

Restoring The Buckingham Balconies



One hundred and forty-four balconies were restored at The Buckingham senior living community in Houston, Texas, to remedy water infiltration.

The Buckingham is a four-story senior living community located in the center of Houston, Texas. This establishment encompasses over 200 residences, with a balcony attached to each exterior unit. Due to unknown issues during original construction, the waterproofing and flashing details installed on the balconies failed, allowing water infiltration that caused extensive damage over the years. The framing members were deteriorated, and the plywood decks rotted, with many requiring complete demolition and rebuild. A nearly two-year-long project kicked off to fully restore and waterproof 144 balconies at The Buckingham.

THE PROCESS

Chamberlin was conscious of the residents' schedules and strived to keep interruptions to a minimum. Work only commenced from 8:00 a.m. to 4:30 p.m. daily. Crews began their work by sealing the windows on the exterior side with window film to help mitigate dust penetrating the tenant's living space. When needed, insulation was added to muffle noise as well.

Chamberlin used chipping hammers and jack hammers to demolish the concrete topping slab of the balconies followed by the plywood decking. Crew

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CONSULTANT'S CORNER:

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Lock-Strip Gasket Replacement & Remediation Strategies

Mid-century through 1980s buildings with lock-strip or "zipper-gasket" glazing systems are an ever present part of the urban landscape in many cities across North America. Although these systems are considered outdated by many and seldom used in new construction, the systems have performance attributes that should merit respect.

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members created an efficient way to keep debris to a minimum while they worked. A trash chute was constructed to run through the scaffolding so they could dump directly from the balcony to a wooden trash box at the bottom of the chute. The waste was emptied regularly into dumpsters maintaining an orderly work site.

After demolition, Chamberlin repaired and replaced damaged framing and columns, as well as installing new through-wall flashing. Next, new wooden decking was installed with an eighth-of-an-inch drop per foot to create the proper drainage slope. Then a W.R. Grace Bituthene 3000 sheet waterproofing system was applied and covered with a Wausau paver system. Finally, metal retaining flashing was installed.

A NEW APPROACH

Each balcony included one or two columns consisting of four-inch steel tubes concealed with a decorative fiberglass cover. These columns proved to be a challenge in accessing the wooden decking beneath them. The crew utilized the column base plates to raise the steel tube so the plywood and framing could be replaced. In addition, some of the column base plates were rusted, so new steel plates were welded and installed.

A larger challenge came when replacing the columns that had been completely removed from the balconies. The fiberglass covers were made of two pieces, which became warped when removed, therefore not matching up perfectly when reassembled. Crew members used Bondo to smooth out the seam and imperfections on the cover before sanding, priming and painting the columns. Since Chamberlin was brought in mid-project, complete removal of the columns and handrail on each balcony was the system in place from the previous contractor. However, Chamberlin devised an alternate method for the deck replacement that did not require removing the column covers or handrails. The crew members secured the columns in place by removing only the ornamental base of a column's fiberglass cover. They then removed the eight-inch lag bolts connecting the steel column to the column base plate and underlying framing members. Using those anchor points, they attached chains connected to supporting I-beams that suspended the column's weight, holding it in place. With this system, the crew could remove the damaged wooden decking substrate, as well as the column base plate, and replace them while the column remained intact. This system not only enhanced productivity for the restoration process, but also

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Balcony demolished to the framing before reconstruction.



Scaffolding system used to repair and replace damaged balconies at The Buckingham.

(LOCK-STRIP GASKET REPLACEMENT Continued from pg. 1)

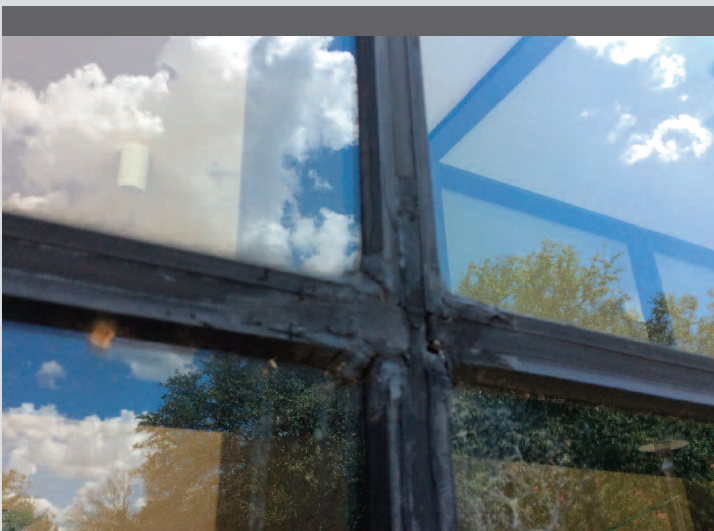


Figure 1: Lock-strip gasket in need of repair. Photo courtesy of Chamberlin Roofing & Waterproofing.

