Zero/Six

BEYOND THE EXTERIOR

August 2018

A MESSAGE FROM OUR CEO: MY TENURE AS A STUCCO NERD

(SEE PAGE 4)

CONTENT

Photo Info : Extreme movement observed on stucco panels after hurricane Ike

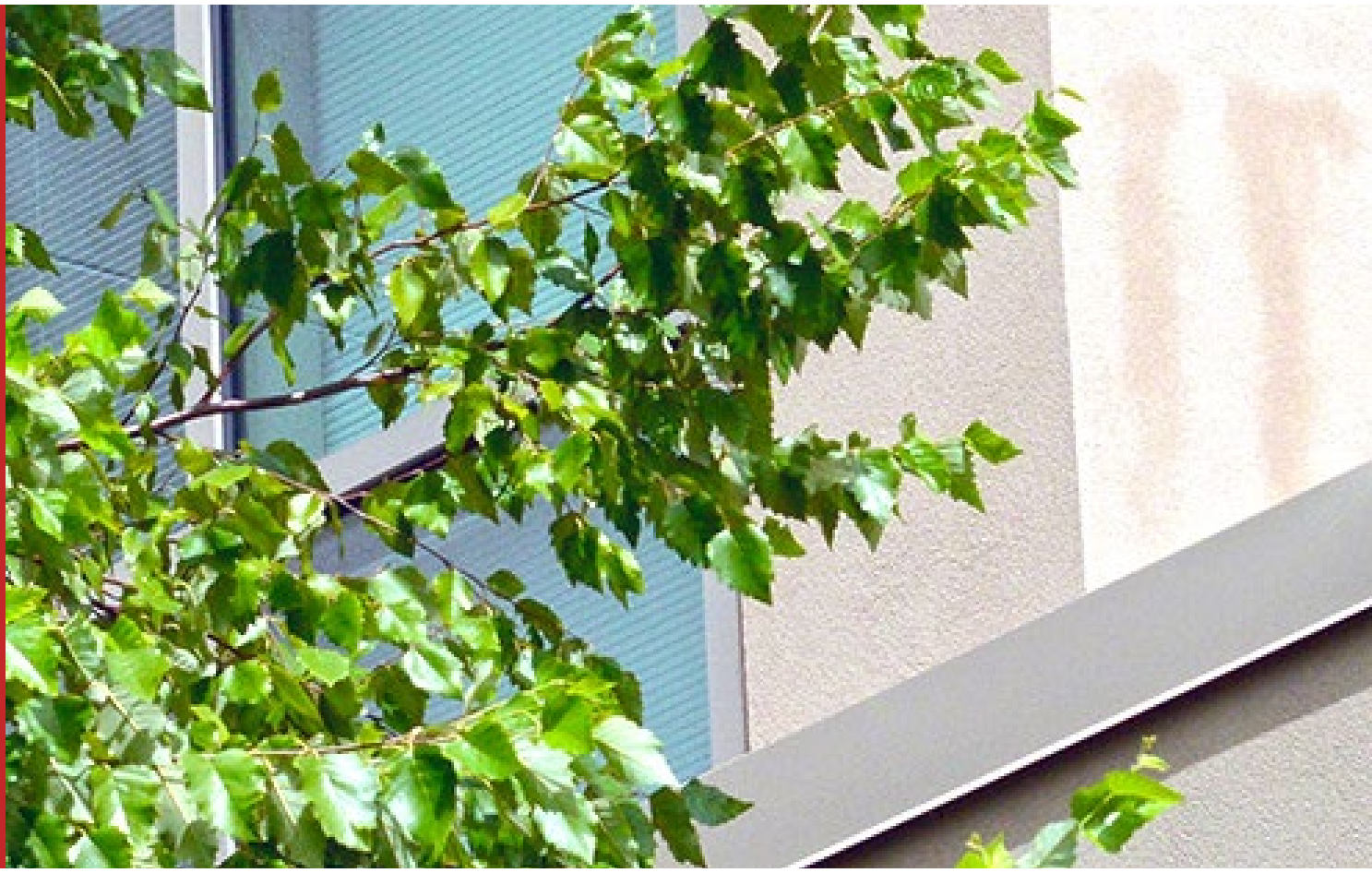


Photo Info : Water staining on face of wall at area with inconstant drainage plane

