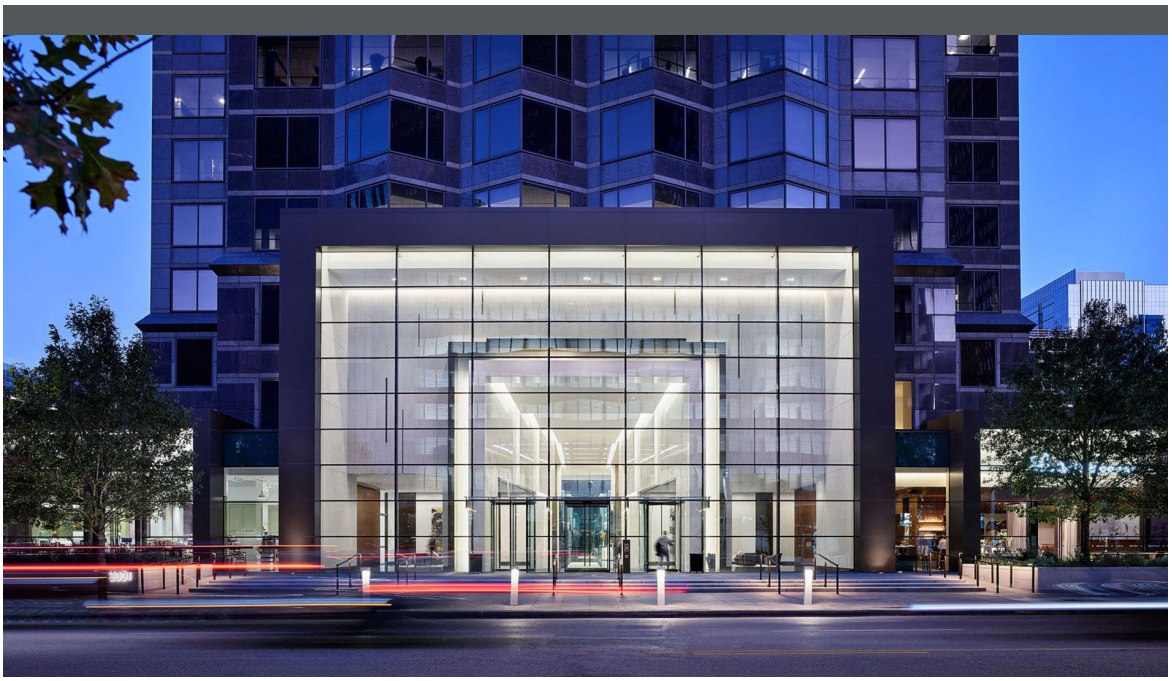
FALL 2020 CHAMBERLIN Roofing & Waterproofing NEWSLETTER

Plaza Renovation Stops Garage Leaks



Chamberlin Roofing & Waterproofing replaced the original waterproofing on Trammell Crow Center's plaza deck in Dallas, Texas, to stop water infiltration issues.

Trammell Crow Center in Dallas, Texas, is a mixed-used destination encompassing a nine-level parking garage, 34,000 square feet of retail space, a 9,000-square-foot conference center and a 400-unit high-rise tower comprised of office space.

A unique renovation was recently completed to cease persistent water infiltration in the parking garage. The center's plaza deck, which encircles the high-rise tower, was originally built over a 35-year-old existing parking garage and had to be removed to replace the waterproofing between the deck and the garage. After the original waterproofing was removed, Chamberlin installed 45,000 square feet of hot fluid-applied waterproofing, caulked expansion and control joints and installed 4,000 square feet of pavers. Chamberlin also installed Carlisle TPO Membrane over concrete decking on three balconies on the tower.

SMART SCHEDULING

Precise scheduling was a main focus on this project. Working with multiple trades, such as electricians, plumbers, masons and other exterior trades can create scheduling challenges.

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CONSULTANT'S CORNER

Brett Newkirk, P.E.
Principal Engineer
Alta Engineering Company

Metal Flashing + Liquid-Applied Membrane = Failure

You need a new formula for success when abutting incompatible materials.

