APPLICATOR

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HANGING ON FOR 117 YEARS… AND COUNTING

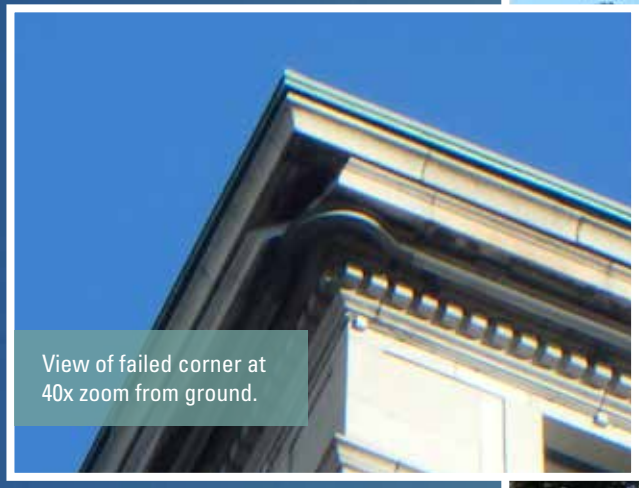
THE FRICK BUILDING CORNICE

HANGING ON FOR 117 YEARS… AND COUNTING THE FRICK BUILDING CORNICE

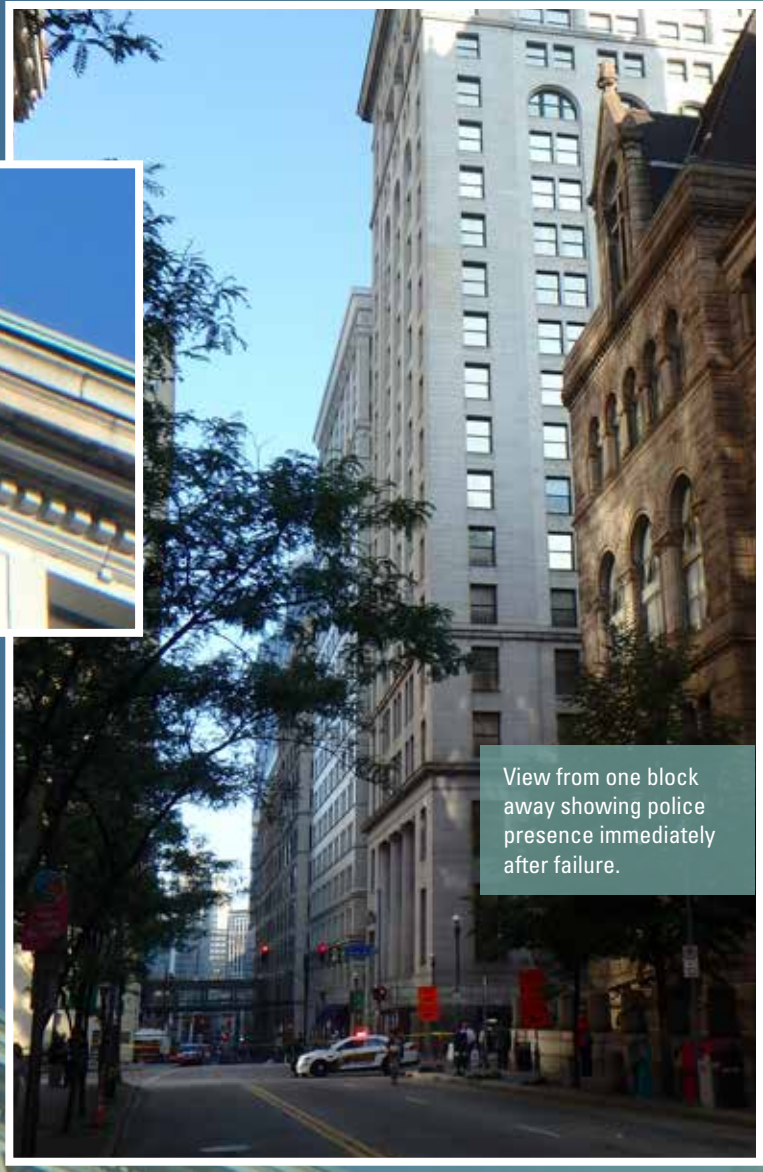
BY STEVE BENTZ

This article will discuss the three+ year restoration project that began when a ~one ton section of granite crashed to the city street 300-feet below. The project began as a causation investigation into the stone cornice failure and evolved into a stabilization, repair, and restoration of the granite building façade; a roof replacement, and finally into the installation of a specialized window washing and façade maintenance system. Challenges encountered included permit department coordination, façade access, antiquated structural systems, budgetary constraints, a site fire, and site logistics. The insurance claim process for this building owner would stretch into a nearly five year effort.

In order to consolidate the various stages of this lengthy project, we've opted to break the timeline into four arbitrary phases based on turning points or transitions that occurred during the project.



View of failed corner at 40x zoom from ground.



View from one block away showing police presence immediately after failure.

Brick paver street damage due to impact.

FRICK BUILDING BASIC INFO

Current Owner: Rugby Realty

Date Constructed: 1901

Awards/Accolades: None that I know of; it is a Registered Historic Landmark in the City of Pittsburgh. I do not believe it is on the National Trust.