WORDS: MR. BILL COLTZER JR., AIA

MY TENURE AS A STUCCO NERD

A MESSAGE FROM OUR CEO

I WOULD RATHER HAVE CONTINUOUS LATH SERVING AS A STRUCTURAL DIAPHRAGM THAN A QUILT OF CEMENT SQUARES HANDING OVER MY HEAD

Hanging around with Tim Rogan (Houston Lath and Plaster) and Chad Dupree (Diversified Plastering) the last couple of years has definitely increased my awareness with regard to the more technical aspects of lath and stucco. I consider myself a pretty well-rounded envelope fellow, but these two are more along the lines of stucco specialist; I believe we use to call them craftsmen, but today, they are commonly called nerds.

As many of you may or may not know, our three firms set out to build a large-scale mock up at our facility in Galveston about a year and a half ago to determine if cutting lath at control joints really reduced cracking. Apparently, the Architect/Engineer side thinks cutting the lath is better and the contractor crowd thinks running the lath through is better. I really don't care – I just like testing big mock ups. That is not to say that my testing circus does not come with opinions and over the length of this process, I have developed some really strong opinions on stucco installations.

First of all, the cracking that we saw was no more prominent from the cut lath side of the mock to the side that ran through (in fact many of our cracks started in the middle). If it does not make a difference, why would you cut it? I would rather have a continuous lath serving as a structural diaphragm than a quilt of cement squares hanging over my head.


1

What do you think? You are right. Time for another big mock-up! Calling all sponsors!

Secondly, along with the lath cutting comes the securement of the edges of the lath which comes complete with hundreds, if not thousands, of holes though the water resistive barrier (WRB). Now we are back on my home turf! We need to minimize holes through the WRB, especially if we are going to continue to sheath with oriented strand board (OSB) to minimize pesky (litigious) water infiltration issues.

Lastly, (and this has nothing to do with cutting the lath), I do not agree with the International Building Code (IBC) that the stucco system should be designed to minimize water behind the stucco system (modern day drainage planes can handle the water). Typically, when you limit water in, you limit water out. We see much more damage (i.e. cracks) related to water trapped behind stucco than cracks related to any other distinguishable source; we also see a lot of trapped water when we core stucco systems for forensic purposes. So, what does that have to do with lath? It is my opinion that we need more room behind the stucco (than self-furring lath provides) to facilitate the complete evacuation of water that will get behind the stucco system. The movement of air and water behind the lath will prevent premature degradation of building materials, specifically stucco systems and the WRB (WRB'S are not made to stay wet, i.e. they are not water proofing) due to continuous exposure to water and may help reduce cracking since the lath would not be pulled tight across the sheathing.


2

> IT IS MY OPINION THAT WE NEED MORE ROOM BEHIND THE STUCCO TO FACILITATE THE COMPLETE EVACUATION OF WATER THAT WILL GET BEHIND THE STUCCO SYSTEM

CHECK OUT THE RESULTS FROM THE STUDY HERE!

1. Photo Info : 1200-square-foot stucco mock-up in Galveston, TX

2. Photo Info : Screw holes at areas that missed studs causing water infiltration

AT-A-GLANCE

SCHOOL OF MEDICINE TEAM BASED LEARNING CENTER

Aimed at enhancing the next generation of physician's teamwork and problem-solving skills, the University of Texas Rio Grande Valley's School of Medicine Team Based Learning Center advances the university's mission to expand medical training in the Valley and remain at the forefront of medical education.

Owner / Client	The University of Texas System
Architect	Muñoz & Company
Location	Edinburg, TX
Type	New Construction
Scale	Three-story, 24,000 SF
Construction Cost	$12.2 million
Status	Spring 2020
Scope of Work	Drawing Review, Submittal Review, On-site QA/QC and Reporting and Commissioning of the Building Envelope including Static Pressure Water Infiltration Testing per ASTM E1105 and Diagnostic Nozzle Water Testing per AAMA 501.2.

Photo Credit: Rendering provided by Muñoz & Company

SCIENCE AND ENGINEERING BUILDING

The University of Texas at San Antonio Science and Engineering Building is the largest construction project in the university's 49-year history and will be the first new building completed at the campus since the North Paseo Building opened in 2014. The 153,000-square-foot SEB facility will not only provide a home for world-changing breakthroughs for students and faculty, but it will include laboratory, classroom and collaborative space for multiple programs in brain health, chemical engineering, biology, and chemistry.

