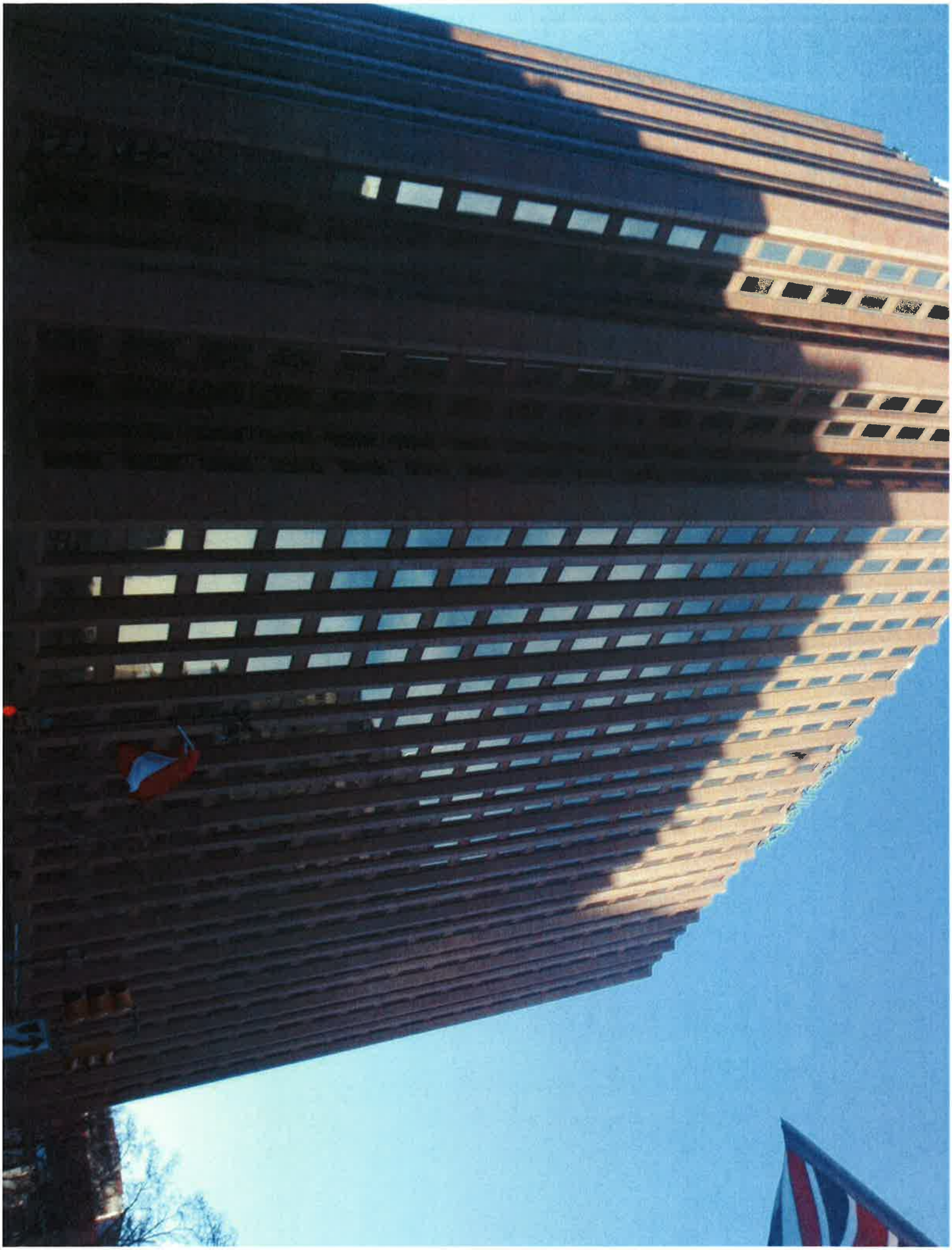
Quality Control/Field Testing

The project approach required matching the existing mortar color because not all joints were to be re-pointed. Several color trials were installed to satisfy the Owner's aesthetic requirements and to ensure consistent batches. The flashing design also required several trial approaches because the as-built conditions were not consistent with the original design. This required strict coordination between the engineer and contractor to guarantee the water-tightness of the installation. Each swing-stage drop was surveyed for an initial lay-out of the repairs. The engineer made frequent inspections of the work in progress and each drop was given a final inspection sign-off before the swing-stage was moved.