Liquid-applied waterproofing membranes are popular for waterproofing exterior balconies and corridors. The purpose of the membrane is to keep water from contacting the moisture-sensitive structural elements and from migrating to the finished interior space. A common notion is that you should terminate liquid-applied membrane decks in the same fashion as sheet-good roof and waterproofing materials—with metal. Metal drip edges

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(Plaza Renovation continued from pg. 1)

Additionally, the center was operating during construction, so considerations had to be taken to keep the tower entrances and exits as well as the surrounding plaza functioning.

To accommodate the patrons and staff of Trammell Crow, the deck renovation was performed in a sequence of small sections so the majority of the plaza and tower was accessible throughout the project. The work area was confined to approximately 5,000 – 6,000 square feet at a time. In this limited space, the multiple trades had to work together and pay special attention to their surroundings.

These working conditions called for a considerable amount of daily coordination between Chamberlin's project manager, superintendent and foreman. In addition to internal coordination, Chamberlin participated in daily subcontractor meetings to make sure everyone was on the same page. This practice helped mitigate mishaps such as equipment being driven over the waterproofing membrane or penetrations being made after the membrane was installed.

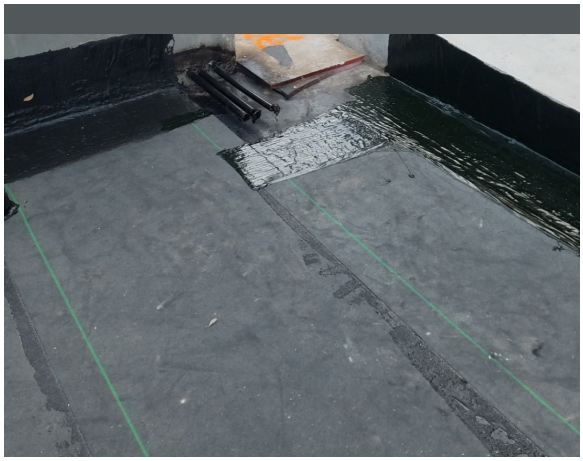
HIGH CLASS QUALITY CONTROL

While Chamberlin crews worked on the waterproofing scopes, they were mindful of quality control and focused on the sequencing that had been created by the general contractor. Because there were three to four trades working on a section, sometimes simultaneously, Chamberlin had to go above and beyond normal QA/QC practices.

Communication was vital during this project. Not only did crews have to keep up with the scheduling of the sequences, but it was important for Chamberlin to coordinate with the other trades who would need to make penetrations through the deck for things such as electrical pipes and plumbing for drains. These penetrations had to be created before the hot fluid-applied waterproofing was installed or it would puncture the membrane allowing water to seep in.

In order for Chamberlin to verify their work was 100% watertight, they utilized Electronic Leak Detection (ELD) testing. Once all trades completed their scope in each section, an ELD test was performed and a report was provided that identified if the

Chamberlin crews installed a hot fluid-applied waterproofing system on the plaza deck.



Completed protection sheet for the hot fluid-applied waterproofing system.

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(Metal Flashing continued from pg. 1)

are often placed along the perimeter of a corridor or balcony deck to be covered with the deck-coating material. Similarly, light-gauge metal angle (commonly referred to in the roofing world as 5 by 5) is positioned along deck-to-wall interfaces so that workers can apply the deck coating over its surface. The elevated deck surface is typically plywood, concrete or cement fiberboard.

The use of metal flashing gives most professionals a feeling of comfort because of its long, uninterrupted and impossible-for-water-to-penetrate, solid cross-section. The reality, however, is that metal flashing is sold in pieces that you must lap, abut, bend and cut. Perhaps the greatest concern with metal flashing is that the liquid-applied membrane must transition from the horizontal flange of the flashing to the deck substrate. When the metal flashing moves—due to the result of thermal strain, discussed in the next section—the membrane interface becomes highly stressed and tears.