Number of Stories: 20 office floors + 1 attic, 2 below grade levels.

History: Built in 1901 on what was called Grant's Hill, the Frick building was at the time the tallest building in Pittsburgh. The Frick was the first building in Pittsburgh to have banked elevators, one bank servicing floors two-11 and another bank servicing floors 11-20. In 1905 a large public works project was undertaken by the City of Pittsburgh to eliminate what they called "the Hump" which was the severe grade change at Grant's Hill. At this time, the lower story of the Frick which was originally built below grade became the first floor, resulting in a change in the cladding and a revamping of the ground floor to allow what was basement to become the current lobby configuration. The cornice that encircles the building at the 20th floor is original to the building and comprised of solid granite stones and steel framing.

Phase 1

Day 0: The Triggering Event

At approximately 2:30am on the morning of Sunday, July 30th, 2017, a section of granite measuring approximately 3-feet long by 2-feet wide and 2-feet thick fell to the brick pavered surface of Forbes Avenue in Pittsburgh. The section of stone would be, initially, mislabeled and misunderstood to be brick by local reporting agencies, but later confirmed to have been solid granite prior to impact. The force of the impact damaged the street and created shrapnel of stone pieces that were found nearly a block away. The building window washing system, historic outdoor wall lighting, and a tenant ATM were all damaged by the falling stone and its shrapnel. Luckily, no one was injured in the event.

This event would become a catalyst not only for the inspection and repair of the Frick Building, but also for a renewed interest and methodology for enforcement of the local façade inspection ordinance.

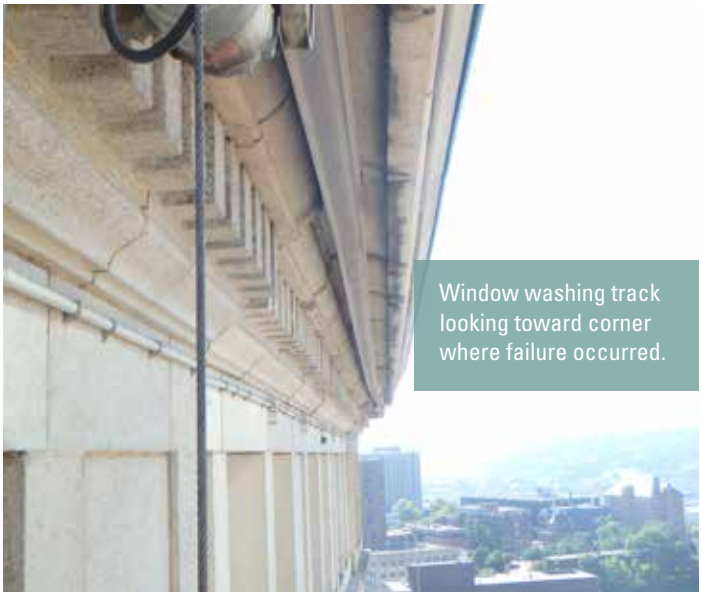
Day 1: The BMU Paradox and Rapid Vertical Access

At approximately 9:00am on the Sunday morning of the event, the author was contacted by a local contractor that had been already involved at the building performing light-duty window caulking and painting. A site visit was coordinated for the following Monday, what would become Day 1. On July 30th, 2017, the author arrived on-site to news crews and their vans, a heavy police presence, road and sidewalk closures, and an assembly of local building officials, the building owner, and the contractor. The site was somewhat chaotic as all parties looked on anxiously awaiting an explanation for what had occurred.

Prior to our arrival, the owner had already been questioned as to the status of their compliance with the local façade inspection ordinance. The contractor had performed a review of the façade, and indicated that the façade was safe as part of their work. At the time, this was an acceptable sign-off per the local ordinance. The owner would later be forced to fight the Department of Buildings in city court to remove a violation of the façade ordinance from their record due to the city citing the triggering event as a failure to comply. The owner would eventually be vindicated in this argument and charges dropped.

Section of remaining stone after impact.

Shards of stone after impact.



Window washing track looking toward corner where failure occurred.

The building window washing system consisted of an aluminum trolley rail suspended from the cornice by steel threaded rods. The system incorporated a two-line trolley-mounted platform (the Building Maintenance Unit (BMU)) that had two points of fall protection also connected to the same trolley track with no redundancy. The author was requested to assess the failed cornice from the existing BMU. Upon review of the BMU, a paradox was noted. While a BMU was provided, it was support from the cornice which has failed, and therefore (somewhat paradoxically) if the cornice were considered unsafe then the BMU should also be considered unsafe. However, city officials and building ownership were adamant that the BMU be used to inspect the cornice failure. The author requested that the contractor provide suitable, independent, life safety tie offs in the event that the BMU should be found to be unsafe, this was quickly implemented.

Life safety tie offs and platform primary lines on same track.

Close-up of failed stone section.

Blast wall from a distance.

"This event would become a catalyst not only for the inspection and repair of the Frick Building, but also for a renewed interest and methodology for enforcement of the local façade inspection ordinance."

By mid-day of Day 1, the BMU was moved into position and the cornice failure observed from the BMU to the extent possible. Due to the position of the BMU under the cornice, access was severely limited; with the only vantage point being to stand on the back rail of the platform and use cameras to obtain photos from outstretched hands. Local news crews would catch this investigation on camera and it would, of course, make the 6:00pm news.

