



concrete façade restoration project

Mission National Bank San Francisco, California

Restoring sand-blasted and weathered decorative concrete elements with an extremely vapor permeable façade protection system against water infiltration without fading or peeling for 30 years.



KEIM *Lasting Protection
& Preservation™*



Summary

Mission National Bank
3060 16th St
San Francisco, CA 94103

Year built: 1920

Project completed: September 2010

Recoated Surfaces– South and East Façade Walls

- precast concrete cladding blocks
- precast decorative moldings
- precast friezes
- precast columns and capitals
- concrete repairs
- mortar joints
- corroded steel reinforcement bars
- lime cement stucco panels

Surface Area

8,900 square feet

Budget

KEIM repair and coating products
\$53,465

KEIM system cost

\$6.00 per square foot

Warranty for the coating system

15 years

Expected coating service life

+30 years on vertical surfaces
(3-coat system with repellency)

Coating Properties:

KEIM Concretal W + Silan 100

- permanent chemical bonds
- never peel or blister
- never fades
- highly vapor permeable
- repellent against wind driven rain
- remains clean
- incombustible

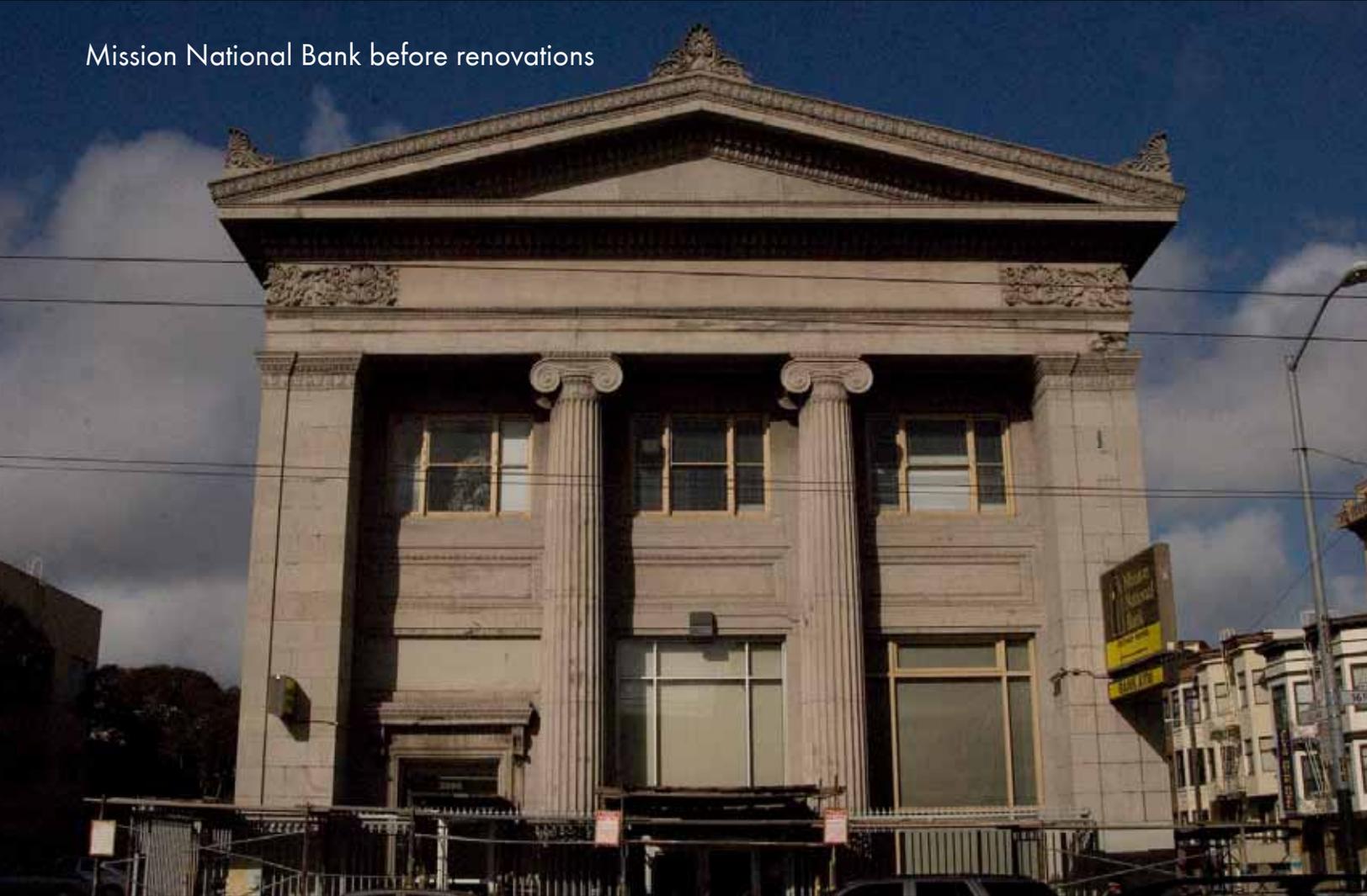




History

Mission National Bank is a financial institution occupying a National Register eligible Greek Revival temple style building in the Mission District at 3060 16th Street in San Francisco. Built in 1920 of precast concrete block cladding tied to a concrete and steel skeleton, it was finished with gray paint.