Owner / Client	The University of Texas System
Architect	Alamo Architects and TreanorHL (Rendering provided by Alamo Architects)
Contractor	Bartlett Cocke General Contractors
Location	San Antonio, TX
Type	New Construction
Scale	Four-story, 153,000 SF
Construction Cost	$95 million
Status	2020
Scope of Work	Drawing Review, Submittal Review, On-site QA/QC and Reporting and Commissioning of the Building Envelope including Air Infiltration Testing per ASTM E783, Static Pressure Water Infiltration Testing per ASTM E1105 and Diagnostic Nozzle Water Testing per AAMA 501.2.

Photo Credit: Rendering provided by Alamo Architects

Photo Credit: Rendering provided by Alamo Architects

BARSHOP INSTITUTE

In October 2017, the University of Texas Health Science Center at San Antonio entered a new era of research and discovery after breaking ground on the new and expanded Barshop Institute for Longevity & Aging Studies, a research facility to house top scientists conducting clinical research in aging and neurodegenerative diseases. As one of the world's premier aging research centers, the three-story,108,000-square-foot project, will house state-of-the-art open research labs, laboratory support, administrative and research faculty offices, and a large vivarium with support spaces to foster innovation and collaboration for tomorrow's breakthroughs.

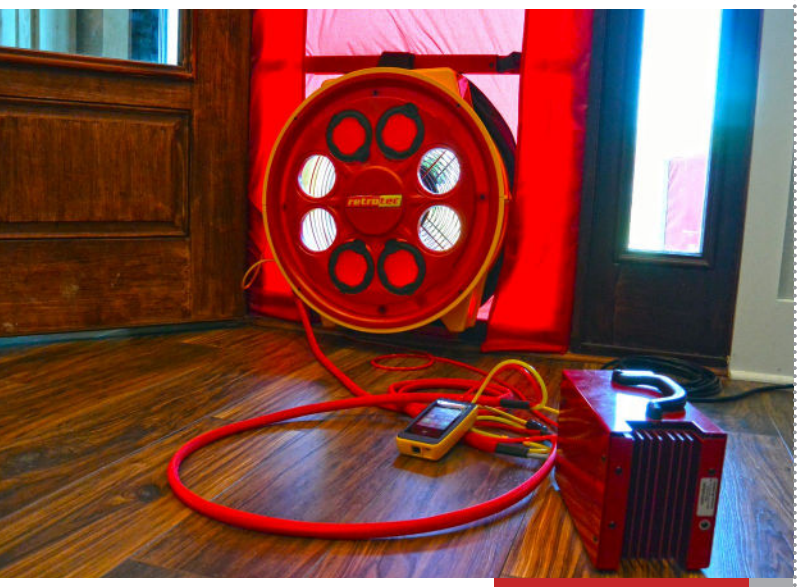
Owner / Client	The University of Texas System
Architect	Alamo Architects and TreanorHL
Contractor	Vaughn Construction
Location	San Antonio, TX
Type	New Construction
Scale	Three-story, 108,000 SF
Construction Cost	$70 million
Status	November 2019
Scope of Work	Drawing Review, On-site QA/QC and Reporting and Commissioning of the Building Envelope including Air Infiltration Testing per ASTM E783, Static Pressure Water Infiltration Testing per ASTM E1105 and Diagnostic Nozzle Water Testing per AAMA 501.2.

ASK OUR EXPERTS

PERFORMANCE TESTING

WORDS: MR. JEFF BISHOP, P.E., LEED GA & MR. DANIEL HODGE, RRO

THE CHALLENGES ARISE WHEN THE COMMISSIONING AUTHORITY ISN'T INTEGRATED INTO THE TEAM DURING THE PLANNING OR DESIGN PHASES



Q: How does building envelope performance testing get applied to a commercial building?