Initial observations revealed what would come to be known as a "paddle anchor" which had been set into the stone at the time of initial construction to allow the large stone to hang from the steel framing of the cornice. The actual stone was later found to be about 5-foot square in plan dimensions and about 2-foot thick; the section that fell was only the outermost edge. The paddle anchor had corroded, resulting in "rust jacking" which effectively split the stone along the line of the anchor

From the limited observation area and the poor vantage point of the BMU, a determination of overall cornice stability and public safety could not be made….steps would need to be taken to investigate further.

Day 2: The Sky Falling, Roads Closing, and Questions Raised

After collaborating with the contractor, owner, and building officials it was determined that further investigation of the cornice construction would be needed in order to make a statement as to the safety of the assembly. At this stage, city building officials questioned the overall safety of the cornice. The building owner began to question if the system was salvageable or if it should be removed entirely; a process that had been undertaken on local terra cotta cornice assemblies on many buildings, but not necessarily on massive stone assemblies like this one. Everyone agreed, more investigation was necessary.

This failure occurred at the corner of Grant Street and Forbes Avenue, across the street from the local city and county courthouse, one block away from the Pittsburgh Department of Buildings office, and about six blocks away from the local OSHA office. Sections of Grant and Forbes were closed in both directions and detours implemented. Sidewalks on both streets were also closed. The city required that an engineer attest to the safety of the cornice prior to all these restrictions being lifted. Additionally, city officials required that protection of the public be installed "in case of" another large section of stone falling..

Without better access it was impossible to answer these questions….a special thank you is due to the contractor and his personnel who braved the existing BMU with the author to review the initial conditions!

Day 3: The Blast Wall Complication

In order to limit the risk of potential harm to the public or additional property, a temporary blast wall was designed and implemented at the corner of Grant and Forbes (SE corner) which became known as Corner 1. This wall system consisted of multiple layers of plywood supported vertically by weighted pipe frame "walk-through" frames that would create a "safe zone" in the event a section of stone fell. The safe zone was established at Corner 1 only as a means of protecting things at the ground level if any additional stone should become dislodged by selective demolition activities.

Once the blast wall was designed and implemented, the contractor was permitted to begin building scaffolding that would reach the 300-foot level at Corner 1 and allow for selective demolition of the cornice roof system. The contractor maintained their independent life safety tie offs to other points throughout the use of the pipe frame scaffolding as an added precaution

Although rapid in its design and set-up, the blast wall and pipe frame would take nearly two weeks to reach completion.

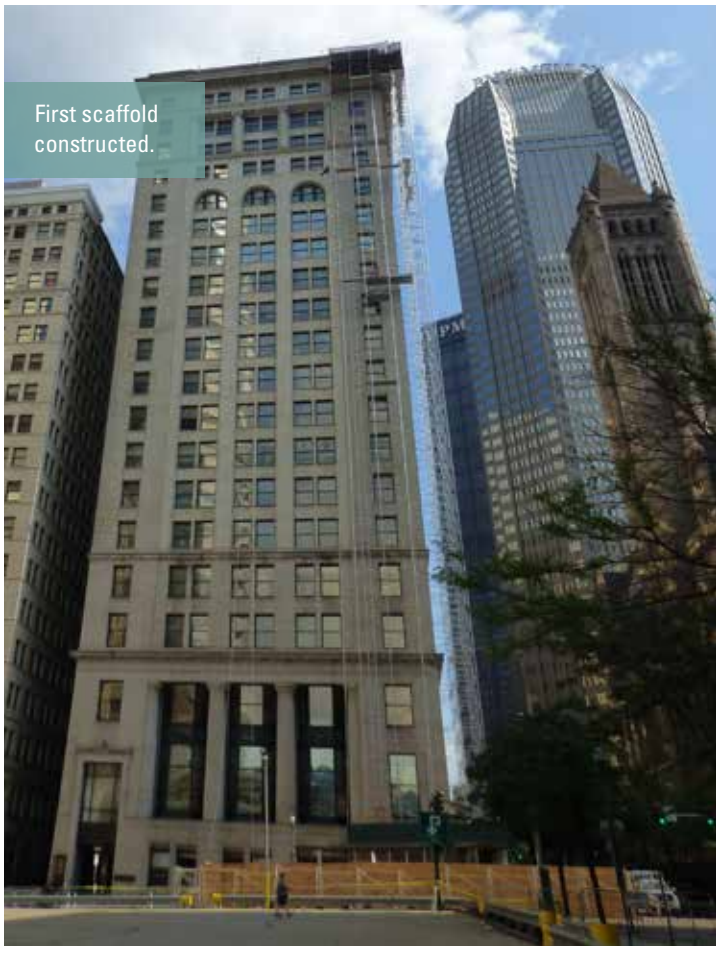
Blast wall construction

Day 15-Day 20: Ropes, Linen, and the Can of Worms

About two weeks after the triggering event, the author and a team of four engineers returned to the site to perform a rope access façade inspection. Parapet clamps were used at the 20th floor setback parapet to allow for rigging to drop beyond the face of the cornice. During the rope access inspection, the roof membrane of the cornice was reviewed, along with the condition of the stone cornice and façade.