Rigging Approach

Swing-stages were used to access 100 of the façade. Even though roof anchors made tie-backs straightforward the sloped parapet required the outrigger beams to cantilever their maximum distance. Additionally the north elevation required custom outrigger beams that allowed over an 11 foot cantilever. Brick pilasters spaced approximately 8 feet on-center represented a challenge of positioning the swing-stage platforms so that all debris could be captured in the platform and not fall between. Inconsistent power at the roof also presented many opportunities for the crews to observe the city views while breakers were switched!


Spider

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Note the safety instructions in the user's manual!
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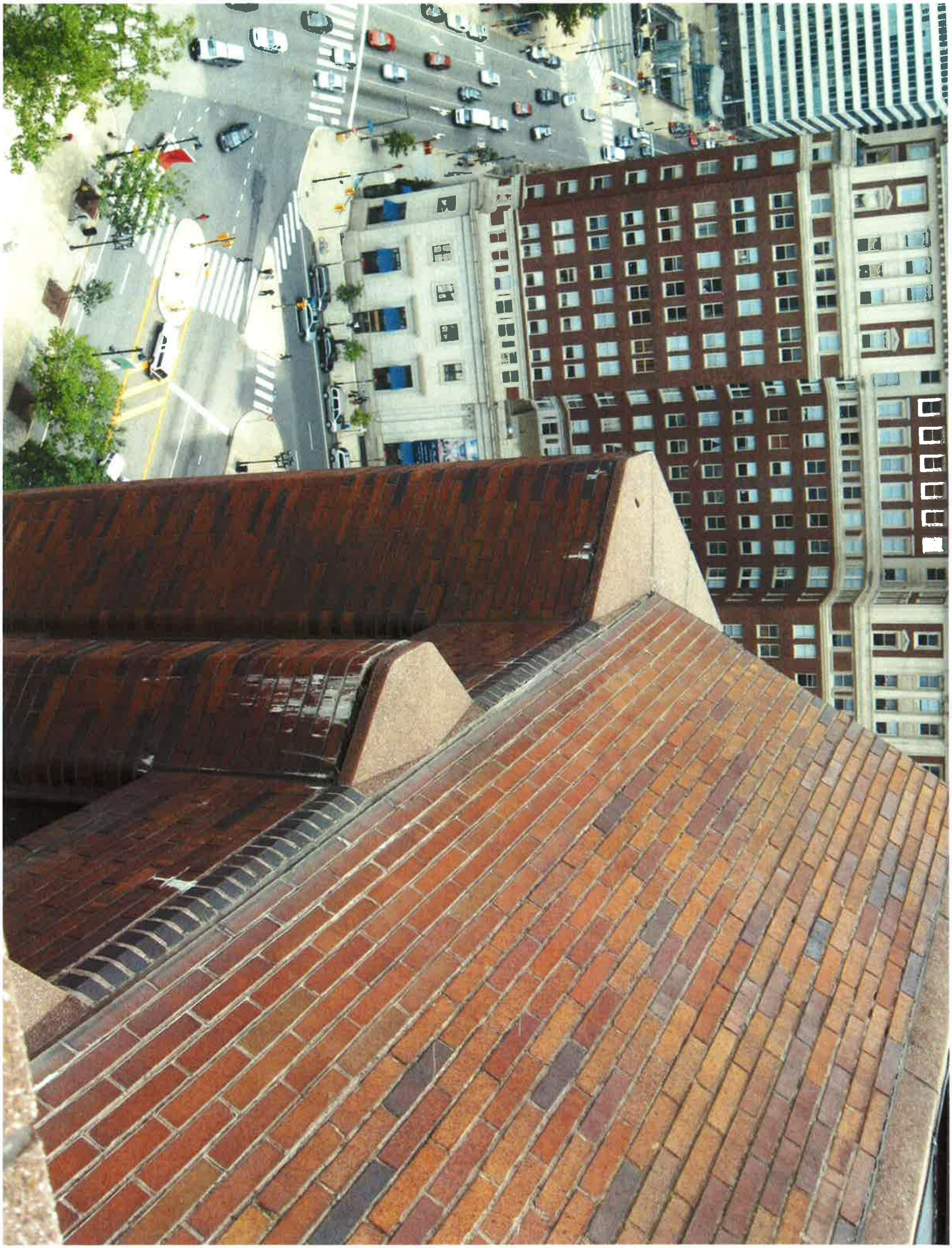


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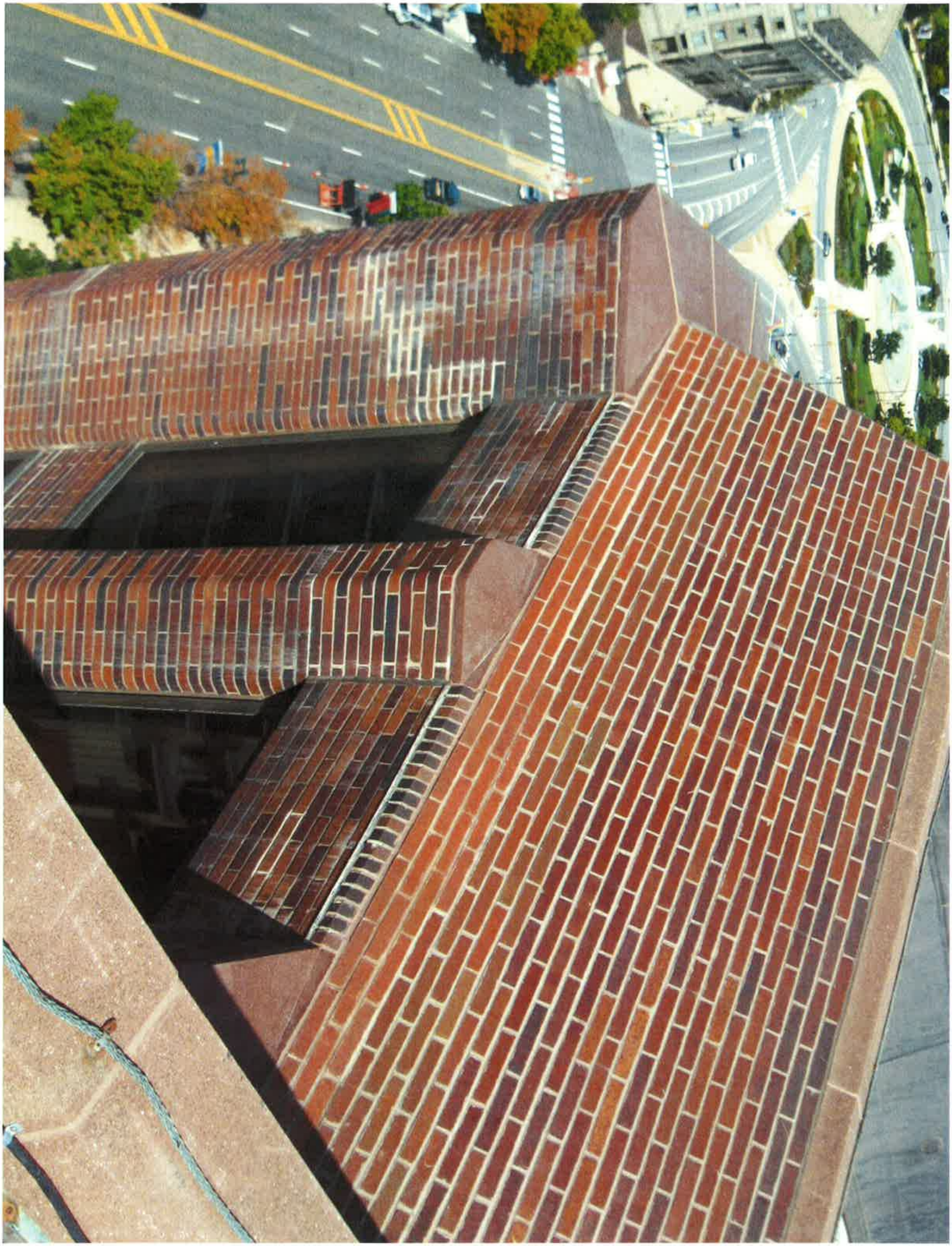