A: The easiest way to incorporate building envelope performance testing is to engage a commissioning team and outline the commissioning plan during the schematic design phase; this way performance assurance costs can be accounted for early on. Commissioning uses drawing review, inspection, and testing to systematically confirm and document that all building components are planned for, installed and performed as required. In the design phase, the commissioning requirements incorporate into the A/E & CM scope of services. This will drive the specifications for exterior systems and define the field testing requirements so that high-performance exterior components are specified and the contractor understands their workmanship will be subjected to inspection and performance testing in the field.

Q: How do owners develop, integrate and implement testing protocols into the building envelope program? What are some of the challenges?

A: Owners benefit from a building envelope program when they engage with a commissioning authority to create and implement the plan for functional performance testing. The challenges arise when the commissioning authority isn't integrated into the team during the planning or design phases. If testing protocols and commissioning are put off until the construction phase, the architect and construction team will push back since their budget and schedule may not have accounted for any functional performance testing. Also, if the testing parameters aren't clearly defined in the contract documents, the construction team has a legitimate concern since they haven't accounted for the risk associated with performance issues discovered during testing. It can be argued that the construction team should be relieved to find (and correct) issues

through testing during construction rather than after the building has been turned over. All parties would agree it is less expensive to correct issues while tools, personnel, and access are in place. The problem is that the construction team is solely focused on finishing the project on time and under budget during construction, and any additions or changes to the initial contract and understanding of the project will be used as reasons to extend the schedule or add cost to the exclusion of the owners' best interest.

Q: Mock-up testing versus field testing.

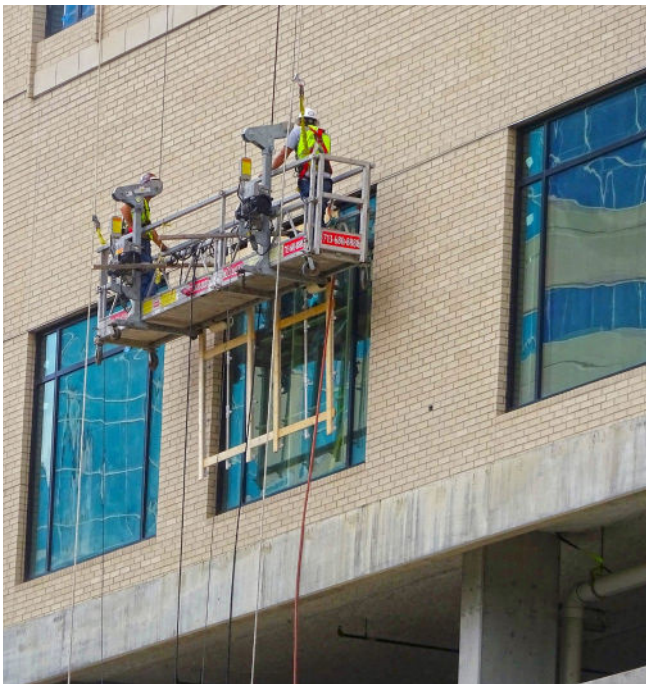
A: Mock-up testing accomplishes several things; first, it determines if the actual product performs in place as it was designed on paper. Second, it establishes parameters for requiring proper installation upfront and a go-to model for reference moving forward. Third, without mock-up testing, issues discovered later prove costly to the contractor during construction and to the owner after occupancy. Mock-up testing is useful for working through difficult details of various building components and prepares the construction team by testing far in advance of the installed product, allowing for pre-diagnosis of potential problems, such as air and water infiltration, structural detection, thermal and sound transmittance. This is a great tool to bring the trades together and ensure the project-specific assembly can meet the performance requirements.

Field testing is more focused on ensuring the installed systems interface as intended and workmanship meets the specified standards of performance. One of the best benefits of field testing is simply the contractors knowing that field tests will be performed on some representative samples of the work. Since there will be monetary & time consequences for any building components that do not meet performance requirements, it is less likely corners will be cut during installation.

Q: What measures are put in place to ensure the integrity of test results?