It was determined that the majority of the cornice did not exhibit signs of the corrosion of the paddle anchors that was evident on the surface. However, this did not allow us to rule out paddle anchor corrosion as a suspect issue throughout the cornice. The team looked for the start of stone cracking on the underside and face of the stones that might indicate that an anchor had corroded to the point of failing the stone. The majority of problems noted during the investigation were open mortar joints, some cracked stones, and movement at the corners of the cornice, in addition to the damage at Corner 1. It was determined that the majority of stones were stable.

Original drawings for the building were made available during this time; they had been stored in an attic room, unprotected from the changing temperature and humidity conditions in the attic. These drawings were consistent with the artifacts expected on a building constructed in



First scaffold constructed.

Close up of first scaffold constructed.

1901 in that they were hand drawn and on literal linen. Drawing "sheets" were exactly that, sheets of linen. A single sheet was approximately six-foot in length, by about three-feet wide. These drawings were developed by Master Architect Daniel Burnham, the same Master Architect responsible for Union Station in Washington, D.C. and many other monumental historic buildings. Review of the linen drawings informed the investigation that would come.

"You never realize how many people traverse an alley each day until you need to do work overhead!"

Armed with the knowledge from the rope access inspection and drawing review, the contractor began the painstaking process of peeling back the layers of the cornice roof system above the damaged Corner 1. As the engineer observed the layers being removed, it was noted that the EPDM membrane and underlying polyisocyanurate (ISO) insulation had been installed in a recovery roof application over top of the original historic copper roof system. As the layers continued to peel away, it was noted that the ISO was wet, adding weight to the cornice. The ISO had been screwed to the original copper. This recovery roof was reportedly original to the building at the time that the owner purchased the building. It became evident that the recovery roof was an attempt to hide the underlying deteriorated condition of the cornice in order to sell the building.

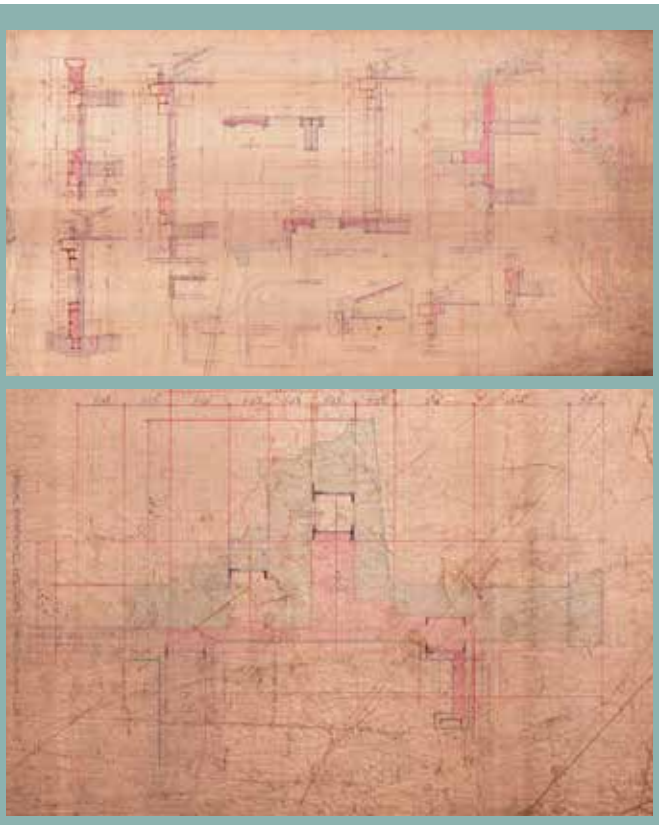
Beneath the original copper roof (which was standing seam, but the seams had been bent over to accommodate the ISO) a failed building felt (that was miraculously not ACM) was found. Below the building felt, wood plank was found, which was nailed to embedded wood sleepers in cinder fill concrete. The wood plank and sleepers were dry-rotted and deteriorated, and in some cases wet. It is presumed that the reason for the recovery roof was on-going leaks at the original roof of the cornice, likely going back 25 years or more.

The drawings indicated that the cornice was supported by steel framing. As the layers were removed it became evident that the steel framing of the cornice had been buried in the cinder fill concrete from the original construction. This fill material was not shown on the drawings, and likely held water in contact with the steel and the paddle anchors for extended periods of time.

The top of the failed stone at Corner 1 and its paddle anchor were now exposed to the sky for the first time in over 100 years.

Day 21: The Skies Clear (and the roads open)

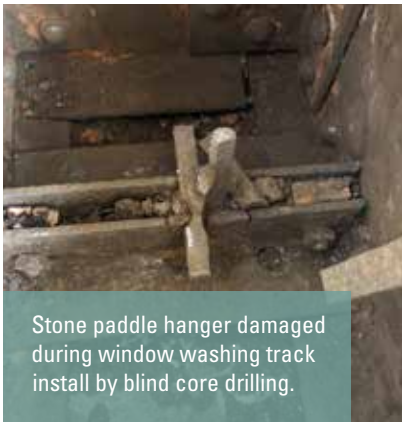
Once the above information was known, the author felt comfortable stating to the city and the owner that the streets could be reopened; however, sidewalk protection was recommended along the three primary street elevations of the building in order to allow for overhead work.