The Effect of CTEs

PERCENTAGE DIFFERENCE BETWEEN FLASHING AND DECK MATERIAL CTES* *CTEs = coefficients of thermal expansion		Typical Deck Material		
		Plywood	Concrete	Cement Fiber Board
Typical Flashing Material	**α = 1/˚F x 10-6**	**3.4 CTE**	**6.7 CTE**	**7.65 CTE**
Aluminum	12.8 CTE	276%	91%	67%
Copper	8.9 CTE	162%	33%	16%
Stainless Steel	9.6 CTE	182%	43%	25%
Galvanized Steel	6.7 CTE	97%	0%	-12%

To understand the complexity of how thermal strain affects a project, consider its trigger: temperature. Heat causes materials to expand, while cold weather causes them to contract. How the variances in heat and cold affect material is reflected in their coefficient of thermal expansion (CTE). CTEs characterize the rate at which the material will expand or contract during a unit change in temperature. A review of metals commonly used for flashing (aluminum, copper, galvanized steel and stainless steel) reveals that aluminum changes at the greatest rate, followed by copper, stainless steel and galvanized steel. (See the table for typical CTEs of deck substrates compared to flashing materials.)

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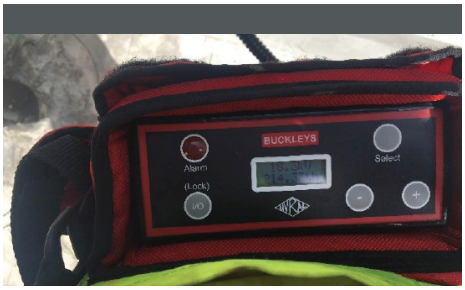
(Plaza Renovation continued from pg. 2)



ELD testing was performed to determine the hot fluid-applied membrane was sealed watertight.

section was watertight or had breaches in the membrane. If the report came back with no breaches, Chamberlin would proceed to the next section in the sequence. However, if a breach was identified Chamberlin would fix the breach immediately so it could be retested.

ELD testing wasn't the only quality assurance test performed during the completion of Chamberlin's scopes. Mil-gauge testing was used to assess the thickness of the hot fluid-applied waterproofing to ensure Chamberlin's installations met the requirements of the manufacturer.

STRONG SAFETY PLAN

Especially on the areas of the plaza near tower entrances and exits, the crew members were working very near pedestrian traffic. The general contractor blocked the work areas with barricaded walkways, and Chamberlin took care to store the hot kettle on the side of the workspace furthest from the building. Crew members were ultra-cautious to protect the safety of themselves, other tradespeople and pedestrians.

Crew members wore appropriate Personal Protective Equipment (PPE) for hot fluid-applied waterproofing application including long sleeves, long pants, gloves and protective eyewear. The kettle operator also wore a face shield.

An additional tool used during the Trammell Crow project was Chamberlin's Safe Performance Self-Assessment (SPSA) process. SPSA combats the risks of unforeseen conditions that arise during the workday and encourages workers to stop before beginning any and all tasks and go through the following mental steps:

1. Assess the risk. What could go wrong? What is the worst outcome if something does go wrong?

2. Analyze how to reduce the risk. Do I have all the necessary training and knowledge to do this job safely? Do I have all the proper tools and Personal Protective Equipment?

3. Act to ensure safe operations. Take the necessary action to ensure the job is done safely. Ask for assistance, if needed.

Taking time before starting a task to recognize potential hazards and identify preventative measures that can be taken helps protect employees and those working around them from potential hazards becoming incidents. This was especially pertinent on this project given the close proximity of other trades.

THAT'S A WRAP

Chamberlin's attention to coordination, internal and external communication and their ability to complete their scopes in a timely manner were critical in delivering a high-quality project on time and with zero safety incidents. Chamberlin Project Manager Justin Holiman said, "Thanks to our crew's diligent effort on a daily basis, we were able to successfully complete this project and further strengthen our bond and trust with our client." ■

Completed Trammell Crow Center plaza.

(Metal Flashing continued from pg. 2)

The differences in material-expansion change can be substantial between the substrate and the flashing. The most significant difference is between aluminum flashing and plywood decking, in which the flashing has a strain rate that is nearly four times greater than its substrate. Notably, galvanized steel and concrete have the same CTE.