Mission National Bank before renovations



After many gray paint recoatings, the faded and peeling finish was aggressively sand blasted off in 1950 which erased the smooth surface of the concrete and decorative trim detailing leaving them rough and in some locations, exposing the steel reinforcement.

Having lost its smooth protective skin, the building readily absorbed water from the regional damp and wet coastal weather beginning a systematic deterioration of the steel reinforcement and metal block ties which went unchecked until a sizable piece of the cornice fell to the ground prompting the bank to commission emergency repairs.

Existing Conditions

The general contractor, assisted by the engineer, determined CO² infiltration over the last 60 years carbonated the concrete cladding and decorative elements, removing the alkaline passivation layers that protected the steel reinforcement and metal ties that held the cladding and elements to the framework. Corroding steel reinforcement fractured the decorative concrete elements.

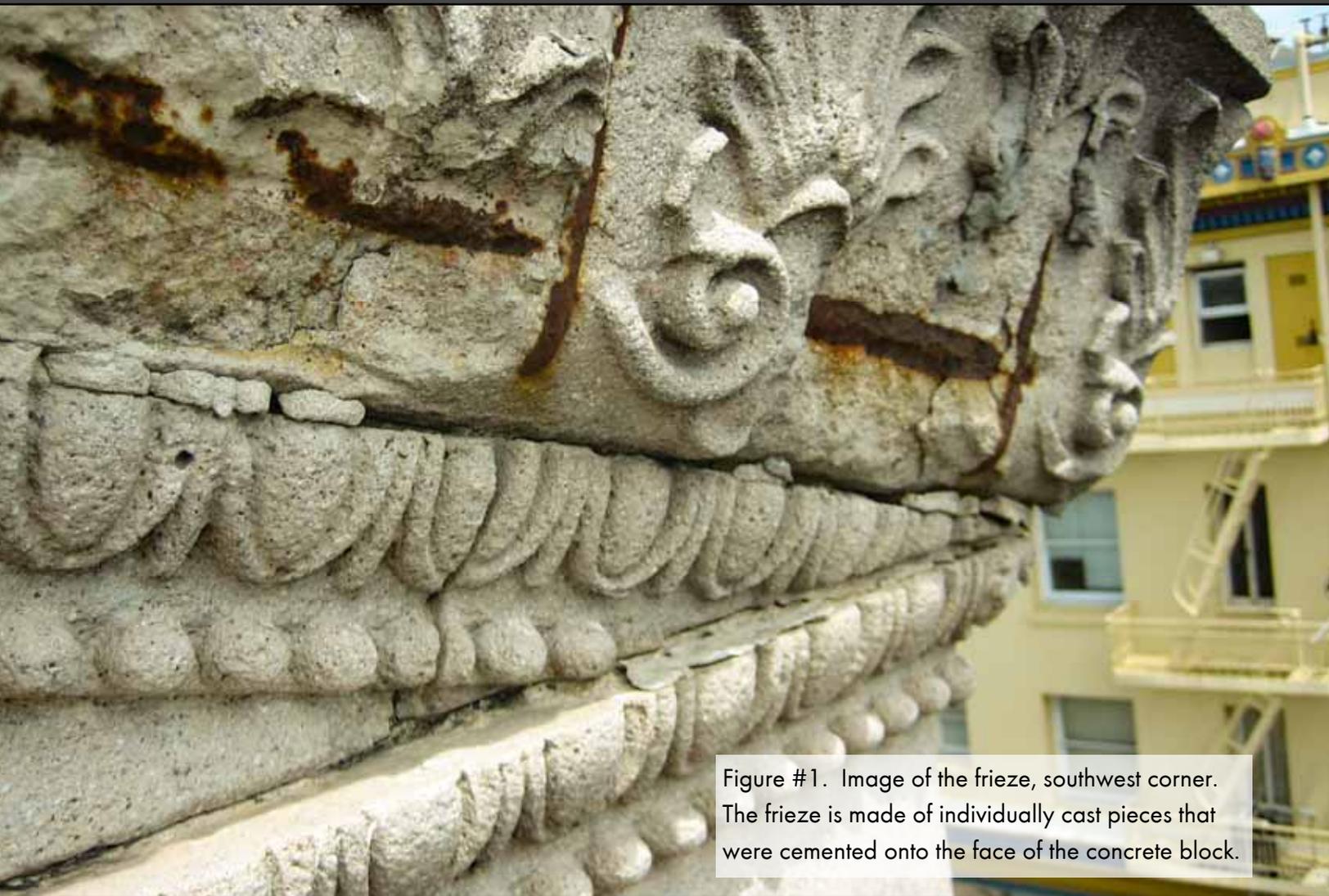


Figure #1. Image of the frieze, southwest corner. The frieze is made of individually cast pieces that were cemented onto the face of the concrete block.