Original hand-drawn drawings on linen.
Top: typical sections. Bottom: section through cornice.

Improvised original hanger for window washing track.

Cinder concrete fill under rusted hanger for window washing track.



Stone paddle hanger damaged during window washing track install by blind core drilling.

Close-up of core-drilled paddle hanger.

The uncovered conditions at Corner 1 and the failed section of stone resulted in the need for temporary bracing of the ogee stones at the top of the cornice while the work began. Because the scaffold had been constructed quickly, without planning for its use as shoring, ratchet straps were used to secure the ogee stones to the steel framing. This innovative approach gave the contractor the comfort to work around the stones and gave the city the reassurance that Corner 1 would remain in stable condition

It was time to see how deep the rabbit hole went and see if more corrosion issues existed beyond Corner 1.

Days 22-55: The Great Scaffold Debate

The pipe frame scaffold set-up at Corner 1 was installed on an emergency basis, and was a small portion of the overall cornice. The owner, in an attempt to minimize the total cost of the project, began negotiations with multiple scaffolding vendors in order to obtain pricing for additional sections of scaffold. Due to the overall cost, and in some way the availability of scaffold sections, the project would end up resulting in 10 different scaffolding set-ups done by two different vendors over the course of the three year project. At many points along the way the use of one vendor and a set-up of 100% scaffold was recommended by not implemented.

This debate of the scaffold ultimately resulted in a phased project, with work progressing around the building as scaffold lead the work progress. In some cases, scaffold would lag and work would be slowed to allow for scaffold to be ready for use. As the work progressed, the design of the scaffold became more repeatable and intentional, including using the scaffold as temporary support for the stones while work progressed.

Pro tip: scaffolding over 300-feet high expands and contracts enough with the weather to lift stones off their support……make sure you allow for thermal expansion and contraction of your scaffolding.

Days 56-Day 90: Report, Design, Repeat

Numerous reports and schematic designs were issued as the contractor continued to work on removal of the roof and cinder concrete fill. The back-and-forth communication loop between engineer, city, and owner was nearly constant; necessitating weekly meetings and updates. At about three months past the triggering event, the engineer was able to issue a design for the restoration of the cornice.

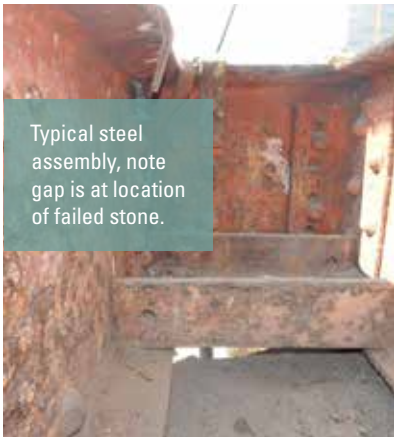
Based on uncovered conditions and the drawings, it was determined that there were 82 large stones that made up the "soffit" of the cornice, the underside of the cornice that was seen from the sidewalk below when looking up. These stones were each hung from the steel framing above (which was encased in cinder fill) by two paddle anchors per stone. The engineer determined that the safest approach to stabilizing the cornice would be to consider each paddle anchor as a failure plane in the stone, and then to support the resulting three stone pieces as if they were independent of the larger stone. Essentially each of the large stones became three separate stones…..and the 164 original paddle anchors would be replaced by 328 new hangers. A design incorporating epoxy adhesive intended for a suspended application and additional steel hangers was developed.

Recovery roof exposed.

Section through roof system.

Steel corrosion on primary cornice framing.

Paddle hanger.



Typical steel assembly, note gap is at location of failed stone.

Sample anchors were placed and pull tested to confirm the strength (which was off the charts in solid granite) and the design was submitted to the city for permitting. The paddle anchors were not removed, because of their embedded nature it was thought best to leave them alone for fear of dislodging a section of stone.

As the design progressed, it became evident that the existing BMU would no longer serve the property due to damage sustained when the stone section fell and the deteriorated condition of the threaded rods that had been in contact with water in the cinder fill for over 40 years. In some locations the threaded rods were corroded to the point of showing more than 25% section loss. The design drawings for the BMU were found during the drawing review process and it was determined that the original installation was somewhat of a blind effort, core-drilling through the entire depth of the cornice from the top down to install the trolley rail. It became evident that the BMU would need to be abandoned, the trolley rail removed, and a new system designed and

Paddle hanger thickness.

incorporated into the cornice repair project. Because the building was over 300-feet, a ground-rigged swing-stage option was selected due to the building exceeding the allowable height for rope descent systems (RDS) per OSHA 1910.27(b).

Scaffold enclosure for winter work (exterior).

Scaffold enclosure for winter work (interior).

Winter conditions on the cornice.

At this point, a conversation occurred between the engineer and the city. Local codes required special inspections for post-installed anchors; however, no city inspector was available that had knowledge and understanding of the project. It was at this time that the engineer requested that they be given special permission to act as both the EOR and the Special Inspection Agency. The city granted this permission, provided that weekly reports were submitted to the city by the engineer.

