

# SMAC NEWS

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The Tower at PNC Plaza.



## 'SMART' BUILDINGS TECHNOLOGY GROWING MORE COMMON IN HVAC DESIGNS SMACNA's Energy Efficiency Issue

The 33-story world headquarters of PNC Financial Services has been described as “a building that breathes,” thanks to the unique design of the landmark office tower in Pittsburgh, Pennsylvania.

The \$400 million structure uses a “double-skin facade” that allows natural airflow in a way that few modern skyscrapers can duplicate. Unlike most similarly sized structures, its highly efficient HVAC system is able to rely

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## Building on the Benefits of Energy Efficiency

Sustainability has traditionally been pursued by developers through the deployment of new technologies aimed at reducing energy consumption. Today, both energy management and sustainability have been established as core strategies to increase the competitiveness of real estate portfolios whether they are multi-family, commercial or industrial. Investors and owners both realize that financial value increases the more you focus on energy savings and sustainability.



Building owners have realized they can charge higher rents and enjoy lower vacancies if their buildings are designated energy efficient and environmentally friendly. Currently in the market, LEED certified properties — silver, gold or platinum — are commanding up to 9 percent rental premiums over non-LEED certified buildings. The combination of premium pricing and more sophisticated building operating systems puts SMACNA contractors right in the sweet spot for continued work in the energy efficiency space.

In SMACNews this month you will see how energy efficiency is viewed more holistically as a broad-ranging, integrated effort to use all the systems of a building to minimize the impact of building operations on the environment. For instance, a feature on green roofs illustrate how they can reduce a roof's temperature by 30 to 40 degrees, which in turn significantly reduces the building's need for air conditioning in the summer. Another feature touches on a high efficiency HVAC system that relies on natural ventilation for half the year — with operable windows 33 stories up.

How do you measure whether energy improvements are optimized? One way is to have SMACNA testing, adjusting and balancing contractors provide consultations and test the performance of your building. Our TAB contractors report on their evolving role to help owners and general contractors get the most out their energy efficient systems.

The mindset of owners is changing. Many now view a building as one inter-connected system rather than disparate silos of heating/cooling, electricity and plumbing. Integrated building operations including the installation of green roofs, adding ventilation as a component of HVAC, reducing electrical demands, and controlling water usage — all make good business sense these days. They also provide SMACNA contractors with an unprecedented opportunity to not only be involved in more sophisticated HVAC systems, but to get involved in more aspects of running a building's energy efficient operations.

The challenge for owners is to reduce the impact of a building on the environment while maintaining the comfort for occupants. I am certain the sophisticated systems needed to accomplish this are best provided by SMACNA contractors.

Sincerely,

A handwritten signature in black ink that reads "Nathan L. Dills".

Nathan L. Dills  
SMACNA President



### CAPITOL HILL UPDATE

#### **SMACNA Endorses Bipartisan Bill to Speed Hospitality Retrofits**

SMACNA has enthusiastically expressed support for the bipartisan bill, Restoring Investments in Improvements Act of 2019 (S. 803), which would amend last year's Tax Cuts and Jobs Act to boost renovations and retrofits for restaurants and retailers.

"Making sure our local small businesses can invest in themselves is critical for the economic success of our communities. This bipartisan legislation is important to make sure the tax code works as intended, and restaurants, retailers and other businesses can make the improvements they need to make their stores competitive, vibrant and safe," said Sen. Doug Jones (D-Alabama).

The legislation was introduced by Sens. Jones and Pat Toomey (R-Pennsylvania), along with eight other bipartisan senators. It would correct an important oversight contained in last year's Tax Bill that would boost retrofit and renovation activity in the commercial and hospitality sectors and the businesses supporting them.

SMACNA members include thousands of firms specializing in energy efficiency contracting, facility energy management and residential, commercial, public and industrial energy system efficient retrofits. Both SMACNA members and the HVAC industry would see an

expansion of projects once the bill is passed into law.