The cast pieces were reinforced with steel rebar that was placed too close to the surface. When the protective outer skin of the cast concrete was removed, carbon dioxide was able to move deep within the concrete carbonating the protective alkaline passivation layer surrounding the steel reinforcement. The opened pores allowed rain water to be drawn into the concrete carrying oxygen that corroded the unprotected steel, thus expanding its size. This is the force that fractured the concrete's structure causing ultimate failure.



Figure #2. An example of improper concrete repairs from an earlier campaign. Lacking adequate surface prep and proper renovation mortars, the unprotected reinforcement again expanded from corrosion breaking the patches apart.



Existing Conditions, continued

Figure #3. Detail A, the west-facing southwest corner below the frieze at top of column capital. Note exposed rebar and missing concrete substrate. We will examine this particular location to help explain how the KEIM Concretal System was implemented to renovate the façade.

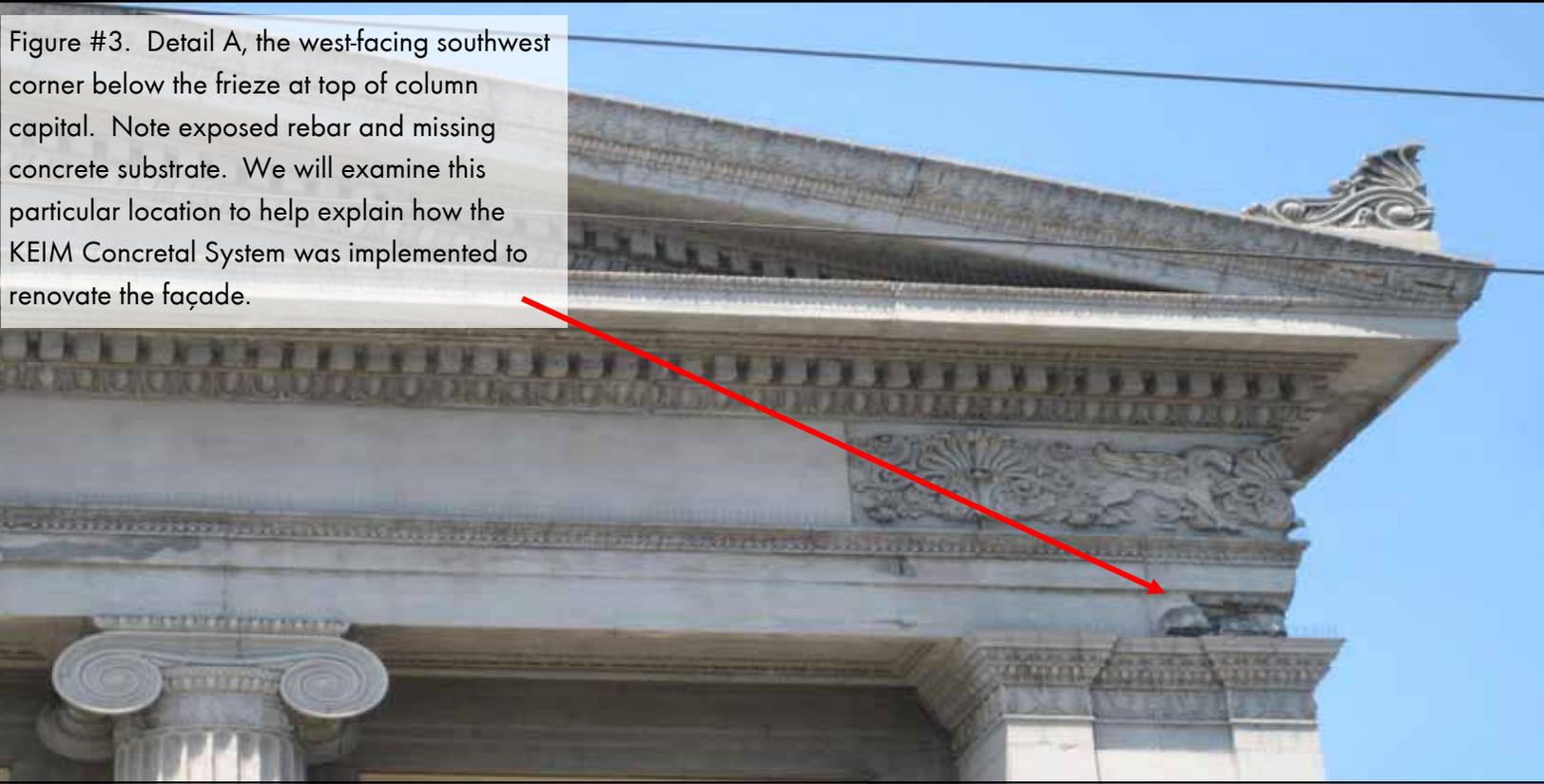


Figure #4. Detail A, close up view. The large steel bar corrosion has deeply fractured the poured-in-place concrete band. Superintendent is pointing at a southwest corner section of the precast cladding stack that actually separated and leaned two inches away from the building's concrete skeleton.