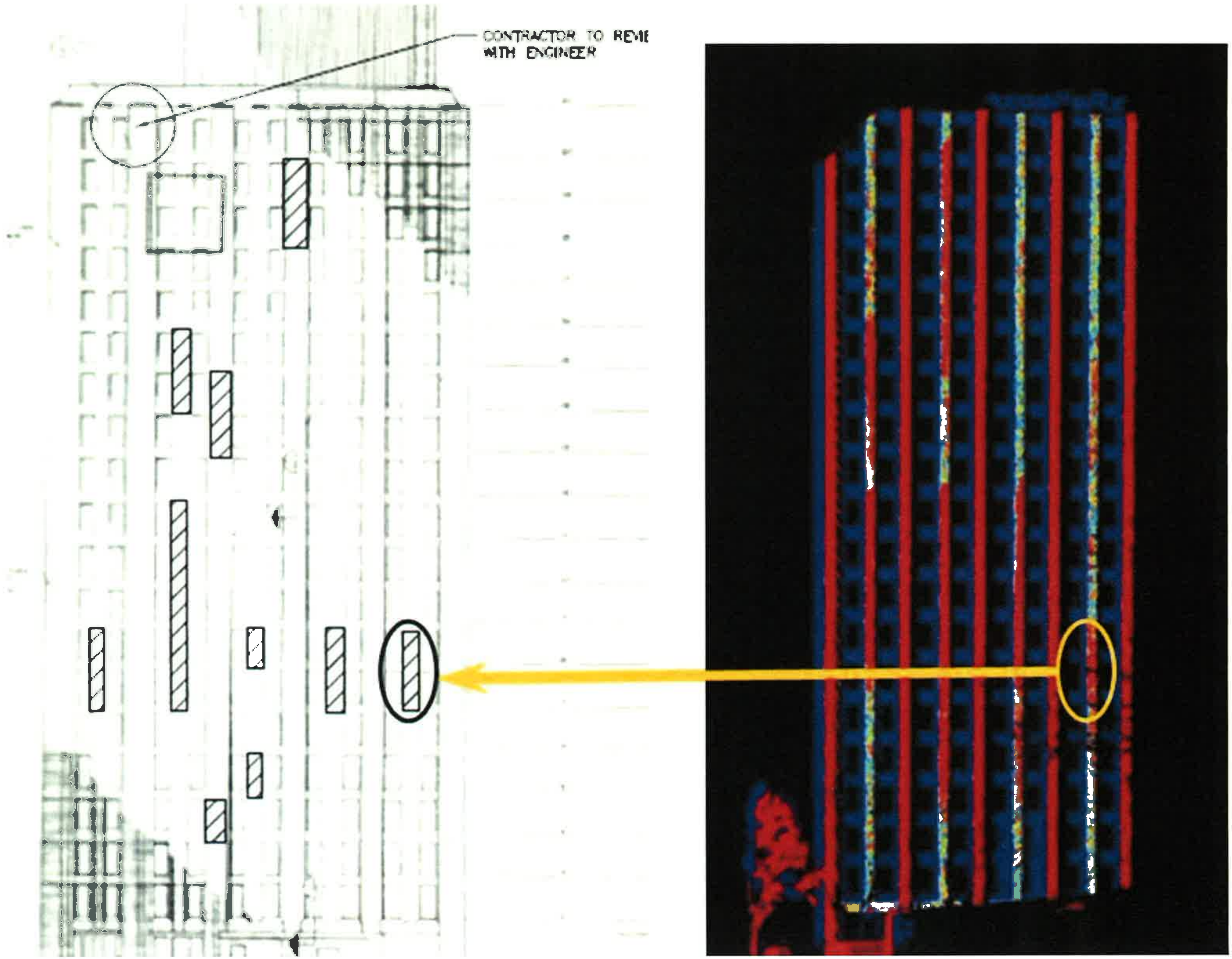
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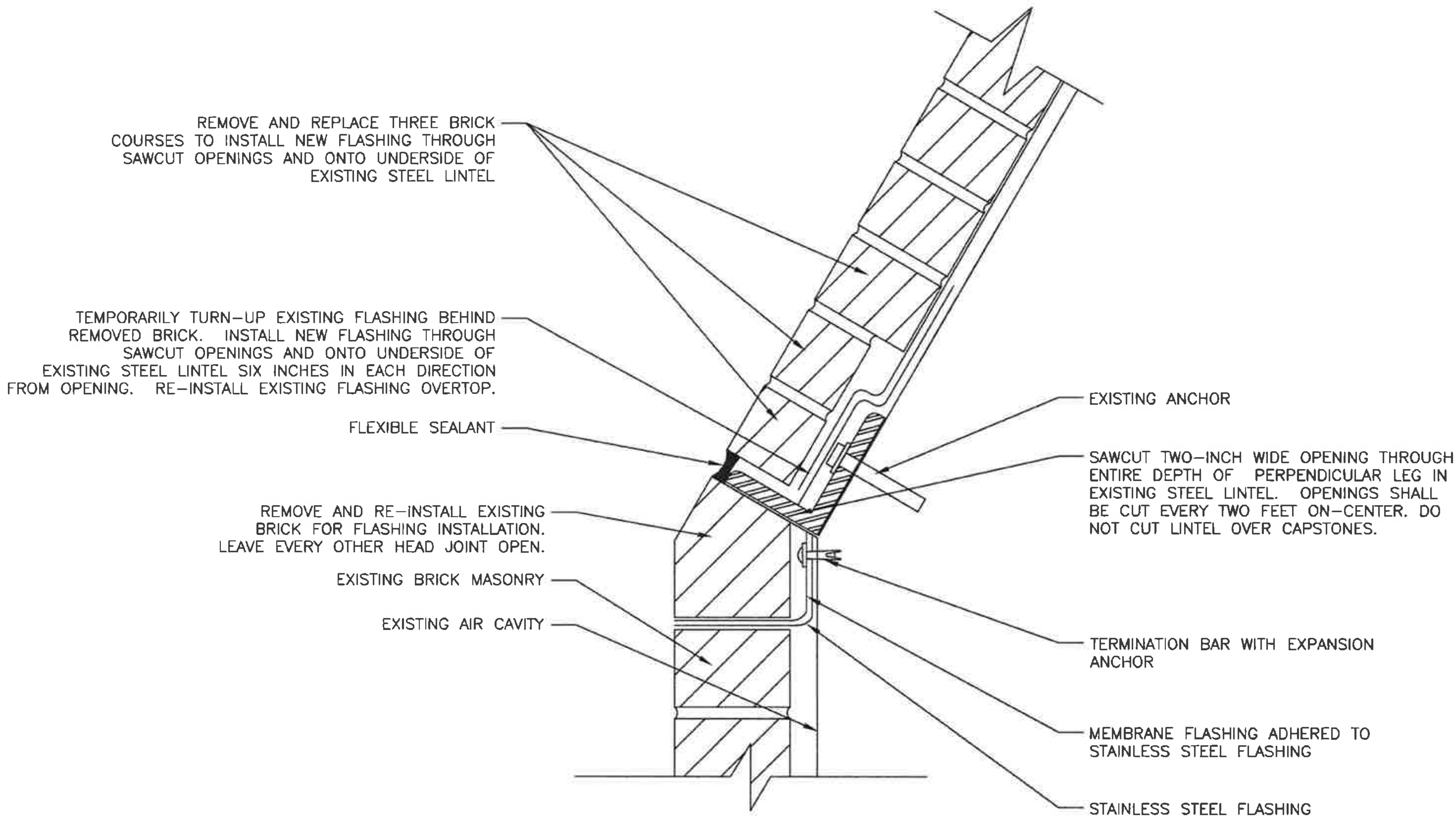
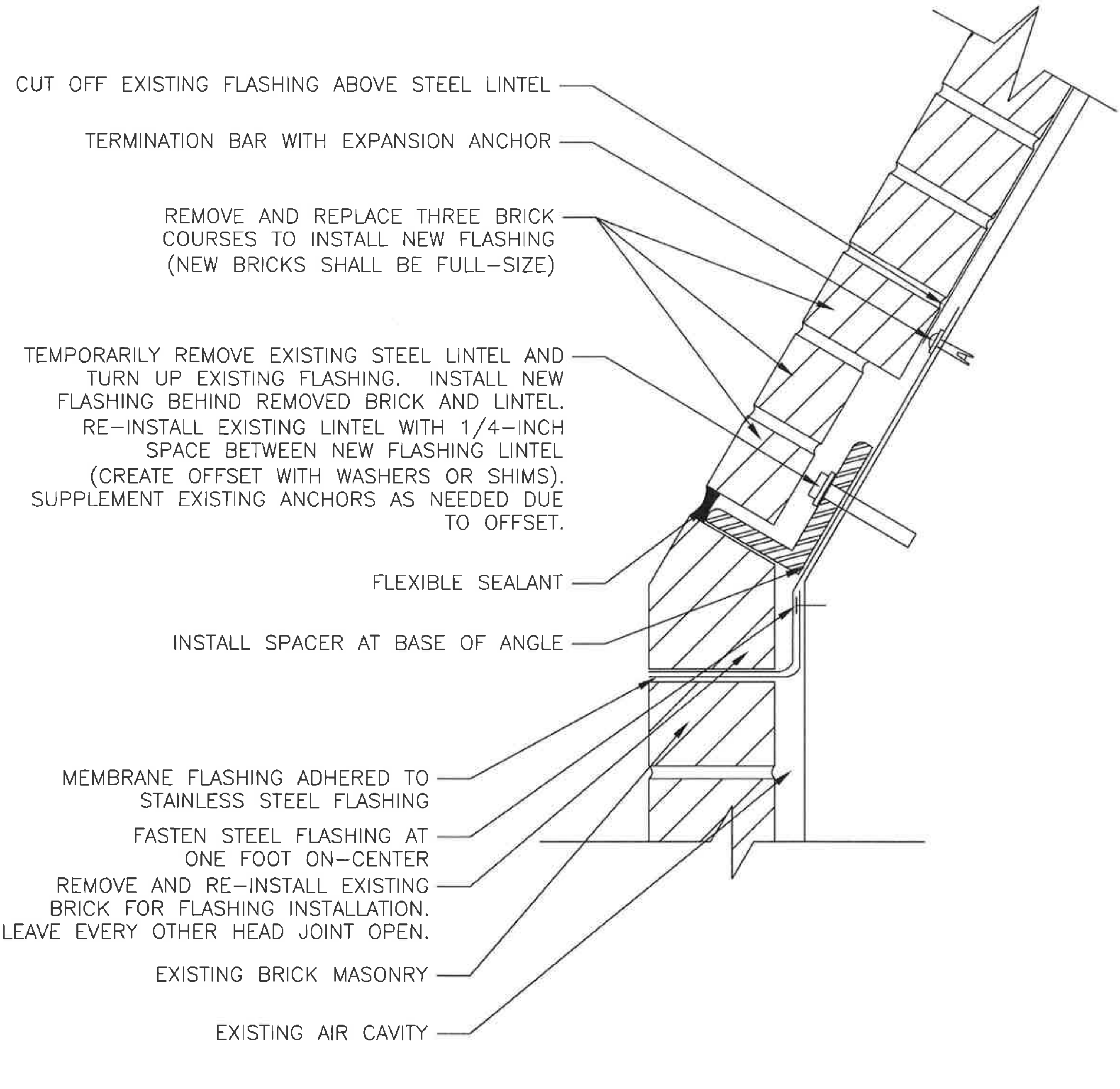


REMOVE AND REPLACE THREE BRICK COURSES TO INSTALL NEW FLASHING THROUGH SAWCUT OPENINGS AND ONTO UNDERSIDE OF EXISTING STEEL LINTEL
TEMPORARILY TURN-UP EXISTING FLASHING BEHIND REMOVED BRICK. INSTALL NEW FLASHING THROUGH SAWCUT