For many in the facade community, lock-strip gasket facades are often dismissed as a system to be removed and replaced with modern aluminum curtain wall. While this may be practical in certain situations, it is far from the only option available and not always the right option for the owner's budget or maintaining the original architecture of a building.

Lock-strip facades continue to endure, but age has taken its toll on the functionality of what was once a revolutionary glazing system. By maintaining the lock-strip gasket facade and upgrading glazing when possible, building performance can be restored or even increased as retrofit technology improves.

Remedial options are available for lock-strip gasket facades that focus on preserving and maintaining the primary elements and appearance of the system from simple remediation efforts, such as the installation of exterior "wet-seals" to limit air and water infiltration, to complete replacement and reglazing. (Fig.1 and Fig. 2)

Improved curtain wall performance (reduced air infiltration, lowered solar heat gain and improved acoustical performance)

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incorporated an additional safety element with the handrails in place during construction.

Chamberlin recognized the detail waterproofing and flashing at the column base as another area where installation could be streamlined. Originally, a three-piece metal design was being used, but Chamberlin developed a method that only required two pieces and was easier to install. Each balcony and column on the property differed slightly in measurement, so there was not a one-size-fits-all piece for this task. Varying slopes and angles added to the difficulty. Each piece of metal had to be custom measured and fabricated by Chamberlin sheet metal mechanics. Reducing the number of pieces to be manufactured and installed by a third greatly increased overall production, saving time and money.

WEATHER CONCERNS

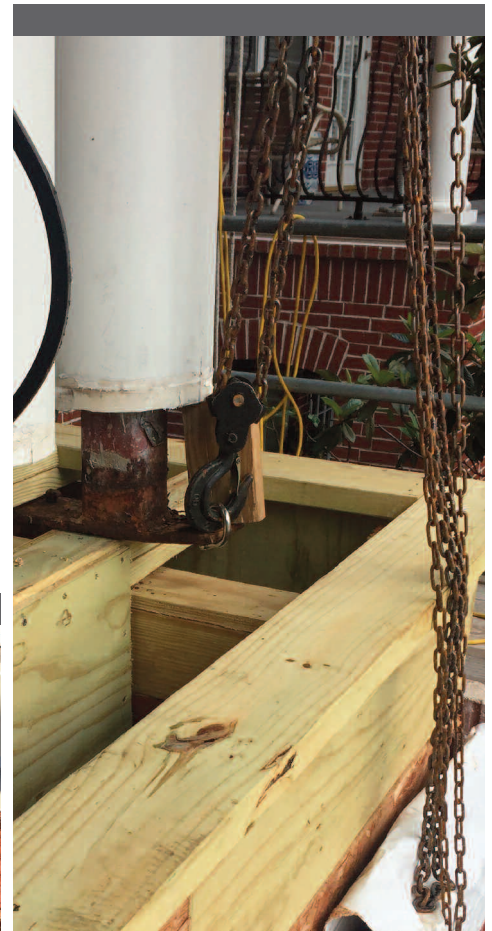
Extreme weather was experienced during this project as several storms tore through Houston, including Hurricane Harvey. For each storm, Chamberlin shut down the jobsite following Chamberlin's Hurricane Preparedness SMART Plan: Secure, Monitor, Alert, Review and Team. These steps are put in place to create a safe environment for all involved and include securing equipment, trash, materials or other objects on the jobsite

that could be a potential hazard in high winds. Many of the Chamberlin crew members also utilized this protocol at their homes when Hurricane Harvey struck to keep safety as a top priority off the job with their families, as well.