A: This was the question we wrestled with; an owner or contractor hires a testing company to test the product and installation, but who tests the tester? This is why we voluntarily chose to become

> MOCK-UP TESTING ALLOWS FOR PRE-DIAGNOSIS OF POTENTIAL PROBLEMS, SUCH AS AIR & WATER INFILTRATION AND STRUCTURAL DEFLECTION



an ISO/IEC 17025 accredited organization. The International Organization for Standardization (ISO) is an independent, non-governmental organization; it is the world's largest and most stringent developer of voluntary international standards. ISO is one of only a handful of organizations granted Consultative Status to the United Nations Economic and Social Council (ECOSOC) which is the highest status granted by the United Nations to non-governmental organizations (NGO's), thereby allowing them to participate in the work of the United Nations. ISO accreditation is a lengthy and expensive process that requires external auditing of our integrity, testing procedures, equipment and how we report the results. To be ISO accredited means you have established beyond doubt the three requirements for ISO accreditation: proven competence, systems in place to maintain this proven competence and in-house processes in place to systematically identify and correct any and all disruptions to this competency. The bottom line is that integrity is not just a part of who Z6 is, but the whole, because now, the tester is being tested.

Q: How are test results interpreted?

A: From the perspective of the testing organization, the tests are performed to the specified test standard and results are given; interpretation and diagnosis generally fall into the realm of consulting. If the test results are

as expected for the performance requirements in the field then it can be easily interpreted as "pass". If the test results are as expected for the performance requirements in the field, then it can be easily interpreted as "pass". If there is a failure, the testing agency can document and point in the field to "where" and "how" the failure was observed but must leave the "who", "why" and "what to do next" to the consulting team. The testing team's role is to strictly follow ISO test standards and accurately, objectively and impartially report on the integrity of building materials and products.

Q: What are some best practices for testing the building envelope?

A: The three rules of testing the building envelope are starting early, start early and start early. A mock-up, either at a laboratory or on-site, is a best practice since it can identify any issues prior to installation on the project which reduces disruptions during actual construction. This gives all parties time to thoroughly review and adjust products, detailing configurations, and installation techniques to make sure the exterior components meet the appropriate standard. Testing milestones are typically when 10%, 35% and 70% of the building component has been completed and allowed the manufactures required time to cure. Any errors made in the field are costly and time-intensive to correct, so identifying them as early as possible in the process is paramount.

Q: What are the categories of functional performance testing?

A: Categories for building performance testing start by breaking down each building component:

Fenestrations (windows, doors, and skylights)

- **Water Infiltration Testing (ASTM E1105)** - the ASTM E1105 test method consists of sealing a chamber to the interior or exterior face of the specimen to be tested, supplying air to a chamber mounted on the exterior or exhausting air from a chamber mounted on the interior, at a rate required to maintain the calibrated test pressure difference across the specimen while spraying a calibrated water delivery onto the outdoor face of the specimen at the specified rate and observing any water penetration.
- **Air Infiltration Testing (ASTM E783)** - This test method consists of sealing a chamber to the interior or exterior face of specimen to be tested, supplying air to a chamber mounted on the exterior or exhausting air from a chamber mounted on the interior, at a rate required to maintain the test pressure difference across the specimen and measuring the resultant air flow across the specimen.
- **Structural Testing (ASTM E330)** - This test method consists of sealing the test specimen into or against one face of a test chamber, supplying air to or exhausting air from the chamber according to a specific test loading program, at the rate required to maintain the test pressure difference across the specimen, and observing, measuring, and recording the deflection, deformations, and

nature of any distress or failures of the specimen.

Roofing

- **Roof Membrane Uplift Resistance Testing (FM Global 1-52 / ASTM E907)** - wind uplift testing is used to structurally test the membrane using a 5'x5' machine to apply the negative pressure while measuring deflection.
- **Water Infiltration Testing** - typically thermographic imaging and moisture probes are used for checking if water is present under built-up roofing.
- **Electronic Leak Detection (ASTM D7877)** - for horizontal and vertical hot-applied or cold-applied waterproofing applications ELD is used to identify points of potential water infiltration. This work can be performed on split-slabs, pavers, green roofs, pools, and fountains.
- **Diagnostic Nozzle Testing (AAMA 501.2)** - can be performed on unique details or used as a diagnostic test for windows. This is as simple as attaching a calibrated nozzle onto a hose, using a pump to get adequate pressure, and spraying the window at the specified rate to see if infiltration occurs.