OPENINGS AND ONTO UNDERSIDE OF EXISTING STEEL LINTEL SIX INCHES IN EACH DIRECTION FROM OPENING. RE-INSTALL EXISTING FLASHING OVERTOP.
FLEXIBLE SEALANT
REMOVE AND RE-INSTALL EXISTING BRICK FOR FLASHING INSTALLATION. LEAVE EVERY OTHER HEAD JOINT OPEN.
EXISTING BRICK MASONRY
EXISTING AIR CAVITY
EXISTING ANCHOR
SAWCUT TWO-INCH WIDE OPENING THROUGH ENTIRE DEPTH OF PERPENDICULAR LEG IN EXISTING STEEL LINTEL. OPENINGS SHALL BE CUT EVERY TWO FEET ON-CENTER. DO NOT CUT LINTEL OVER CAPSTONES.
TERMINATION BAR WITH EXPANSION ANCHOR
MEMBRANE FLASHING ADHERED TO STAINLESS STEEL FLASHING
STAINLESS STEEL FLASHING


CUT OFF EXISTING FLASHING ABOVE STEEL LINTEL
TERMINATION BAR WITH EXPANSION ANCHOR
REMOVE AND REPLACE THREE BRICK COURSES TO INSTALL NEW FLASHING (NEW BRICKS SHALL BE FULL-SIZE)
TEMPORARILY REMOVE EXISTING STEEL LINTEL AND TURN UP EXISTING FLASHING. INSTALL NEW FLASHING BEHIND REMOVED BRICK AND LINTEL. RE-INSTALL EXISTING LINTEL WITH 1/4-INCH SPACE BETWEEN NEW FLASHING LINTEL (CREATE OFFSET WITH WASHERS OR SHIMS). SUPPLEMENT EXISTING ANCHORS AS NEEDED DUE TO OFFSET.
FLEXIBLE SEALANT
INSTALL SPACER AT BASE OF ANGLE
MEMBRANE FLASHING ADHERED TO STAINLESS STEEL FLASHING
FASTEN STEEL FLASHING AT ONE FOOT ON-CENTER
REMOVE AND RE-INSTALL EXISTING BRICK FOR FLASHING INSTALLATION. LEAVE EVERY OTHER HEAD JOINT OPEN.
EXISTING BRICK MASONRY
EXISTING AIR CAVITY