At times, Chamberlin had up to 35 crew members working together to meet the project's schedule. Chamberlin Waterproofing Superintendent Thomas Borrosco cites teamwork as the main contributing factor to their success saying, "Chamberlin's sheet metal crew did an outstanding job throughout this project helping and supporting the waterproofing team. Project Foremen Federico Castrejon and Losand Quinn also worked really well together, and with the crew, to make it a success for Chamberlin and for the residents of The Buckingham." ■



Perimeter retainer metal protecting the waterproofing and pavers.



Chamberlin devised a hoist system to hold the columns in place while repairing the decking beneath.

(LOCK-STRIP GASKET REPLACEMENT Continued from pg. 2)

is achieved by introducing modern insulating glass with a low-e coating and emerging technologies, such as vacuum insulating glass (VIG), and presents possibilities for replacement of an original monolithic glazed system for increased energy performance. Reglazing also provides the opportunity to increase spandrel insulation or change the aesthetic of the facade by introducing (or removing) existing spandrel panels.

While the benefits of the above are appealing, lock-strip gasket replacement projects are not immune to challenges. As with most remediation projects, there are technical considerations to address.

INTRODUCTION

One of the first large scale lock-strip gasket glazing projects was completed in 1952 at the General Motors Technical Center in Warren Michigan by Architect Eero Saarinen & Associates. In 2000 the building was listed on the National Register of Historic Places and in 2014 it was designated a National Historic Landmark.



Figure 2: Repaired lock-strip gasket. Photo courtesy of Chamberlin Roofing & Waterproofing.

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In 1974 C.J. Parise made mention of this building's facade system in his paper "Evaluation and Test of Lock-Strip Gasket Glazing Systems" in the American Society for Testing and Materials (ASTM) Special Technical Publications 552 where he concluded:

"There have been many successful (lock-strip) installations in the past 20 years which are still providing satisfactory service. Lock-strip gasket glazing is an excellent glazing system, but as true of any building system, there are certain precautions which must be observed for optimal performance." (Parise et.al, 1974)

Although he did not live to see the GM Tech Center become a National Historic Landmark, his conclusion on this topic is as true today as it was in 1974 and concisely summarizes the wide range of challenges associated with working with lock-strip gasket glazing systems.

Since the 1974 article, the technology of the lock-strip gasket has largely remained the same. However, modern lock-strip gasket designs have improved based upon early research and testing as well as improvements in manufacturing technology. As industry processes and the body of technical knowledge have evolved, so have the standards governing the properties, installation and glazing of these systems.

Technical standards are well documented and are a readily accessible resource to gain perspective where the "experience factor" of someone who has specific working knowledge of these systems, such as C.J. Parise in the 1970s and those like him of that era, becomes less available.

To effectively remediate and replace lock-strip gasket systems, a team must understand not only the applicable standards but also the lessons learned and documented by product

manufacturers and those with experience if lock-strip glazed buildings are to stay relevant in our time.

BACKGROUND

Lock-strip gaskets or "zipper gaskets" are generally described as a two-part neoprene gasket assembly consisting of a main body gasket, which is used to capture and support the glazed infill, and a lock-strip or "zipper" that is inserted into a receiving channel on the main body gasket to provide compression between the main body gasket, glazing infill and framing. Lock-strip gaskets provide a complete thermal break from the frame of the building and glass to assist in providing an efficient envelope. With no exposed metal, the systems provide exceptional condensation control as well as exceptional vibration and noise dampening (Griffith Rubber Mills, 2010).

Remediation of a lock-strip gasket curtain wall system, including removal and replacement of the lock-strip gasket curtain wall and glazing, is an option for consideration in many cases where preservation of the building facade is desired.

In such cases, it is likely the lock-strip gasket will require full replacement due to the existing condition of the gasket material. This is highly dependent on the age and exposure of the materials, but the majority of projects considering reglazing have aged to the point where replacement is a prerequisite. However, there are times when this may not be necessary and a waterproofing remediation can be undertaken.

During a reglaze and gasket replacement project, there is an opportunity for the existing aluminum framing system seals (internal/perimeter), as well as coatings, to be restored and the system structurally modified to accept modern high performance glass.