CTEs Affect Fasteners, Too

Typically, the flashing metal is secured to the deck with screws or nails. The problem with this technique is that these fasteners inhibit the flashing material's ability to expand and contract. The consequence? When it gets hot, the flashing will "arch" between the fasteners as it attempts to alleviate its thermal elongation. Due to fastener restraint, the material creates "waves" that allow the material to elongate upward without actually increasing its end-to-end length. This phenomenon is commonly referred to as "oil canning" (see Figures 2a and 2b). When it occurs, it causes the liquid-applied membrane to tear where it bridges from the deck onto the metal flashing because it is so tenaciously bonded to both the deck and the metal. Elongation of the fastener holes also can occur when the metal flashing expands.

One of the best ways to illustrate the incredible effect of thermally induced expansion is using one of my favorite structural-engineering examination questions: A 100-yard-long segment of railroad track is constructed in the middle of winter in 30° F weather. It is fixed in place at the ends with bolts and left unrestrained along the remainder of its length. Once summer arrives, how high will the track arch when temperatures reach 100° F? Students are typically astounded by the answer. While the track expands

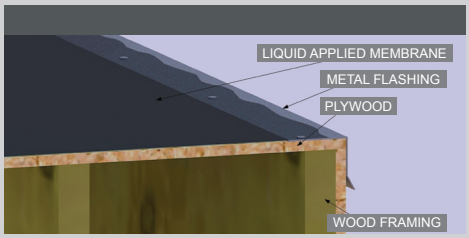


Figure 2a

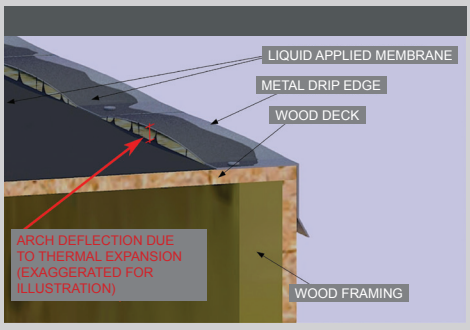


Figure 2b

(Continued pg. 4...see Metal Flashing)

(Metal Flashing continued from pg. 3)

little more than an inch and a half, the vertical height of the resultant arch is an incredible four feet (see Figure 1 below).

As a practical matter for this discussion, what is the resultant height of an induced arch installed under the following circumstances:

- A 20-foot-long piece of aluminum flashing
- Applied over a wood deck
- Secured only at its ends
- Experiencing a 100° F temperature change

The answer? Five inches!

Typically, edge metal is secured with nails spaced about 12 inches on center. The resultant arch between fasteners spaced at 12 inches is 0.225 inches (nearly one-fourth of an inch). This vertical offset movement is far greater than what can be bridged even with the most elastic deck coatings. Therefore, most deck-coating manufacturers would not recommend bridging dissimilar materials without a backed sealant joint. Unfortunately, the provision of a properly backed joint at this flush-material abutment is not possible. Even if it were, the movement described is beyond the capacity of many sealants.

On the other hand, flashing metal installed during the hot season will contract once winter arrives. This will cause elongation of the fastener holes securing the fasteners, potentially creating voids in the membrane that may tear to accommodate significant movement.

It should be acknowledged that the installation of metal flashings will probably not be installed during the coldest or hottest times of the year. Therefore, the thermal strain effect may not be as significant as described above. Nevertheless, the examined temperature variation of 100° F is likely conservative, as it accounts only for typical ambient temperature fluctuations. In direct sunlight, the surface temperature of metals will increase significantly above the ambient temperature.

Some contractors choose to solder or weld segments of abutting flashing together. Don't do it! The flashing will collect the induced temperature strains of the individual segments and combine them into a continuous piece, thus multiplying the strain effect.

The conclusion is that materials with similar CTEs should be used for liquid-applied membrane substrates and flashings with similar CTEs. As the table shows, it is a mistake to incorporate metal flashings with a wood deck substrate. However, regardless of material, the flush joint that naturally occurs between a deck and metal flashing is problematic.

The Best Solutions to Avoid Failure

The best chance for liquid-applied membrane success is to use the same material as a substrate for the deck, wall and drip edge. Though contrary to conventional thought, it is less risky to extend a deck coating from a wood deck onto the adjacent wood-sheathed wall—with a properly backed sealant joint at the intersection—than it is to extend it onto metal flashing. An even better solution is to use reinforced cement board as a substrate for both the deck and wall sheathing to which a liquid deck coating will be applied. Cement board is not subject to hygroscopic shrinkage (loss of water), is inorganic and, therefore, not subject to deterioration. Plus, you can use cement board wall backing in conjunction with a concrete deck.