The Restoring Investments in Improvements Act would remedy a drafting error in the 2017 Tax Cuts and Jobs Act to ensure that the full cost of store, office and building improvements could be immediately expensed, as was originally intended by the law.

That 2017 Tax Bill made changes to the federal tax code, including allowing businesses to immediately write off costs associated with improving facilities. Businesses previously had to write off those expenses over 15 years. However, a drafting error instead required restaurants, retailers and other leaseholders to write those expenses off over 40 years. This would result in cost-prohibitive renovation projects and stalled investments.

#### **Bill Eliminates Tax Barriers to Investments**

Congress's Joint Committee on Taxation has concluded that this legislation would have no impact on the federal budget deficit. Further, S. 803 would eliminate tax barriers to different types of business investments. This correction should allow a wide variety of businesses to save money by deducting the cost of certain investments under a provision known as "100 percent bonus depreciation."

Projects previously excluded from this new full and immediate expensing rule could include improving the interior of



a retail store, renovating the dining space in a restaurant, installing new signs for the business, upgrading lighting fixtures to be more energy-efficient, and modernizing common areas in office buildings. Without the Restoring Investments in Improvements Act, these projects could be cost-prohibitive and those already in progress could be stalled or terminated.

In meetings with Sen. Jones, SMACNA Capitol Hill staff endorsed this legislation and thanked him for his leadership on the bill. Sen. Jones has been a Senate standout in promoting a number of initiatives to increase small business investment as well as his important bill to boost expensing incentives.

In addition to SMACNA, the bill is supported by leading efficiency and real estate industry organizations, including the Alliance to Save Energy, American Institute of Architects, Commercial Real Estate Development Association, National Association of Real Estate Investment Trusts, National Restaurant Association, and the Real Estate Roundtable.

*Members may read SMACNA's letter to the Senate on the "Improvements Act" at [smac.news/wb](http://smac.news/wb). Members may contact their legislators on SMACNA's Take Action web page [www.smacna.org/advocacy/take-action](http://www.smacna.org/advocacy/take-action).*

## A Green Roof Springs to Life

On top of a pharmaceutical company's parking garage in Wilmington, Delaware, there grows a thriving patch of countryside, courtesy of SMACNA member Ernest D. Menold Inc. This unique roof serves as a beautiful reminder of the form and function that can be involved in architectural exteriors. It's a growing, thriving green roof, yet that lush green roof is also growing energy savings as well.

This particular green roof with meadows, gardens, and walking paths – not your normal fare – was produced by a SMACNA firm. This "field" was created to complement the new 190,000 square-foot corporate headquarters of Incyte Pharmaceuticals. The high-profile eco-roof was the second rooftop project for SMACNA member Ernest D. Menold Inc., who took the lead in bringing the architect's vision to life.

"I think the roof looks great," said Ernest J. Menold, president of the Lester, Pennsylvania-based sheet metal company. "We are very happy with the installation. We solved a lot of the architect's issues for them and the final result looks incredible."

The rooftop features a pickleball court, a putting green, a walking trail and community gardens — amenities designed to encourage more interaction among Incyte employees. It's an impressive balance among recreational spaces, pathways and nature. Given the scale of the 154,000-square-foot

green roof, it is challenging to visually capture the beauty of the entire finished project.

Ernest D. Menold Inc. fabricated all the edging, stairways and handrails on the roof, while leading the way with the CAD drawings and coordination of all the various trades involved.

"There is a lot of engineering involved in a green roof," noted Rich Davis, project manager for Ernest D. Menold Inc. "It's not just putting dirt on the roof and growing plants," he said. It includes multiple layers above a weatherproof membrane and special soil that is infused with air to reduce its density and weight. Much of the Incyte eco-roof included large pieces of block foam as one of the many underlayment layers. All of this serves as additional insulation, while saving energy too.

According to the EPA, the temperature on a green roof is 30 to 40 degrees lower than a conventional roof, which significantly reduces the building's need for air conditioning in the summer. Eco-roofs also reduce water runoff and improve outdoor air quality.