While many engineers may not want to assume both duties….in this case this was both the safest option for the city and the fastest option for the client…… keeping city inspectors safely on the ground (not on the scaffold or 300-feet in the air) and allowing the engineer to self-inspect sped up the work.

Completed cornice repair at Corner 1.

Day 91: A Parting of Ways

On October 11th, 2017, the author and his current employer at the time parted ways due to corporate cultural differences. At this time, the author was retained by the owner to continue to serve as EOR and Special Inspector on the project through his new employer.

In order to keep the project moving, an agreement was reached with the city that the work would continue and that the paperwork of the permit would catch up to the project. Inspections were to continue, uninterrupted, in order to ensure that the scope of work was adequately performed.

Work/Life balance became somewhat of a myth at this point. . .

Phase 2

Days 92-100: Transition

In what became a grand experiment in psychology and project management (and a trial-by-fire learning experience for the engineer) BECS reassigned and shuffled personnel around to allow for a consolidated undertaking to re-do the design package and refile for the permit. A tremendous amount of overtime and late nights were put in to redo the package in this eight-day timeframe. Thankfully, the city allowed the document to be amended; but that did not remove the need for the package to be completely redone in order to avoid any intellectual property right infringements.

Developing a scope that addresses the same problem on the same building without specifically copying the material is about the same as comparing a GMC truck to a Chevy. Sure….GM tries to change the logo….but are they really that different?

Day 135: Make Cover

By the time four months had passed, the scaffold debate had settled on completing the shorter, Forbes Avenue side of the building first, then moving to the longer Grant Street elevation. The corner at Forbes and Scrip Way (SW corner) had been identified as Corner 2 and being in the most immediate need of the next repairs. System scaffold from a second vendor was set-up on the Forbes elevation and the demolition work was planned to progress along Forbes as the work at Corner 1 was completed.

Scrip Way is the alley behind the building on the west side, any scaffold that extended into Scrip Way had to be built on an elevated platform that would allow trash trucks and other large vehicles to have continuous access to the alley.

You never realize how many people traverse an alley each day until you need to do work overhead. . .

As might be expected, at this point in our story the weather begins to become a factor in completing work. The contractor requested that the scaffold vendor enclose the top portion of the scaffold in an effort to create an enclosed workspace that could be conditioned and allow work to continue through the winter months. This change in the scaffold would, ultimately, become the norm for the remainder of the project, allowing work to continue through most rain events.

Enclosing 2.5 stories of scaffold 300-feet in the air was no easy task…a special thank you is due to the fearless scaffold vendors that made this project possible.

Day 155: Resolution

Five months into the project, the engineer was on-site to perform the required special inspections for the cornice work along Forbes Avenue and to perform a punch list inspection of the repairs that had been completed at Corner 1. The failed section of stone had been (begrudgingly) replaced by a section of ornamental sheet metal, attempting to replicate the stone profile and mass. The supplemental hangers had been installed; all the steel that was exposed had been prepared, primed, and painted; the necessary rigging sleeves and fall protection systems had been installed (more on this later), and the roof system and structure replaced with a tapered wood deck.

At the time, we felt like we were hitting our stride with the scope of work and the process. . . it was thought that other areas would go much faster than Corner 1.

Day 156: Fire

After completing the punch list of Corner 1, the engineer remained in town to perform the review of Forbes Avenue cornice progress the next day. Overnight, a tenant-maintained HVAC split-system unit at the 20th floor setback terrace sparked a fire that caught the plastic enclosure on fire. The building made the 6:00am news this time, and film of flames billowing from the side of the building was aired on the major local networks. The fire department responded to the blaze and it was extinguished quickly, but the damage to the plastic sheeting of the enclosure did slow the work for several days as the scaffold vendor was called in to restore the enclosure.

How many times on one project can you make the news and say no one was hurt? Thankfully on this project it was two times!

Days 157-450: Demo, Chip, Scrape, Drill, Weld, Anchor, Restore, Prep, Prime, Paint, Repeat

As work progressed around the cornice, and the scaffold was moved from position to position, the above process was repeated more that lather, rinse, repeat from your shampoo bottle. Nearly an entire year was spent exhuming the steel frame of the cornice from its cinder fill tomb, preparing the existing steel for another 100 years of use, and installing the new hangers, fall protection, rigging sleeves, wood roof deck, and EPDM roof membrane. While the work at the cornice was continuing, planning for what would be the next two years of involvement at the building was underway.

The roof system was, miraculously, the original roof shown on the drawings. It was a clay "Roman" tile roof placed over a building felt over a cementitious layer over "book tile." Book tile are terra cotta block units that resemble modern day CMU. This roof system was steel-framed and much lighter than the rest of the building, making it difficult to find locations to install fall protection and façade access systems. The roof system had built-in copper gutters which were primarily hidden behind the terra cotta components at the 21st floor level. At the 20th floor setback the façade switched to a primarily terra cotta system in the original design.

Consideration was given to an historically-accurate or simulated roof system; but cost considerations outweighed the team's historic preservation sympathies and a two-ply modified bitumen roof was decided on. Design and bidding of the roof project was performed in parallel with cornice repair work.

When your client says that their only goal, before they retire at 70+, is to get the roof project done, you double down on keeping things moving!