Existing Conditions, continued



Figure #5. Detail A, close up view after loose pieces of concrete were removed exposing the corroded rebar and concrete skeleton substrate that supports the cladding.



Figure #6. Detail A, after removing loose concrete pieces and debris, steel reinforcement was cleaned to white metal and a protective two coats of KEIM Concretal MKH anti-corrosion mortar was immediately brushed over the cleaned steel surfaces.



Existing Conditions, continued



Figure #7. Detail A, moving around the corner to the south-facing side the steel has been cleaned and coated with KEIM Concretal MKH anti-corrosion mortar.

The next step was to dampen the surfaces and substrate with water, allow the water to soak in, apply a bridge coat of Concretal MKH by brush immediately followed with the placement of KEIM Concretal Mortar R to fill the voids.

Surfaces were retextured to match original and replacement decorative pieces were cast from molds made from intact decorative elements using reinforcement steel and KEIM Concretal Universal Mortar S and cemented in place with Concretal Universal Mortar S.



Surface Repairs

Figure #8. Note the two bolts securing the decorative trim in place. Over the concrete block cladding of the front and south-facing side of the building, over 3300 bolts were bored and epoxied into the concrete substrate.

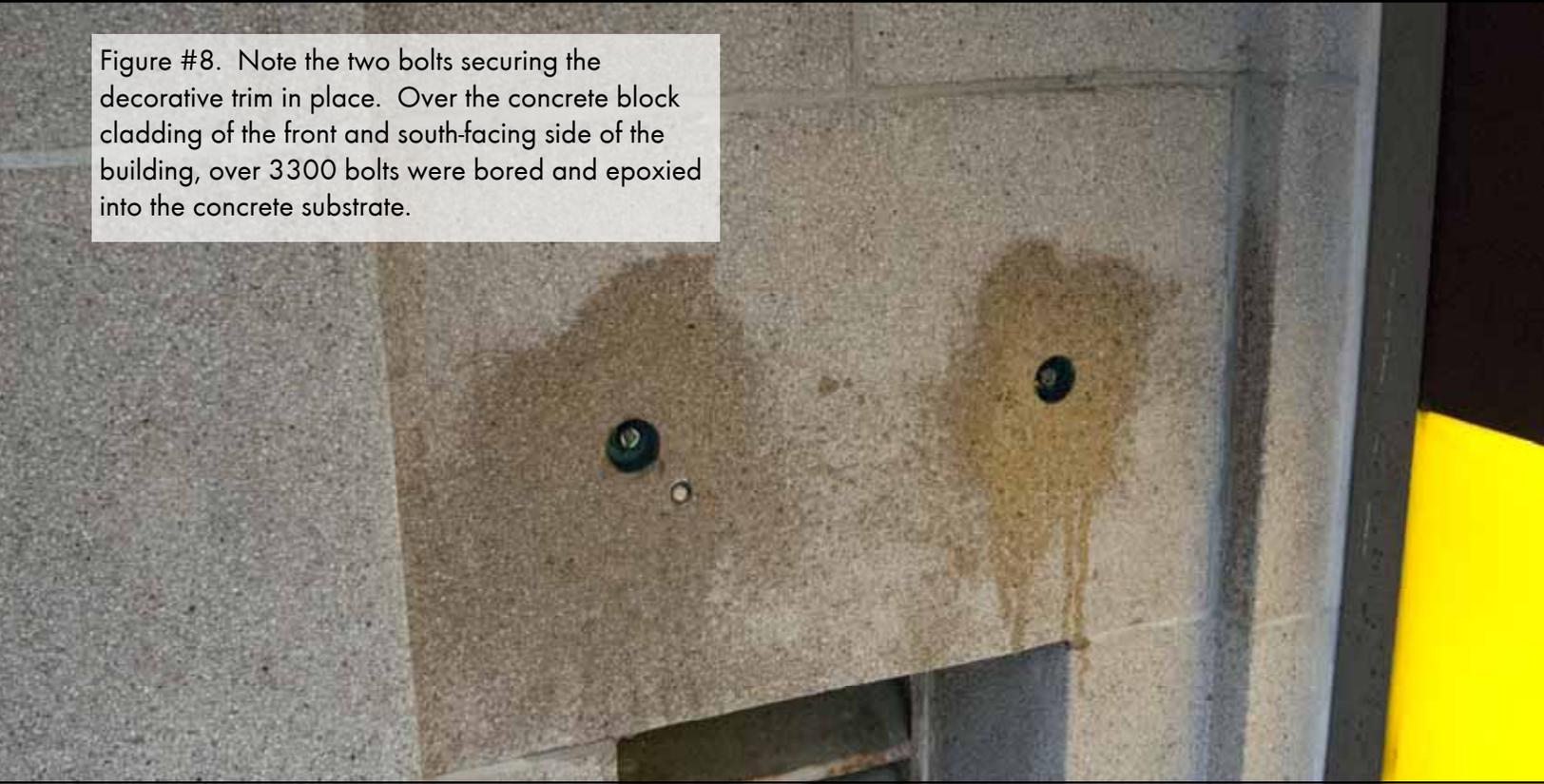
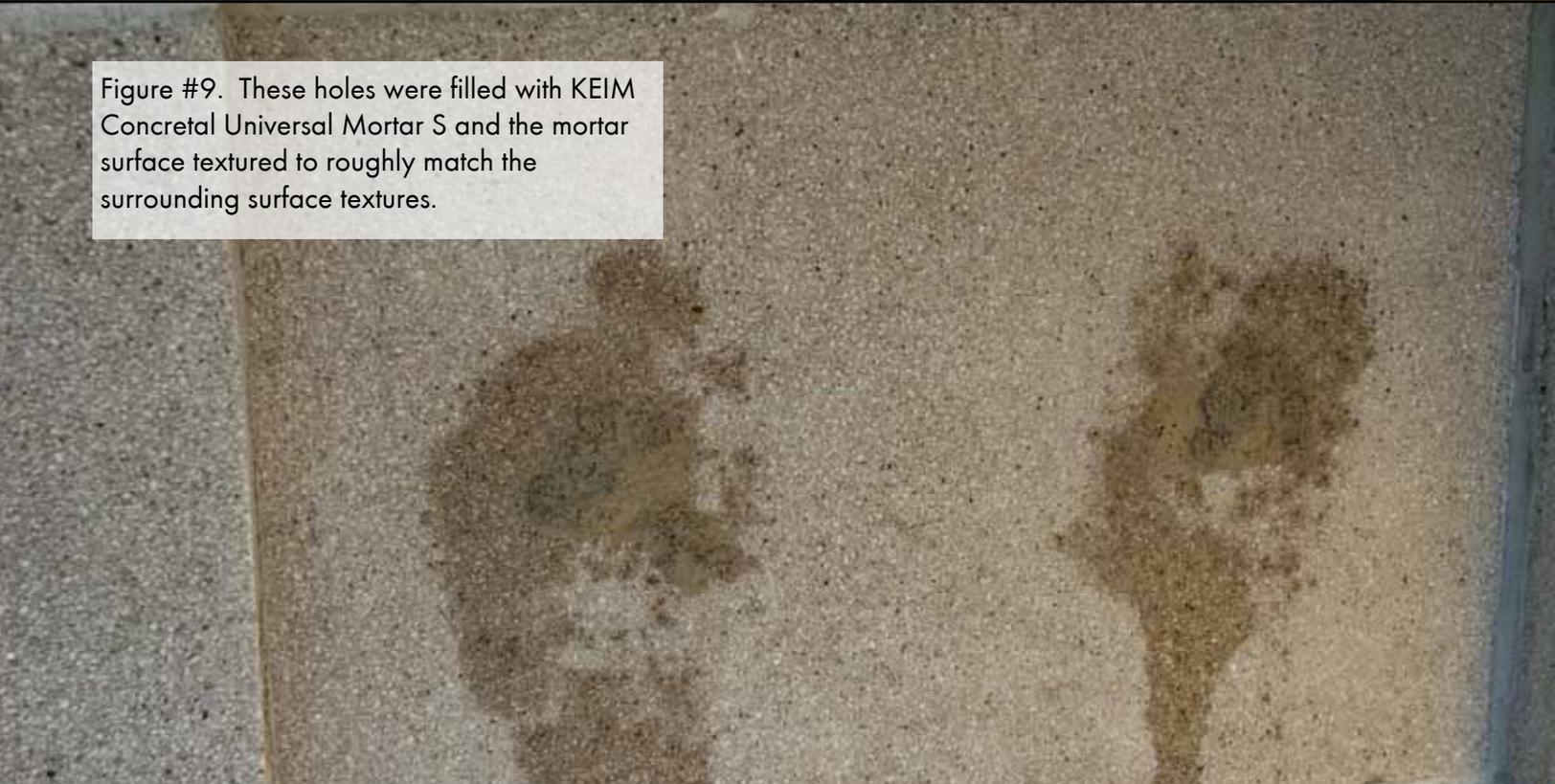


Figure #9. These holes were filled with KEIM Concretal Universal Mortar S and the mortar surface textured to roughly match the surrounding surface textures.