Besides a heavy engineering lift, the rooftop project also called for architectural components using solanum steel, a pre-oxidized weathering steel alloy (also called Corten) developed by another SMACNA member, architectural metalwork company A. Zahner of Kansas City, Missouri.

The steel surface is produced by accelerating the natural weathering process and stabilizing the result.

Solanum steel provides long-term endurance and as its surface oxidizes, the oxidized layer becomes a protective layer. It provides the weathered look of steel with warm hues yet will not bleed into adjacent surfaces as regular steel would.

The weathered steel components help add artistic elements of line, shape and color to the Incyte roof landscape, while contrasting beautifully with the natural living features of the roof design.

Greenrise Technologies, a full-service green infrastructure firm, contacted Ernest D. Menold Inc. for the roof project. The scope of their work included fabrication and installation of these architectural elements:

- A 16-foot high sloped metal wall, along with the 3-inch by 3-inch by ¼-inch HSS (hollow structural section) architectural structure to support it.
- A ¼-inch thick solanum steel retaining wall.
- Corten edging on the green roof.
- A 9,000-pound upper feature staircase.
- 20 feet of solanum steel cabinets for recreational supplies and seat cushions.

"The landscape retaining wall and edging met at all different compound angles, all while keeping the construction without exposed fasteners. It ensured that the finished product was aligned and straight," Davis said.

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*Brendan Iribe Center auditorium.**Installing roof panels.*

# University Innovation Center Designed for Collaboration

**T**he roof and façade design for a new academic building project created “the perfect blend of high-tech and natural esthetics” for the University of Maryland’s new Brendan Iribe Center for Computer Science and Engineering, according to Scott Callaway of Overly Custom Metal Systems.

“We were chosen because the design for the building façade and cladding was fairly complex,” said Callaway, the company’s design services manager. “HDR Architects reached out to us for pre-construction assistance. We have a history of experience with complex roofing projects and have done jobs with HDR in the past.”

SMACNA contractor Overly Custom Metal Systems of Greensburg, Pennsylvania, fabricated the aluminum sheet metal panels that clad the auditorium roof, walls and vestibule enclosures of the new center for innovation at the University of Maryland-College Park. The rooftop panels give the center a modern yet traditional look. The center was named for the university alumnus who founded the virtual reality company Oculus VR.

The center includes labs for virtual reality, augmented reality, robotics and artificial intelligence, and is intended to spark innovation through collaboration. It is meant to be “a hub for technology at the heart of a new innovation district, among high-tech companies, government agencies and institutional colleagues,” according to the university.

The 215,600-square-foot, six-story building serves about 620 regular occupants and can accommodate more than 4,000 individuals during peak usage. The center includes these features:

- 5,300 square feet of collaborative makerspace
- 785 seats of instructional space
- 13 computer labs, including virtual and augmented reality labs
- Eight classrooms and five seminar rooms
- 20,000 square feet of community space
- A 300-seat auditorium

Expanding interest in computer science and engineering, both current and anticipated, meant that the university needed a single facility for those offerings.

“We supplied our Batten Type B (raised batten) and FLP (flat

lock) panel systems, fabricated from 18-gage .040 inch painted aluminum,” Callaway said. “We finished the panels using the Overly Vintage Series painted metal finishes, which provide a beautifully weathered look without rust runoff or staining the surrounding material on and around the building.” The sleek auditorium roof projects the appearance of natural copper.

These products, Callaway said, “are a combination of a high-tech, modern look that combine with a rich historical or rustic appeal by blending natural materials.”

The “greatest hurdle” for the client, he said, was the financial decision in choosing the right finish for the budget. The client originally wanted copper, but that exceeded the budget and mandated a change in materials. “We introduced them to our painted metal option,” Callaway said. “It’s a two-color print process.”