Whole Building

- **Blower Door Testing (ASTM E779/E1827/E1186)** - an air blower door test is conducted throughout the entire building and measures the number of air changes per hour based on the standards established for the climate zone in which the building is located. The test is conducted by inserting a calibrated fan into an airtight shroud installed over an exterior door opening and creating a vacuum over the entire structure. Test equipment then measures the airflow (how much air is moved into the building) and the corresponding pressure difference acting across the building enclosure.

The U.S. military has been using whole building air leakage testing for many years to achieve superior air leakage control; they have figured out what works on their detailing and building components using this data. The DOE says controlling air leakage can reduce energy costs by up to 40%.

Q: What are some common misconceptions regarding performance testing?

A: I think there is a common belief that testing is time-consuming and disruptive on the job site; when, in reality, 6-8 window systems can be tested in a day with minimal disruption to the various trades during construction. Set-up time is around an hour and the test itself usually only takes 15 minutes per system. Logistics are another misconception. Many building owners assume it will be impossible to test certain configurations based on the height of the building or areas with limited access. Z6 specializes in testing unique and difficult conditions; we can get the chamber and water distribution rack into place to test per the standard on any area of high-rise buildings. We employ innovative techniques to solve logistical problems and build custom spray racks for unique details like corners, skylights, and hard to access areas.

THE HOSPITAL WAS DESIGNED TO BE FLEXIBLE WITH SHELL SPACE PLACED STRATEGICALLY FOR FUTURE EXPANSION.

THE HOSPITAL INCLUDES 95 MORE PATIENT ROOMS, 22 ADDITIONAL EMERGENCY ROOMS, AND TEN STATE-OF-THE-ART OPERATING ROOMS

PROJECT SPOTLIGHT

METHODIST WEST HOSPITAL EXPANSION

After opening its doors eight years ago, the Houston Methodist West Hospital recently expanded its campus to serve the Katy community's growing needs and continue its mission to deliver personalized care and innovation to Waller, Harris, and Fort Bend County residents. The six-story, 228,700-square-foot hospital building provides easier access to the hospital with the new multi-level parking garage and a sky bridge to provide a critical connection with the existing infrastructure and includes 95 more patient rooms, 22 additional emergency rooms, and ten state-of-the-art operating rooms. With the West Houston population projected to reach one million people by 2023, the hospital must stay ahead of these challenges to ensure they meet the future demands of the ever-growing community, which is why Page designed the building to be flexible with shell space placed strategically in the new facility for future expansion.

To ensure the building's expected life cycle was achieved for the Houston Methodist West Hospital Phase II Expansion, Zero/Six provided construction administration services including peer reviews, submittal/shop drawing reviews, and observation of the ongoing construction of building enclosure components twice a week to compare with the construction documents. Performance testing of the installed enclosure systems was conducted by Z6 Commissioning and included static pressure water infiltration testing (ASTM E1105), air infiltration testing (ASTM E783), roof membrane uplift resistance testing (ASTM E907), and diagnostic nozzle testing (AAMA 501.2) of fenestrations to ensure the final product exceeded expectations.

Hedwig Place

Associate Principal Daniel Hodge was on-site to conduct a preliminary review of the exterior mock-up at Hedwig Place, a 102,474-square-foot, five-story, Class A medical office building located in Hedwig Village, an affluent, independent municipality of Houston's booming west side. Developed by Stream Realty Partners and AMD Global, Hedwig Place is situated on two acres in the heart of Memorial Villages, three miles from Memorial Hermann Memorial City Medical Center and within minutes of Houston's popular Uptown District. The development broke ground 65 percent preleased with anchor tenants Memorial Plastic Surgery and Texas Ear, Nose and Throat Specialists.

Historic Preservation

The team performed ELD testing at the historic Lancaster Hotel in Houston to confirm the integrity of the waterproofing membrane. Built in 1926, the nearly 100-year-old downtown hotel is undergoing a multimillion-dollar renovation after sustaining damages due to the flooding that inundated Houston during Hurricane Harvey.

Mid-year Meeting

It's not often that the entire Zero/Six team is together in one room. But when we are, it's a lot of fun! Last week, we had our mid-year meeting to celebrate, recognize and reflect on current company efforts and the accomplishments of our amazing team members! We even witnessed history as our "Song of the Day" John Wayne trophy holder, Brandon McDermott, passed his long-held title to Zack Johnson. The future looks bright at Zero/Six!