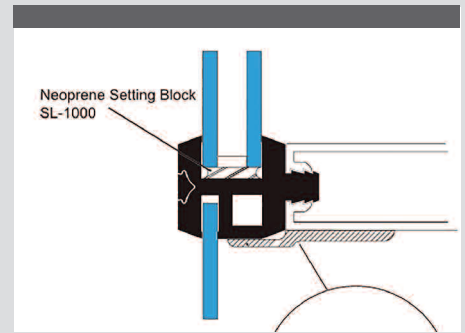
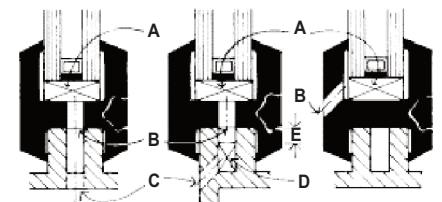


Figure 5: Lock-strip gasket support for IGU glazing. Image courtesy of Griffith Rubber Mills, Stanlock Catalog 2010.

Improvements may include dual-paned insulating glazing unit (IGU) as infill, as well as increased spandrel insulation. The aesthetic of the facade can be altered by introducing (or removing) metal spandrel panels. As the technology becomes more commercially viable, there is the opportunity to reglaze with vacuum insulating glass (VIG) for projects where the modification of a monolithic glazed system is prohibitive and increased energy performance is desired.



MOST ACCEPTABLE METHOD **ACCEPTABLE METHOD** **LEAST ACCEPTABLE METHOD**

- A Setting blocks at 1/4 points
- B Weepholes not covered by setting blocks (center between and on each side of blocks near jambs)
- C Weepholes in frame
- D Open-cell polyurethane pad behind each weephole in frame
- E 6.4 mm (1/4 in.) minimum clearance when pad is in line with weephole above

Figure 6: Weep strategies for lock-strip gasket with insulating glass. Diagram courtesy of ASTM C964.

Introducing a new lock-strip gasket system to an aged facade with modern low-e coated insulating glass can provide additional visible light transmittance, lower solar heat gain and improved sound transmittance (OITC and STC) performance. This all translates to increased interior occupant comfort and safety, as well as energy savings.

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...see LOCK-STRIP GASKET REPLACEMENT)

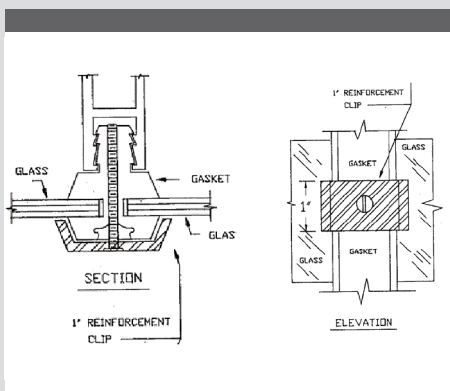


Figure 3: Retaining clips for lock-strip gasket. Diagram and image courtesy of Griffith Rubber Mills.

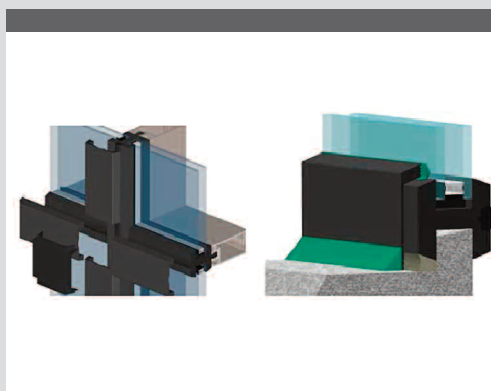


Figure 4: Silicone sheet overlay and wet seal accessories. Diagram courtesy of Tremco Commercial Sealants.

Industry Honors

Chamberlin Roofing & Waterproofing's balcony repair and replacement for The Driskill Hotel in Austin, Texas, was awarded an ENR Texas & Louisiana Best Project Award of Merit. This program recognizes the top construction projects in their region and the companies who designed and built them. A panel of industry experts evaluates the projects on many criteria, including safety, innovation and teamwork. Additionally, Chamberlin is a proud team member of nearly a dozen other ENR-award-winning projects this year. From airports to aquatic centers, projects of all types swept first and second places in the Best Projects competition. Chamberlin is honored to have been involved with excellent partners delivering those successful projects to our clients.



ENR Texas & Louisiana presented Chamberlin a Best Project Award of Merit for their balcony repair and replacement at The Driskill Hotel in Austin, Texas.