While there were no major technical challenges, fabrication was driven in large part by the building information model (BIM). “BIM helps with potential conflicts between trades in design changes; it helps resolve problems before they occur on-site,” Callaway



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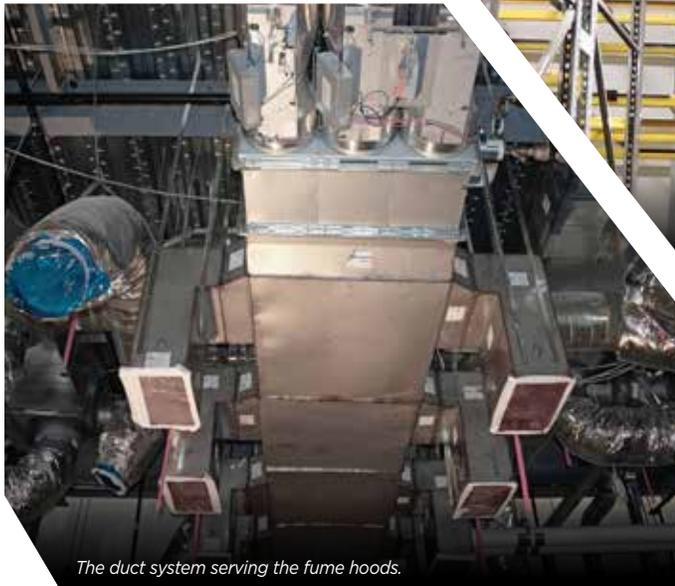
BRENDAN IRIBE CENTER  
[iribe.cs.umd.edu](http://iribe.cs.umd.edu)

noted. “The general contractor served as the BIM manager and all the manufacturers fed models of their work for complete integration.”

Overly’s part of the project was about \$325,000, with raw materials representing nearly 45 percent of that cost. “We didn’t do installation, but about 15 Overly workers were involved in pre-construction, estimating, design, operations, fabrication and on-site assistance,” Callaway explained.

“We’re very proud of the look. Our specialty paint sets it apart,” Watkins continued. “When you look away from the drawings and see the finished version, it gives you a burst of energy. You can feel a breath of fresh air.”

This project, Callaway said, “is proof that if you’re willing to change with the times, you can present an esthetically pleasing project that performs well.”



The duct system serving the fume hoods.



Supply air ducts for the smoke removal system.

# San Diego Crime Lab Requires Complex Systems

The Major Crimes and Property and Evidence Unit Building of the San Diego Sheriff's Crime Lab is one of many laboratory projects on which Associate Mechanical Contractors (AMC) has worked, but this one stands out for its complexity including unique requirements and secure storage conditions.

The crime lab is one of 13 buildings on the county's main operations campus. The five-story, 160,000 square-foot building houses 200 employees and includes 60,000 square feet of secure evidence and property storage, 54,000 square feet of office space and 44,000 square feet of state-of-the-art laboratory space.

The project included a central plant expansion for the additional requirements of the new crime lab. The basement, which is 25 feet high, contains sensitive ev-

idence and delicate materials that require basement wall waterproofing and a permanent dewatering system.

AMC president Rick Reinholz pointed out that the requirements for the crime lab's air and exhaust systems were exacting. "Typically, if you're in a lab-type environment, you don't have the criminal element requirements on top of it. Just having the security measures for our systems — tamper-proof grills and man bars (for secure ductwork) and other things like protection of sensitive evidence. We're familiar with it, but you don't typically see all those elements mixed together."

The laboratory exhaust and air handler systems were also used for the smoke evacuation system instead of completely separate air handling and duct systems. "On this project, the engineer designed that to be incorporated within the laboratory exhaust and

the comfort cooling air handlers," said Bruce Robuck, AMC operations manager.

"In the event of a smoke evacuation situation, the air handlers go into smoke evac mode, which shuts down a number of smoke/fire dampers and opens up other smoke/control dampers. The laboratory exhaust system also performs these functions. The engineer did it for space and also to maintain the laboratory conditions in a fire or smoke event," Robuck explained.

The air handlers in the HVAC system are 100 percent redundant, which keeps occupants inside safe. "Once it's been determined that a carcinogenic or something has gotten loose in the exhaust system, the system switches over to the other air handling system. Those air handlers can continue to service the building while they decontaminate the other part of the building," he noted.