Surface Repairs, continued

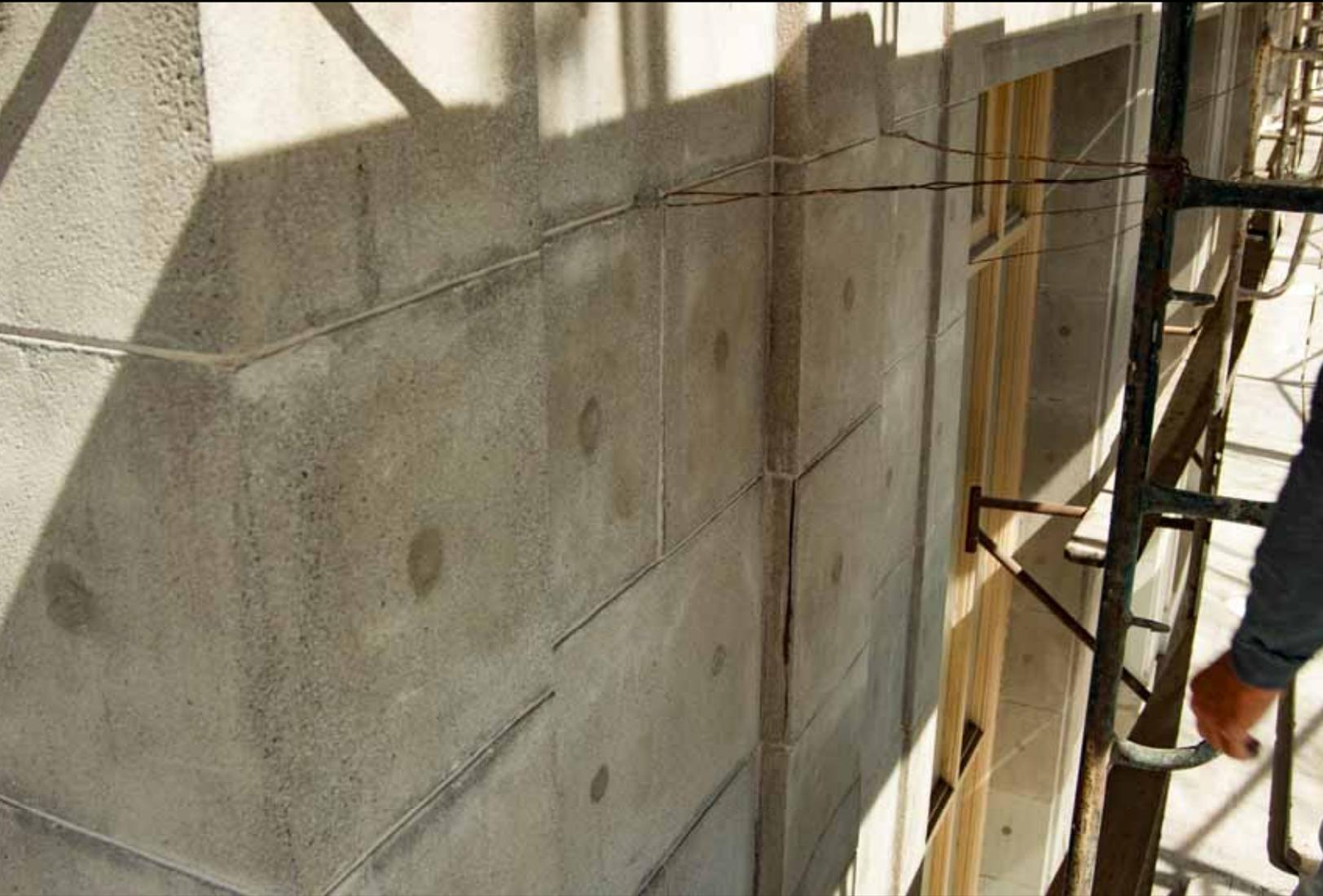


Figure #10, above. Image of the precast cladding with the filled bolt head cavities.

Normally this is a serious aesthetic issue that is difficult to overcome with ordinary finishes and silicate coatings. KEIM recommends a coarse-grained silicate base coat called "Grob" that blends the textures of these patched holes and other concrete repairs with the surrounding surfaces to homogenize the appearance of the façade.



The Finished Façade



Figure #11, above. Finished southwest corner of the building.

Fine details are retained even after three coats of KEIM Concretal W silicate coating. KEIM silicate coatings chemically bond to the concrete and cement forming permanent bonds. The natural beauty of KEIM coatings spreads light across surfaces with soft luminosity. Concrete elements retain their concrete appearance, not lost to the coating which is so often the case with non-mineral high performance paints and coatings.

Image taken at 9 AM as the sun was rising above the surrounding buildings. Note the color is influenced by the warmth of the sunrise as the building's actual color is light gray.