Work Perk

The Zero/Six Consulting team had a great time at our company outing on the water before the mid-year meeting. Wish we were on a boat right now!

ZERO/SIX OUT&ABOUT

▲ It's a Pass!

Z6 tested the wind uplift resistance on a recover adhered to a 20 year old coal tar roof to 210 PSF at Moody Methodist Church in Galveston, TX for our strategic partner, Coltzer Company. This is really cool because it allows us to minimize coal tar exposure to the workers and keeps a few hundred CY's of trash out of a landfill! It is a solid roof, is highly reflective and stuck like a duck. Not the worlds cheapest operation but a high performing, responsible option for the Gulf Coast. Other mock up players included FiberTite Roofing and Strategic Roofing Solutions, LLC.

◄ Leak Detection

Z6 performed Electronic Leak Detection (ELD) testing at The University of Texas Rio Grande Valley's Brownsville Interdisciplinary Academic Building (BINAB). The 55,509-square-foot facility will consist of a pair of two-story wings connected by an exterior bridge and arranged to create a courtyard reflecting the environment and culture of the campus and serving as a gathering area, study space and event venue.

Site Visit! ►

Our senior field specialists were on-site to conduct quality control inspections for the addition to Wisenbaker Engineering Building, part of Texas A&M University's new Engineering Quad. This addition supports the guiding principles of Dwight Look College of Engineering's 25 by 25 initiative to enhance students' educational experience and respond to the workforce needs of the industry. The program is designed to increase access for qualified students to pursue engineering education and grow the University's total enrollment to 25,000 students by 2025.

HAVE A LOOK INTO YOUR FUTURE...

JOIN OUR ZERO/SIX TEAM

CURRENT OPPORTUNITIES

BUILDING ENVELOPE CONSULTANTS – THROUGHOUT TEXAS

PRIMARY RESPONSIBILITIES:

- Critical evaluation of building envelope performance.
- Resolving complex building envelope issues, including evaluating existing design.
- Inspect work in progress related to the exterior building envelope. Inspections will require climbing and operation of access equipment (i.e. swing stages) on high rise structures.
- Organizing field data to facilitate analysis and problem solving.
- Management of client services, communicating progress, reporting, technical discussion of findings, recommendations, and project close-out.
- Scheduling and implementation of project needs.
- Attending project meetings, including leading meetings.
- Business development

CANDIDATE MUST HAVE THE FOLLOWING SKILL REQUIREMENTS:

- Strong expertise in the building envelope, including building materials, glazing systems; insulation and air barriers; cladding assemblies; roofing; and waterproofing systems.
- Experience in various building envelope related test methods.
- Knowledge and experience in field quality control and investigation methods.
- Ability to work on-site and to also travel which may include overnight travel.
- Experience managing projects and project teams of varying sizes.
- A mature professional with excellent written and verbal skills.
- Scheduling and implementation of project needs.
- Bachelor degree in Architecture, Engineering, Construction Science or similar degree preferred.
- Minimum 5 years' experience with site investigations, project management and construction monitoring of commercial roofing/building envelope and waterproofing projects.
- Minimum 10 years' experience in the roofing/waterproofing industry.

COMPENSATION: Base salary is commensurate with experience and licensure.

JOB TYPE: Full-time

LEAD / TECHNICAL ARCHITECT – GALVESTON, TX

CANDIDATE MUST HAVE THE FOLLOWING SKILL REQUIREMENTS:

- Five to ten years' experience in the preparation of technical drawings related to the exterior building envelope.
- Construction experience related to the exterior building envelope (not tenant build-out experience).
- Currently licensed in the State of Texas (licensure in other Gulf Coast states is a plus).
- Proficiency in AutoCAD and Microsoft Office Suite applications, including MS Word, Excel, Publisher, and PowerPoint. Must be willing/capable to become proficient in AutoCAD 3D and BIM related software such as REVIT.
- Team player with above average communication skills and a dispute resolution mindset.
- Must be equally comfortable at job site and boardroom settings.
- Physically fit and without fear of heights (appropriate training will be provided).

REQUIRED EDUCATION: Bachelor's or Master's degree

COMPENSATION: Base salary is commensurate with experience and licensure.