Phase 3

Day 451: Build a Bridge on a Building

Due to the shape of the building, which in plain view appears as an "E" from the sky, the Scrip Way elevation had two setback roofs at the second floor that created 19-story courtyards (this was typically referred to as The E Space). In order to access the steep-sloped clay tile roof, perimeter scaffold would be used to create a catwalk for the transportation of debris, personnel, equipment, and materials. The catwalk would have a rated railing, allowing roof work to proceed without fall protection.

Utilizing the existing framing for the BMU trolley rail (which in the E Space could be visually assessed) a scaffold bridge system was constructed spanning the courtyards at the 19th floor level, then pipe frame was constructed on top of these platforms to create the perimeter catwalk.

Have I mentioned that scaffold contractors are fearless? Thank you to the vendors that made this crazy idea a workable reality!

Days 452-750: The Marshmallow and the Outriggers

As the cornice work was completed and the scaffold for the roof replacement was installed, the components of the

Fire damage to scaffold enclosure.

Ratchet straps used to temporarily secure stone to steel framing.

Typical excavation of cinder fill from steel framing cavity.

Mag drill use at 20 stories.

Typical completed cornice roof

new rigging system at the cornice were load tested and put into service. While the roof was being replaced, the façade contractor was working in the vertical face of the building, utilizing the new rigging system and completing the scope of work. At terra cotta areas, mainly in the E Space and at the 20th floor, a specialty terra cotta coating was used to refresh the façade. The owner selected a high gloss white finish, that when juxtaposed against the stark dark grey of the granite, was notable whiter than white. Since the entire top of the building was terra cotta, the last floor of the building was coated in a bright white coating at the close of the project. Terra cotta patching, stabilization, and repointing were completed prior to the coating application to restore these areas for the next 100 years of use.

The owner elected to have a white acrylic coating applied over the two-ply modified bitumen roof as well. This was selected by the owner due to past successful experience with the coating. Although it was not needed on the system, the owner elected to apply this coating as an extra measure of protection. The stark white roof combined with the 20th floor setback façade being coated in white earned the building the unfortunate nickname of "the marshmallow." The acrylic coating transitioned seamlessly into the liquid membrane roofing that was used to line the existing copper gutters, saving the owner from having to replace the copper box gutters, which could have been exponentially more expensive.

Once the work of the new rigging system had moved beyond the cornice and to the E Space, a different form of rigging sleeve was necessary. The engineer developed a design for long tube steel rigging sleeves that would allow the wire rope for the ground-rigged swing-stage to be dropped from the roof without impacting the terra cotta gutter edge. A horizontal lifeline was used at the ridge of the main roof for fall arrest and workers transitioning to the rigging points. Finally, ladders were added to access the cornice and a glass rail was added to the 20th floor terraces due to OSHA citing that the existing parapets were not 42-inches high.

Typical rigging sleeve and tieback.

Fun fact: the tube steel for the 13 outriggers were well-travelled. The steel was procured from one vendor, shipped to another to be bent, then to another to be welded, and finally to a fourth to be hot-dipped galvanized.

Phase 4

Day 810: Getting Testy

Before the new window washing system could be put into service, OSHA-required certification, testing, and inspection had to be completed to verify compliance of the system. Rooftop components that could be tested against each other were tested while the perimeter protection was in place. By the time the outriggers required testing, the perimeter protection was removed and safety tie-offs were required during testing. The contractor assisted in the testing process, providing wire ropes in order to allow the test loads to be applied at the second floor roofs or the alleyway. The contractor provided labor and expertise to assist in

setting up the tests and moving the weights. Personnel had to brave the steep slope and the cumbersome tie-offs in order to rig each hang point and monitor the outriggers for deflection or displacement. The testing effort took nearly one week to complete with the assistance of four contractor helpers.

The engineer also verified the capacity of the original window frame anchors that were intended for attachment of window washers belts. These anchors were then incorporated into the use plan as the intermittent stabilization anchors (ISAs) for the ground-rigged swing-stage which are a requirement of OSHA.

Throughout the course of the project, the system was designed, installed, tested, certified, and commissioned through use by the contractor and the engineer.

Day 1,000 : The Plan

One of the more over-looked requirements of the OSHA standards related to fall protection and window washing systems is to have a "plan of use" posted, instructing the workers on how to use the system safely. For this project, as previously stated, the building height made the use of RDS prohibited when there was another, feasible way to wash the windows via ground-rigged swing-stages. The Engineer also considered the use of industrial rope access (IRA) with the system components installed. The system was certified for use with both ground-rigged swing-stage and IRA. The plan of use was developed along with a complete binder of compliance documents demonstrating compliance with each portion of the OSHA standards.

The compliance documents included worker sign-in and sign-out sheets as well as worker training validation statements. The owner retained the engineer to conduct on-site training and orientation for the use of the system, and then each worker that was to be suspended from the system needed to sign and attest to having received the training.

Helpful Tip: Documentation of worker sign-off on receipt of training demonstrates that the workers are listening and helps the owner minimize the risk of system misuse.

Day 1,150: We Can See Clearly Now

A little more than three years after the triggering event the Frick Building windows were cleaned for the first time from the new rigging system. The window cleaning was accomplished in a little less than one week by a team of IRA-trained window cleaners. The system was used without complication and many happy tenants enjoyed the views from their clear windows for the first time in over four years.