Chamberlin's safety program was recognized with ABC STEP Platinum status for 2017.

Established in 1989, ABC's Safety Training Evaluation Process (STEP) was developed and written by contractors, for contractors. Participating ABC member firms measure their safety processes and policies on 20 key components through a detailed questionnaire with the goal of implementing or enhancing safety programs that reduce jobsite incident rates. ABC believes world-class safety programs have three main components: a commitment from company leadership to embrace safety as the core value upon which decisions are made, a top-to-bottom safety culture that empowers all employees to create the safest work environment possible and systems and

processes that focus on how to prevent a hazard or incident from occurring. Chamberlin Roofing & Waterproofing achieved ABC STEP Platinum status in 2017.



Chamberlin Roofing & Waterproofing received a 2017 TEXO Distinguished Building Award for their work on the Dallas Cowboys World Headquarters and The Ford Center in Frisco, Texas.

Chamberlin Roofing & Waterproofing won first place in TEXO's 2017 Distinguished Building Awards competition in the Other Specialty Construction category for their massive waterproofing scope at The Star in Frisco, Texas. The Distinguished Building Awards embody the skill, commitment and passion that TEXO members have for construction. Placing first qualifies Chamberlin for ABC's National Excellence in Construction Awards competition. ■

(LOCK-STRIP GASKET REPLACEMENT Continued from pg. 4)

LOCK-STRIP GASKET REMEDIATION

As previously mentioned, remediation of a lock-strip glazing system should include an evaluation of the current physical condition for structural performance, as well as an evaluation of air and water infiltration. Depending on the findings of this evaluation, a remediation of the existing lock-strip gaskets could be considered to maintain the serviceability of the facade.

There are several elements of a lock-strip gasket system remediation that may be considered to extend the serviceability of the existing glazing system. Generally, a remedial program will employ a strategy of mechanical stabilization and preservation of the existing gasket, as well as a means of reducing air and water infiltration.

REINFORCEMENT CLIPS

To provide structural support of the existing system, a remediation may include installation of retaining clips at exterior horizontal and vertical lock-strip gaskets. The addition of mechanically attached

retaining clips will help to ensure structural performance of the system as deteriorated gaskets may not exhibit the same performance characteristics as originally designed. This is especially important at corner zones and locations anticipated to have significant wind exposure. (Fig. 3)

The use of reinforcement clips results in an increase in the resistance of the gasket to roll off the frame. The use of one clip per side provides substantially higher load capacity and still greater capacity is obtained using two clips per side.

Depending on the gasket and frame profile, several reinforcement clip options are available. The majority of applications require an exterior installation, but interior clips are used for some systems to augment exterior clips.

The project-specific reinforcement requirements for the lock-strip gasket system should be designed by a Professional Engineer with experience in facade engineering evaluations. The engineer will be able to determine the

number of clips and spacing requirements as well as evaluate the profile of the clip to ensure glass to metal contact is avoided. The clip design strategy can then be coordinated with any remedial waterproofing work. ■

To continue reading article, visit:
<https://www.chamberlinltd.com/articles/lockstrip-gasket-replacement-remediation-strategies/>

Michael Plewacki joined Morrison Hershfield in 2014 and currently serves as Principal/Facade Engineering Manager. Morrison Hershfield provides integrated solutions to residential, institutional, industrial and commercial clients who require reliable and cost-effective systems in both new and retrofit facilities. The combined skills of their engineers, architects, technicians and support personnel with diverse backgrounds in design and construction provide clients with a team recognized as leaders in the field of building science.

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TEXAS STATE UNIVERSITY ENGINEERING AND SCIENCE BUILDING – SAN MARCOS, TX

New Construction Waterproofing

Contract Amount: \$1,800,000 (approx.)
Owner: Texas State University System
Architect: TreanorHL and Alamo Architects
General Contractor: SpawGlass
Scope of Work: Installation of below-grade waterproofing, hot fluid-applied waterproofing, expansion joints, water repellents, thermal insulation, fluid-applied membrane air barrier, sheet metal flashing and trim, joint sealants, pavers and pedestals, dampproofing and green roof system
Project Description: Higher education Engineering and Science Building