JOB TYPE: Full-time

Zero/Six Consulting, LLC is an Equal Opportunity Employer

> OUR CORPORATE CULTURE SUPPORTS CAREER ADVANCEMENT IN AN ENERGETIC ENVIRONMENT WHERE INNOVATION THRIVES

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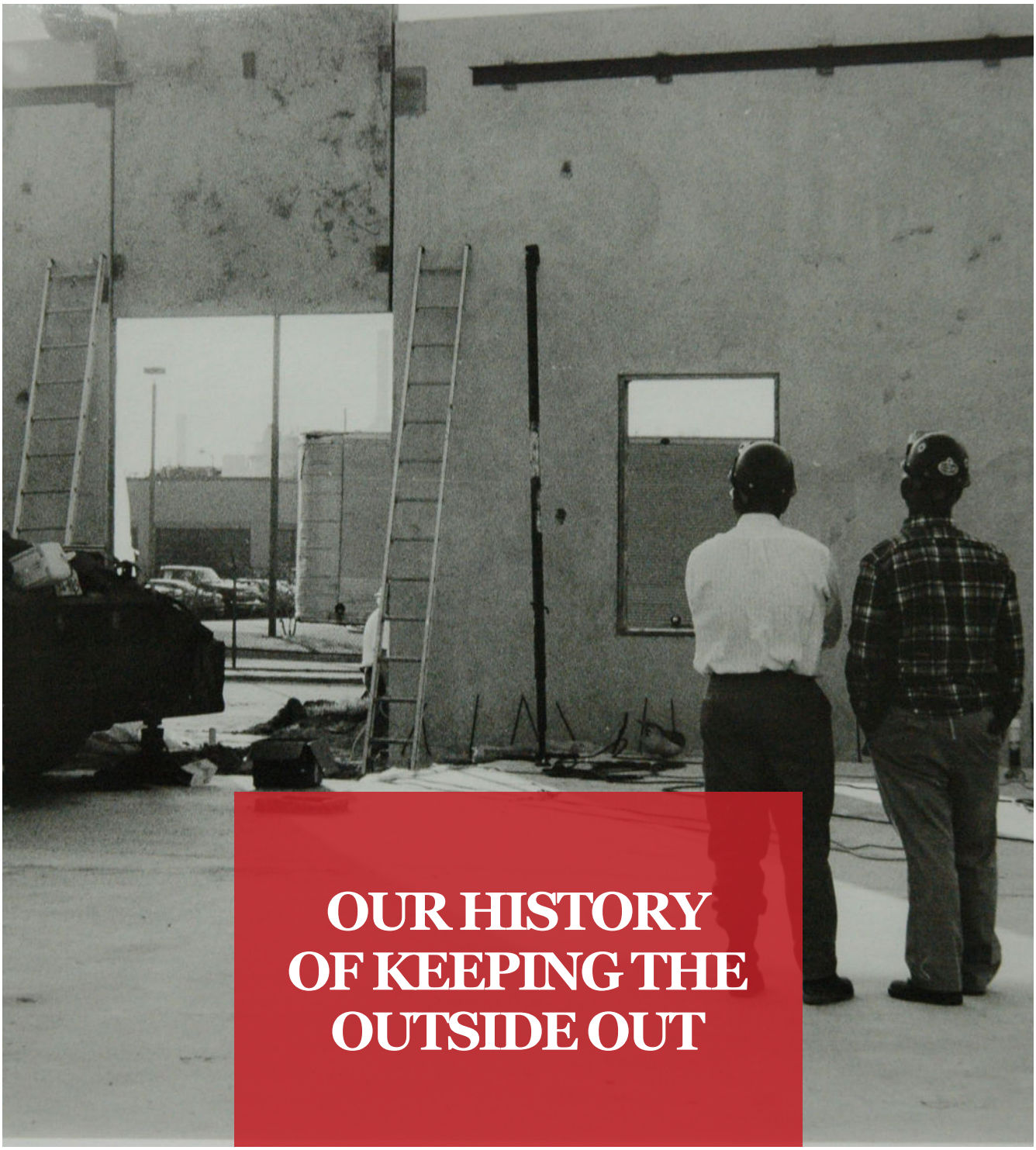

OUR HISTORY OF KEEPING THE OUTSIDE OUT

Thank you for reading our newsletter!

For more information, visit www.z6consulting.com!