The project included a mixed flow lab exhaust duct system ranging from ½-inch positive static pressure to 6-inch negative static pressure. The lab exhaust systems were made from welded stainless steel duct to avoid cross contamination of elements.

AMC also provided the mechanical systems for all 900,000 square feet of office space on the campus, which was certified LEED-Gold; the 160,000 square foot crime lab, also certified LEED-Gold; the 15,000 square conference center certified LEED-Platinum, and the 50,000 square-foot fleet facility.

The HVAC equipment AMC installed included:

- 168,000 pounds of galvanized duct and welded stainless steel duct systems.
- 950 registers/diffusers/grills.
- 146 variable air volume boxes and 92 Venturi air valves.
- 54 smoke/fire dampers and 24 low-leak isolation dampers.
- 18 laboratory fume hoods, 33 articulating snorkel arms, and three ventilated bio-safety cabinets.
- Four air handlers totaling 144,000 cubic feet per minute of air flow.
- Four laboratory exhaust fans totaling 104,000 cubic feet per minute of air flow.
- A shooting/gun range exhaust system and a heat and smoke removal system.

Robuck estimates that at the peak of the project AMC had 24 sheet metal workers on-site. The project took 11 months. "We do enjoy working with the county and they're extremely collaborative for a government agency. They take our input and analyze it correctly," he said.

He credits his trained craftsmen for helping the project go smoothly. "I think it speaks well to our partners and their capabilities. Being union trained, our craftsmen are familiar with these complex systems as opposed to non-union workers. We're typically installing it faster and at a much higher quality," he said.



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One University Circle. Photo courtesy ©Christian Phillips Photography.



Rigging for the cooling tower.



Boilers and pumps.

# Geauga Mechanical Contributes to Luxury High-Rise's LEED Status

**E**xpertise in energy efficiency and early involvement in the planning process were the keys to a successful residential — and landmark — project for Geauga Mechanical of Chardon, Ohio, according to CEO Craig Berman, LEED AP, CEM.

One University Circle is a 20-story, 533,000-square-foot luxury high-rise apartment building in Cleveland, Ohio, with 276 apartments and “a high level of amenities not previously offered at a large scale in the neighborhood,” Berman said. The building is Cleveland’s first luxury residential high-rise in 40 years.

“Our company did the design-assist, so we got involved early,” said Berman. “We worked with the engineer on the HVAC systems and selected the water source heat pump system, which

uses a water loop to share energy throughout the building. Using a water loop system means some units can use heating and others can use cooling at the same time.”

The project achieved LEED-Silver (Leadership in Energy and Environmental Design) status from the U.S. Green Building Council (USGBC) for creating a “healthy, highly efficient and cost-saving green” building and for implementing sustainable design strategies.

Energy efficient components of the HVAC system that Geauga installed included:

- A water source heat pump system including high efficiency condensing gas boilers, variable frequency drives on pumps, and water temperature optimization sequences in the central plant controller.

- Two-speed apartment exhaust fans with integral humidistats.
- Outdoor air economizers on large water source heat pumps.

The enhanced commissioning process added to the building’s LEED points and “was much more thorough in improving air quality,” Berman noted. Another factor in the building’s energy performance was that “we selected two-speed exhaust fans with humidistats for the bathrooms, which turn on automatically to remove damp air and replace it with fresh dry air.”

Geauga’s work enabled the building to earn LEED credits in optimizing energy performance, enhanced commissioning, enhanced refrigerant management, construction indoor air quality management, controllability of systems for thermal comfort and design for thermal comfort.

According to the USGBC, efficient building systems and a high-performance envelope reduce total energy usage by more than 20 percent, plumbing fixtures achieve a water savings of more than 30 percent, and light-colored roofing materials and roof deck pavers help minimize the exterior heat island effect.

The project even included its esthetic aspects. Geauga ordered custom-colored louvers to match the terra-cotta finish of the

exhaust and ventilation systems on the building’s exterior. Each apartment has two louvers on the outside face. “We coordinated the color, size and style,” Berman recalled.