WELLS FARGO PLAZA BUILDING – BRYAN, TX

Remedial Waterproofing

Contract Amount: \$350,000 (approx.)
Owner: Kensington Management, LLC
Consultant: Chamblee and Associates
General Contractor: Chamberlin Roofing & Waterproofing
Scope of Work: Brick replacement, tuck pointing, wet sealing, waterproofing of brick and concrete fascia, power washing and replacement of door and window caulk perimeters and masonry joints
Project Description: Repair and restoration of six-story bank and office building

CHRISTUS SPOHN SHORELINE HOSPITAL – CORPUS CHRISTI, TX

New Construction Roofing

Contract Amount: \$2,200,000 (approx.)
Owner: CHRISTUS Spohn
Architect: Perkins + Will
General Contractor: McCarthy Building Companies, Inc.
Scope of Work: Installation of TPO roofing system, sheet metal flashing and trim
Project Description: Hospital expansion

UTMB PARKING INITIATIVES – LEAGUE CITY, TX

New Construction Waterproofing

Contract Amount: \$600,000 (approx.)
Owner: UTMB Health League City
Architect: Kirksey Architects, Inc.
General Contractor: Hensel Phelps
Scope of Work: Installation of below-grade waterproofing, elevator pit waterproofing, fluid-applied waterproofing, traffic coating, insulation, joint sealants, expansion joints, air barrier, sheet metal flashing and site sealants
Project Description: Parking garage, pedestrian bridge and three-story building

HIBISCUS RESTAURANT – DALLAS, TX

Remedial Roofing

Contract Amount: \$150,000 (approx.)
Owner: Potter Investments, Ltd.
General Contractor: Chamberlin Roofing & Waterproofing
Scope of Work: Removal of existing roof system and installation of modified bitumen roofing, TPO roofing, flashing and sheet metal
Project Description: Upscale eatery

ASHFORD OAKS – SAN ANTONIO, TX

Remedial Waterproofing

Contract Amount: \$300,000 (approx.)
Owner: Woodside Capital Partners
General Contractor: Transwestern
Scope of Work: Wet glazing and replacement of granite control joints
Project Description: Repair and renovation of 200,000-square-foot office building

DEVON ENERGY CENTER CONNECTOR – OKLAHOMA CITY, OK

New Construction Waterproofing

Contract Amount: \$100,000 (approx.)
Owner: Devon Headquarters
Architect: Kendall/Heaton Associates, Inc.
General Contractor: JE Dunn Construction Company
Scope of Work: Installation of hot-fluid rubberized asphalt waterproofing, vehicular traffic coatings, sheet metal flashing and trim, roof pavers and expansion control
Project Description: Fifty-story corporate skyscraper

KATY STATION – DALLAS, TX

New Construction Roofing and Waterproofing

Contract Amount: \$2,600,000 (approx.)
Owner: Genesis Katy LP/Gordon LP
Architect: EDI International, Inc.
General Contractor: Andres Construction
Scope of Work: Installation of dampproofing, hot-fluid rubberized asphalt waterproofing, sheet waterproofing, fluid-applied waterproofing, pedestrian and vehicular traffic coatings, roof and deck insulation, fluid-applied air barrier, roof pavers, firestopping, joint sealants, expansion control, TPO roofing system, sheet metal, flashing and counterflashing
Project Description: High-rise luxury apartments

GALLOGLY HALL ACADEMIC BUILDING – NORMAN, OK

New Construction Waterproofing

Contract Amount: \$250,000 (approx.)
Owner: The Board of Regents of the University of Oklahoma
Architect: Page Southerland Page, LLP
General Contractor: JE Dunn Construction Company
Scope of Work: Installation of hot-fluid rubberized asphalt waterproofing, bentonite waterproofing, fluid-applied air barrier, site and paving sealants, roof pavers and joint sealants
Project Description: Biomedical Engineering learning facility

FROST TOWER – SAN ANTONIO, TX

New Construction Waterproofing

Contract Amount: \$800,000 (approx.)
Owner: Weston Urban and Frost Bank, a joint venture
Architect: Pelli Clarke Pelli Architects
General Contractor: Clark Construction
Scope of Work: Installation of below-grade waterproofing, insulation, elastomeric coating, hot-applied waterproofing, traffic coating, expansion joints and joint sealants
Project Description: Twenty three-story office building and bank headquarters

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