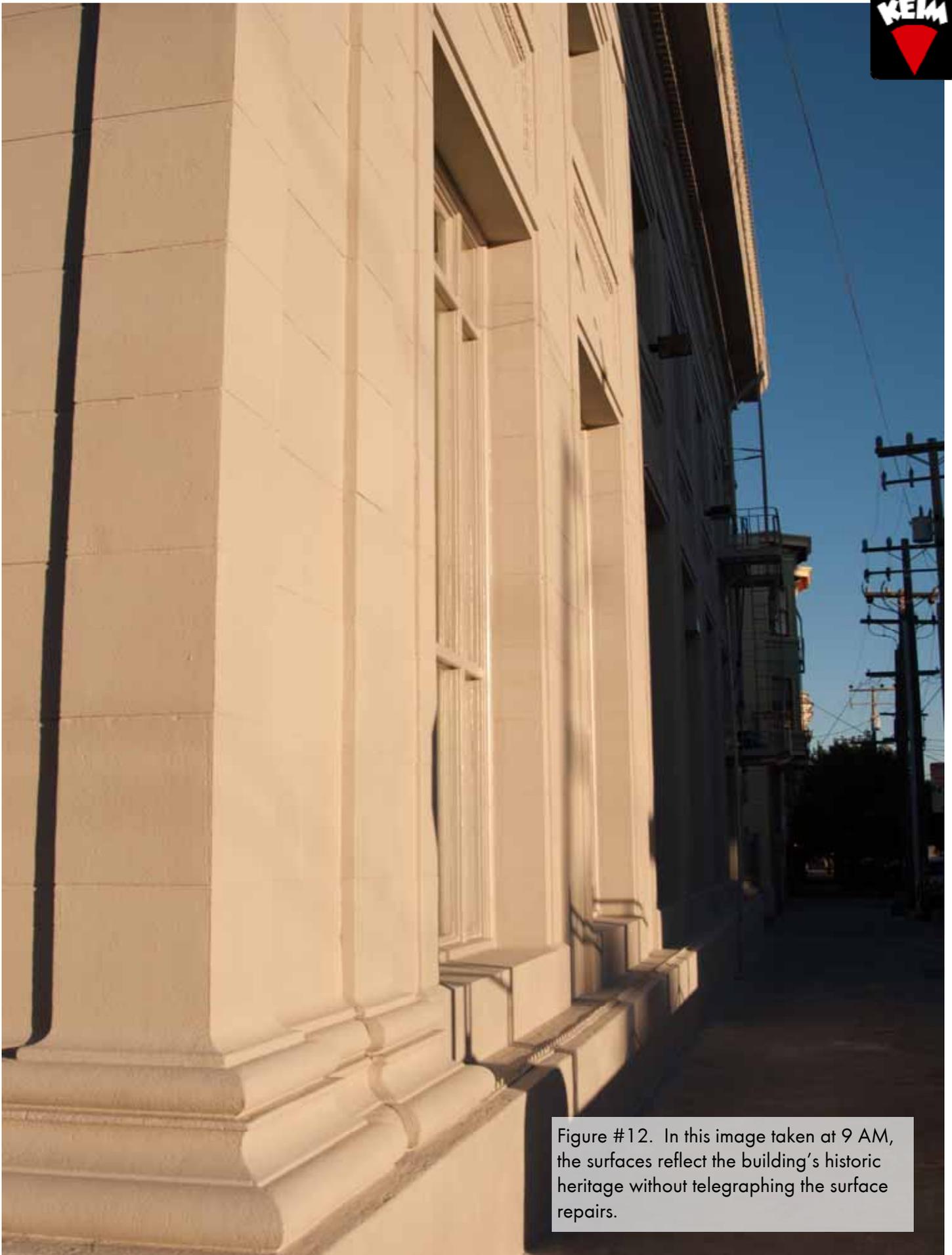


Figure #12. In this image taken at 9 AM, the surfaces reflect the building's historic heritage without telegraphing the surface repairs.