If possible, simply avoid the use of metal along the outer membrane edge. Admittedly, metal flashings will likely be the only feasible means to achieve some deck-edge terminations. For example, you can't avoid making diverter (kick-out) flashings at deck terminations to wall interfaces (see Figure 3 and 4 below).

If metal terminations must be used, configurations should be examined that would allow for a properly profiled and backed sealant joint to bridge the dissimilar deck and flashing material interface. If a concrete topping or cement board is used, consider placing the metal drip edge under the concrete or deck sheathing, so that a vertically backed joint can be provided between the abutting materials. ■

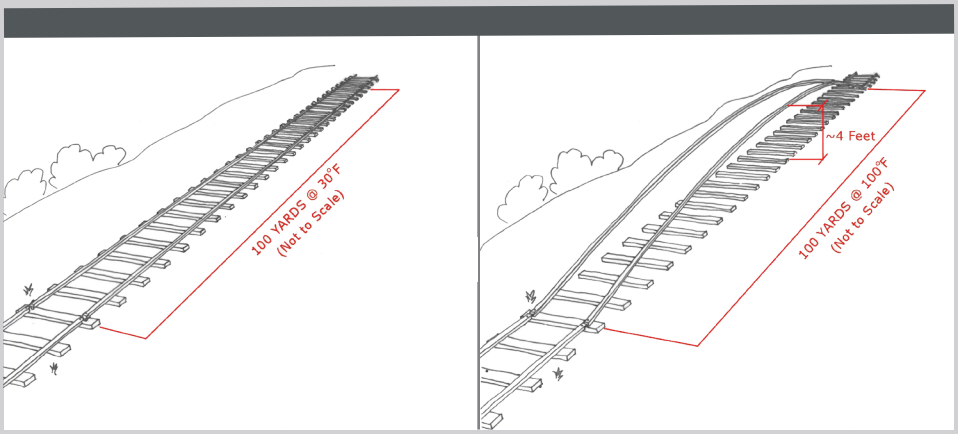


Figure 1

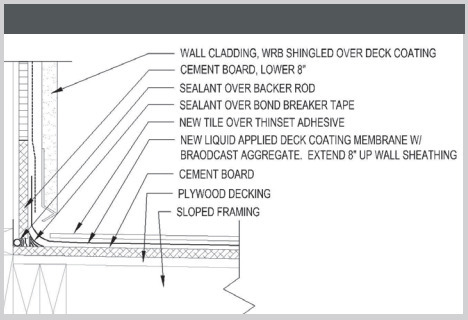


Figure 3

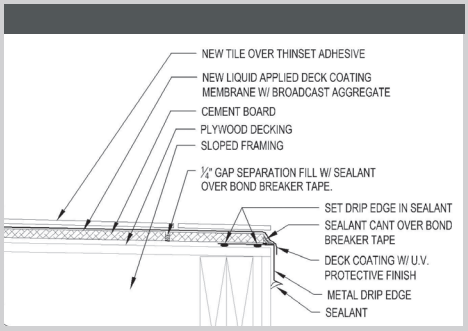


Figure 4

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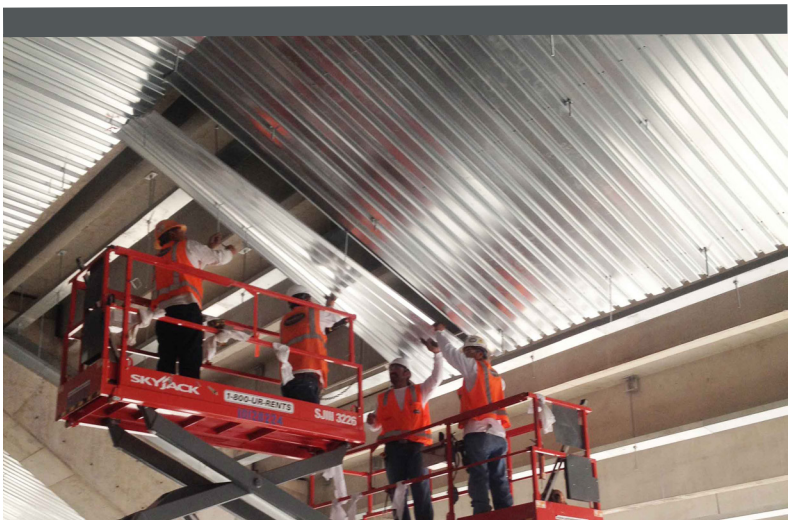
Brett Newkirk, P.E., is a practicing structural engineer with Alta Engineering Company (Jacksonville, FL). He specializes in the diagnosis and repair of moisture-affected structures. You can contact him at: brett@altaengineeringco.com.