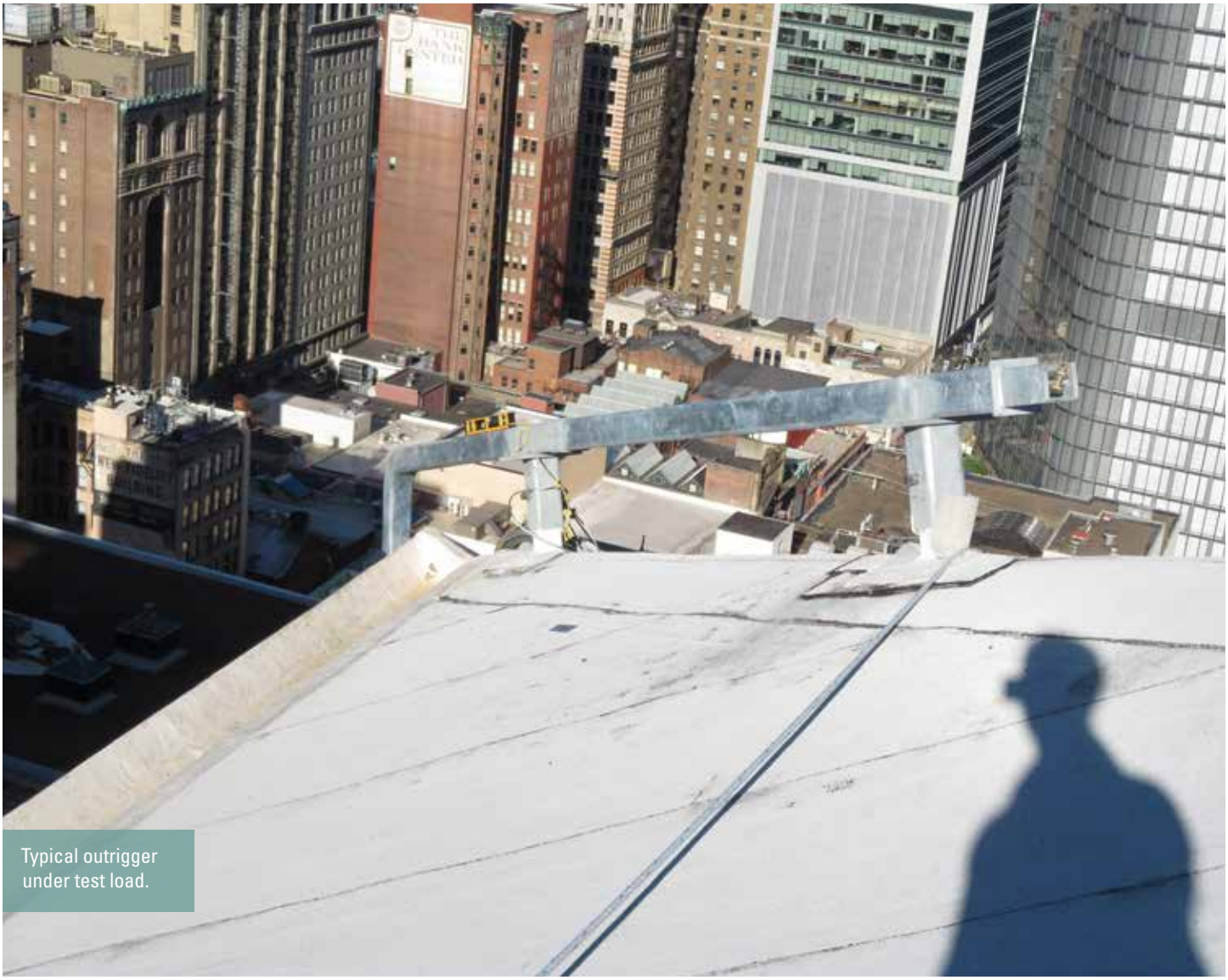
Closing

The failure of the Frick Cornice was really a success story. The team of professionals that came together to bring their expertise to bear on this project represented centuries of experience in the construction industry. The teamwork, comradery, partnership, and craftsmanship that was displayed on this one-of-a-kind project will likely never be duplicated. This project could not have been successfully completed without the dedication and assistance of the following:

- Rugby Realty/Draxxhall Management Company
- Graciano Construction Corporation

E Space scaffold construction.

E Space scaffold construction.



Typical outrigger under test load.

- Arsenal Scaffolding
- Universal Scaffolding
- Strongland Roofing
- The City of Pittsburgh Permits, Licensing and Inspections (PLI)
- Green Window Cleaning
- Grey Welding
- American Scaffold
- Many others that I am probably forgetting….

About the Author

Steve Bentz is registered engineer in four states and the District of Columbia and a Registered Building Envelope Consultant with IIBEC. He has been involved with SWR Institute for over 15 years and was formerly a member of the SWR Institute Board of Directors as an Associate Director. He is currently employed by Building Envelope Consultants and Scientists, LLC as Vice President and manager of the Virginia and Pennsylvania Operations. Bentz can be reached by email at steve.bentz@becsmd.com

APPLICATOR