Geauga put more 14,000 hours into the project, including fabricating about 23,000 pounds of ductwork. “We followed SMACNA indoor air quality guidelines during construction,” Berman said. “We also wrapped the ducts in plastic as we hung them so they would stay clean.”

And working with the structural aspects of the building was a challenge, said Berman. The building structure used post-tension concrete in the floors, which meant that any objects placed in the concrete had to be situated exactly right, because undoing or redoing work would be extremely difficult.

“We had to model the ductwork in 3D before installing the ducts and then we put sleeves in at the exact locations where the ducts would go as the floors were being poured, because you can’t cut into the concrete once it’s in place,” Berman noted.



GEAUGA MECHANICAL  
[www.geaugamechanical.com](http://www.geaugamechanical.com)



Trade-Mark's crane hoists the upper stack into place.



Trade-Mark rooftop ductwork.



Ductwork with damper fan.

## Canadian Firm Revamps Plant Exhaust System

**T**rade-Mark Industrial Inc. of Cambridge, Ontario is flourishing in Canada's booming economy. Trade-Mark has approximately 1,200 men and women in the field in locations as far west as Manitoba and the United States.

In what the industrial contractor calls "a typical industrial project," Trade-Mark recently modified and combined the exhaust system for a customers' two-story, 402,000-square-foot meat production facility outside of Hamilton, Ontario. The goal of the project's new exhaust system was to control odors in the plant. "The design required the exhaust systems from several production areas to be combined," said George

Colussi, Trade-Mark's sheet metal and HVAC manager.

Trade-Mark is a multi-trade contractor and served as the general contractor for the project. "We did the structural fabrication, the electrical work and the pneumatic air lines, and we fabricated the ductwork in our Cambridge facility," Colussi said. "Our people shared resources and equipment on-site and we handled all coordination between the crafts internally."

Trade-Mark owns a crane company, ROC (Royal Oak Cranes), that assisted with the project. "We began with one small boom truck and it was such an asset that we've expanded to 35 cranes at four locations in Southwestern Ontario."

The heavy cranes were crucial to completing the project. Trade-Mark used their 350-pound crane to hoist 115,000 pounds of stainless steel ductwork up to the roof and onto pre-installed roof duct supports, which were fabricated in the shop.

"We removed the existing exhaust duct systems on the roof and installed larger new 70-inch diameter exhaust ducts," Colussi noted "They ran along the roof and down to the new exhaust fans. Modifications were also made to the ductwork inside the plant to accommodate the increase in airflow."

To vent production odors, Trade-Mark added a 115-foot-high, 84-inch diameter stainless steel exhaust stack. The stack had a structural access platform to support two variable speed exhaust fans. The high efficiency fans draw air through the stack at 50,000 cubic feet per minute. The stack releases odors into the atmosphere 85 feet above the facility roofline, 50 feet higher than the previous system did, thereby reducing the odors in the immediate area.

Trade-Mark worked on several weekends to avoid disrupting the customer's production. "We are a 24/7 company," Colussi said. "We receive calls around the clock and can react with teams of trades people to help clients get produc-

tion up and running as soon as possible. We have built long-term relationships with many of our customers because they know we will get them back into production quickly. Production prevails over everything."

Trade-Mark employees spent much of their time working on the plant roof and in utility spaces away from the actual food production. On rare occasions when they entered a production area, they wore protective clothing including booties and hair nets to comply with Canada's strict food hygiene standards.

Working with crews on the roof in bad weather was also a challenge, however there were no cutting corners with safety. Trade-Mark engaged in assertive incident prevention and proactive safety planning.

"Every morning before the shift began the foreman would hold a safety talk with the whole crew that related to the day's activity. Our crews wore harnesses, safety glasses, hard hats and work boots during the project," Colussi said.

"We take safety seriously at Trade-Mark, and we want all our people to go home to their families at the end of the day."



# 'SMART' BUILDINGS TECHNOLOGY GROWING MORE COMMON IN HVAC DESIGNS

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on natural ventilation almost half the year.