SUB-ROOFING SYSTEMS



SUB-ROOFING APPLICATION

Stadiums and entertainment venues are often multilevel concrete structures with multiple expansion and control joints. These joints help the building expand and contract as the building moves over time without causing cracks or failures in the materials. While the joints protect the overall structural components, the sealants in the joints typically only last three to five years. When they fail, the joints allow moisture and spilled liquids to flow between decks and leak onto whatever is below. In most venues this could include suites, concessions, locker rooms, electrical rooms, office space and janitorial facilities. Often times, the owner does not choose to re-caulk all joints in a stadium at the time of failure. This, in addition to weathered traffic coatings and cracks in the concrete, can lead to water leaks. A sub-roofing system can be the solution.

A sub-roofing system consists of specialty engineered metal panels suspended by rods anchored to the underside of structural members. Each system is specifically designed for the structure it will be hanging from to drain any moisture and liquids to a gutter leading to a storm system. The design and installation have to be precise due to the MEP equipment that will surround it.

While the structure is designed for movement, stadium and entertainment venues have large amounts of pedestrian traffic on the structure at once, sometimes causing significant movement. The sub-roof can easily be adjusted to accommodate this by changing the height of the panels on the rods.

SUB-ROOFING LESSONS LEARNED

Chamberlin has extensive experience with sub-roof systems and their applications. We are capable of assisting the design team professionals by determining the proper means and methods of install in a new construction project. Then our team will fully execute the installation while coordinating with the many other trades involved. Since some MEP equipment will need to be suspended below the metal roof, proactive planning and a deep understanding of how the system works is critical to the installation and proper functionality.

Our team has hands-on experience and training in this specific type of system that can be a real game changer for stadium and entertainment venues. Contact us for more information today. ■

Employee Profile

Elaine Molina
Project Accountant
Austin, Texas

Experience:
Elaine worked for Black Millwork prior to joining Chamberlin 16 years ago. What she enjoyed most was the company's culture and core values, which have always been important to Elaine in her place of work. When she started working for Chamberlin, she was happy to realize it was a similar environment with a company who strives to take care of their employees.

A Day in the Life:
Elaine's day involves handling billings, certified payrolls, accounts receivable and miscellaneous duties. She files all bonds and lien notices for Chamberlin's projects in their Austin market. And the list goes on!

Outlook:
Being reliable is one of the top things Elaine prides herself on. She strives to respond quickly to all tasks she is given. She believes when customer service gets done right, it can tremendously boost a company's bottom line. This leads to a strong, positive relationship between customer service and business success.

Outside the Office:
When Elaine is not working hard in the office you can find her enjoying the outdoors, especially swimming or reading. She also spends time hanging out with friends and playing pool. Word around the office is she's quite the pool player as she qualified in the American Poolplayers Association (APA) City Cup Tournament to advance to the next level tournament in Las Vegas. Elaine's greatest personal accomplishments include taking care of her mother at the end of her life and her 22-years-and-counting marriage! ■

We asked Elaine to choose her favorites from this random list of things as a way to get to know her a little better:

ELAINE'S LIST:	
Zoo	Aquarium
Bowling	Billiards
Friends	Law and Order
Bacon	Sausage
Beatles	Rolling Stones

PROJECTS IN PROGRESS

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Also licensed in Arkansas and Louisiana

The Moody Center Arena - Austin, TX
New Construction Waterproofing
Contract Amount: $1,000,000 (approx.)
Owner: University of Texas at Austin
Architect: Gensler
General Contractor: Hunt Construction
Scope of Work: Installation of waterstops, tunnel walls, tunnel lid, bitumen waterproofing and slab waterproofing
Project Description: Multi-purpose arena