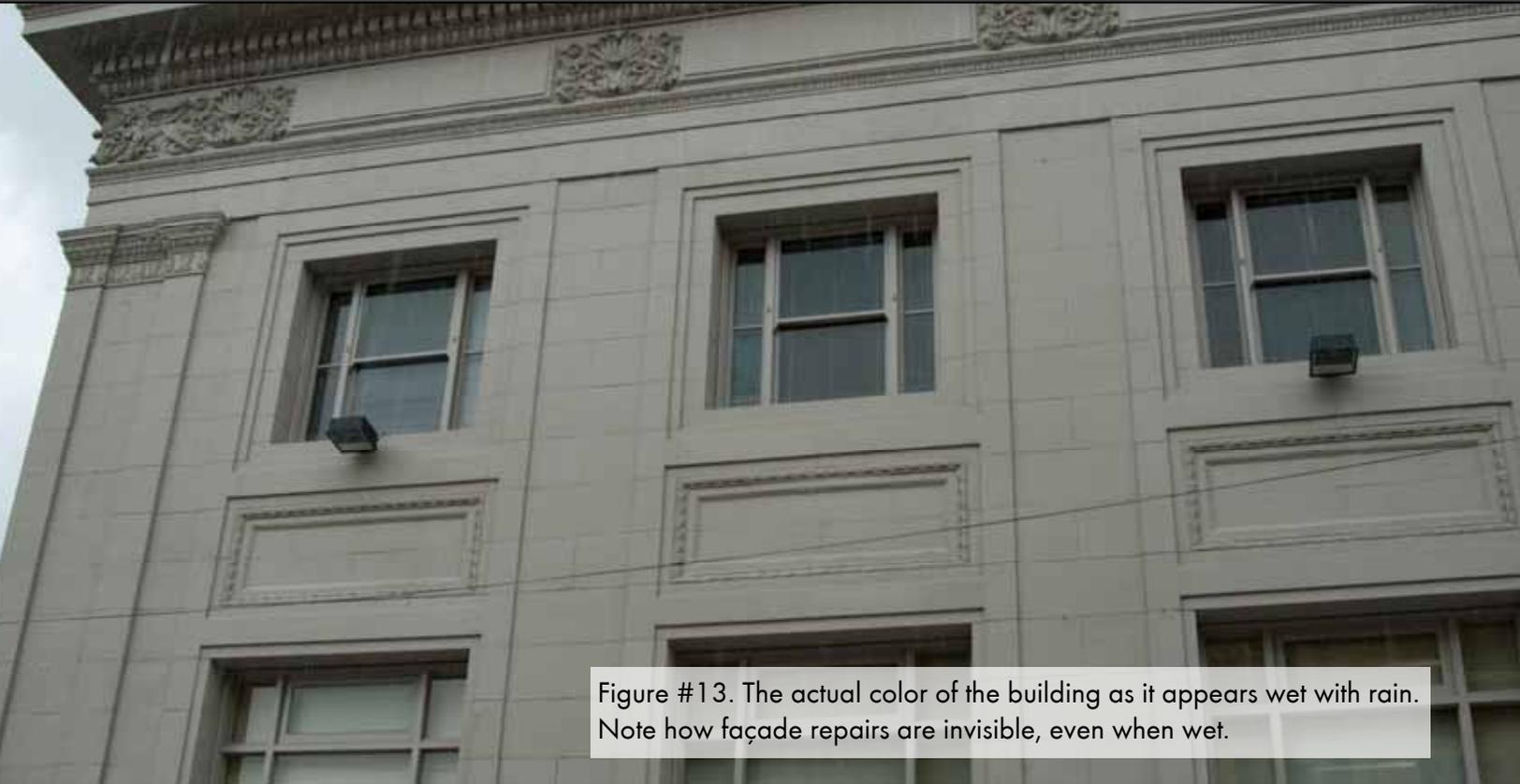


Figure #13. The actual color of the building as it appears wet with rain. Note how façade repairs are invisible, even when wet.

KEIM products used on this project:

- KEIM Concretal MKH, anti-corrosion mortar
- KEIM Concretal Mortar R, Portland mortar for technical repairs
- KEIM Concretal Universal Mortar S, Portland mortar for non-technical repairs
- KEIM Concretal Fine Filler, fine grained skim coating mortar
- KEIM Restauro Fuge, mortar for repointing bedding joints
- KEIM Restauro Top, mortar for rebuilding and carving details for decorative concrete elements
- KEIM Concrete Cleaner, to prepare mortar patches for silicate coating
- KEIM Universalputz Fine Render
- KEIM Glass Fiber Mesh, reinforcement for Universalputz Render
- KEIM Lime Remover, prepare Render surfaces for silicate coating
- KEIM Silan 100, water repellency for application under the protective coatings
- KEIM Concretal Dilution, a silicate diluent for the Concretal W Grob base coat
- KEIM Concretal W Grob, filled silicate base coat
- KEIM Concretal W, silicate top coat



Why Mission National Bank chose KEIM

The Bank's Perspective

The bank faced many challenges with concrete chunks falling 35 feet to the street below, the urgency to protect the public, and to expedite the renovation work. They required a product solution that would solve the challenges at hand, prevent a recurrence of the existing problems, and essentially be maintenance-free for decades. They placed their trust in KEIM's system of compatible products from substrate repair to façade restoration, accepted by the San Francisco Planning Department plan review, environmental review, and compliant with the SF Historic Preservation Commission.

KEIM's Extraordinary Proven Performance

- ◆ Substrate repair and renovation mortars 100% compatible with concrete and silicate coatings.
- ◆ Extremely vapor permeable and water repellent, KEIM keeps wall assemblies healthy and dry.
- ◆ Silicate coatings remain naturally clean without attracting dirt or pollutants to the mineral surface.
- ◆ Mineral pigment color will never fade. The microcrystalline coating structure refracts light providing a luminous, natural living beauty.
- ◆ Protective coating system will last for decades.

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