St. Francis Hospital Renovation and Addition - Tulsa, OK
New Construction Waterproofing
Contract Amount: $200,000 (approx.)
Owner: St. Francis Health System, Inc.
Architect: Perkins + Will
General Contractor: Skanska USA Building, Inc.
Scope of Work: Installation of sheet waterproofing, cementitious and reactive waterproofing, traffic coating, weather barrier, joint sealants, expansion joints, flashing and sheet metal
Project Description: General medicine and surgery teaching hospital

Rogers Middle School - San Antonio, TX
New Construction Roofing
Contract Amount: $1,200,000 (approx.)
Owner: San Antonio Independent School District
Architect: Pfluger Architects
General Contractor: Gilbane Building Co.
Scope of Work: Installation of wall panels, wood blocking, hot modified roofing, TPO hybrid roofing, counterflashing, sheet metal flashing and trim
Project Description: Public middle school

Hope Lodge - Dallas, TX
New Construction Roofing
Contract Amount: $400,000 (approx.)
Owner: American Cancer Society
Architect: Perkins + Will
General Contractor: McGough Construction
Scope of Work: Installation of TPO roofing, roof pavers, subroof, flashing and sheet metal
Project Description: American Cancer Society lodging

AHISD High School Athletic STEM Project - San Antonio, TX
New Construction Roofing
Contract Amount: $1,200,000 (approx.)
Owner: Alamo Heights Independent School District
Architect: LPA
General Contractor: Joeris
Scope of Work: Installation of wall panels, PVC membrane roofing, coping and gutters
Project Description: Public high school

Atelier Flora Lofts - Dallas, TX
New Construction Waterproofing
Contract Amount: $1,600,000 (approx.)
Owner: SOM Living
Architect: Stantec
General Contractor: Balfour Beatty Construction
Scope of Work: Installation of hot fluid-applied waterproofing, sheet waterproofing, traffic coating, water repellent, thermal insulation, air barrier, firestopping, joint sealants, expansion joints, sheet metal flashing and trim
Project Description: Forty-one-story high-rise

The ION - Houston, TX
Remedial Waterproofing and Roofing
Contract Amount: $2,100,000 (approx.)
Owner: William Marsh Rice University
Architect: Gensler
General Contractor: Gilbane Building Co.
Scope of Work: Installation of hot-applied waterproofing, traffic coating, fluid-applied air barrier, membrane flashing, sheet metal flashing and trim, wood blocking, TPO roofing and coping
Project Description: Shared corporate space

Williamson County Inner Loop Annex - Georgetown, TX
Roof Replacement
Contract Amount: $750,000 (approx.)
Owner: Williamson County
Architect: KGA Architecture
General Contractor: Vaughn Construction
Scope of Work: Removal of TPO roofing system and installation of wood blocking, TPO roofing, sheet metal and counter flashing
Project Description: Emergency service operations center

Houston House Apartment - Houston, TX
Remedial Waterproofing
Contract Amount: $2,500,000 (approx.)
Owner: ColRich
General Contractor: ColRich
Scope of Work: Balcony rebuilds plus installation of traffic coating, joint sealants, exterior façade coating, flashing and sheet metal
Project Description: Thirty-one-story apartment complex

Will Rogers Jr. High - Claremore, OK
New Construction Roofing
Contract Amount: $150,000 (approx.)
Owner: Wills Rogers Jr. High
Architect: GH2 Architects
General Contractor: Flintco, LLC
Scope of Work: Installation of sheet metal roofing and expansion control
Project Description: Multi-purpose center

For a complete list of specialty contracting services, visit www.chamberlinltd.com.

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- Modified Bitumen/BUR
- Single ply
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- Metal standing seam
- Roof related sheet metal
- Tile

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- Membrane waterproofing
- Elastomeric wall coatings
- Traffic coatings
- Expansion joints
- Dampproofing/flashing
- Water repellents/metal flashing

BUILDING/GARAGE RESTORATION
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- Epoxy & grout injection
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- Structural repair
- Paver repair & replacement

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