Designing something other than mechanical ventilation for an 800,000-square-foot building was a lot more complex to engineer than simply opening a few windows — and yes, the windows really do open at the Tower at PNC Plaza.

That feat, along with many others, is why PNC's tower is

considered a milestone in the uber-connected world of "smart" building design. So-called intelligent buildings like the PNC tower make extensive use of the latest in computer-controlled technologies to run everything from water to lighting and HVAC.

Since heating and air conditioning are typically responsible for almost half of the energy consumed by a normal commercial building, indoor climate systems are a major part of the interconnected "internet of things" and its efficiency focus.

Whether or not one is an expert in smart buildings and energy-efficient architecture, "the building is impressive," said James Strother, executive director of SMACNA of Western Pennsylvania, who was among those invited to tour the tower while it was under construction.

"You can definitely tell it's an exceptional building," Strother said. "It is a pretty amazing building overall, not just from a mechanical point of view, but also aesthetically. It's a unique design that blends both form and function."

Many SMACNA members have already worked on such connected projects — and if others haven't, they likely will soon. The benefits for building owners and managers are too great to ignore. Landmark smart buildings are being erected around the world, from Singapore to Amsterdam.



*PNC Tower exterior.*

## Atlanta's 'Smarter' Stadium

A very different kind of structure, but one just as intelligent and energy efficient, is the \$1.5 billion Mercedes-Benz Stadium, home to the NFL's Atlanta Falcons. SMACNA member R.F. Knox Co. Inc. of Smyrna, Georgia, fabricated and installed 800,000 pounds of giant-sized spiral ductwork ranging from 66 to 96 inches in diameter in the stadium.

The duct ties into a massive mechanical system that includes more than 50 air-handling units capable of moving 100,000 cubic feet of air per minute. The HVAC system uses 100 percent outdoor air. The stadium is fully zoned, with IBM computers able to factor in the conditions outside. The computer system can also sense whether a section of the 2 million-square-foot stadium is either occupied or empty when deciding how the HVAC system should run. And it can do all of this with a retractable roof that can be open on sunny days or closed in case of rain or snow.

The USGBC awarded the stadium a LEED-Platinum certification — the first stadium to be so designated.



*R.F. Knox Co. installed giant-sized duct in Mercedes-Benz Stadium.*

## McKamish Installed Efficient HVAC Systems

The goal of erecting such a structure meant that it would present a unique challenge for officials with McKamish Inc., the Pittsburgh-based SMACNA member and mechanical contractor that installed the tower's super-efficient HVAC system. The company's \$45 million contract, divided up among three trades, included handling all the mechanical and plumbing work.

Installing HVAC equipment, fabricating and installing the building's sheet metal ductwork was among the project's scope for McKamish. More than 100 McKamish employees worked on the project, which required especially close coordination with other trades, over the course of 2.5 years.

"We estimate that we fabricated about 50,000 linear feet of duct in various sizes," said Dave Wingertsahn, a construction manager at McKamish involved in the PNC project. "This included the distribution duct for the office floors, mechanical rooms, and the supply, return, exhaust and stairwell pressurization risers."

**"WE ESTIMATE THAT WE FABRICATED ABOUT 50,000 LINEAR FEET OF DUCT IN VARIOUS SIZES," SAID DAVE WINGERTSAHN, A CONSTRUCTION MANAGER AT MCKAMISH INVOLVED IN THE PNC PROJECT.**

The downtown Pittsburgh location, which necessitated just-in-time deliveries and extensive coordination with other trades, made the project's logistics especially challenging, Wingertsahn said.

"Often equipment needed to be delivered after normal working hours," he said. "We had to work closely with the control contractor to make sure all devices were installed where they needed to be and that they worked properly to ensure the 'smart' operation of the building."

### Revolutionary Potential

Whether you call them intelligent, smart or part of the IoT, for the facility managers responsible for keeping buildings operational, such computerized systems are



MCKAMISH  
[www.mckamish.com](http://www.mckamish.com)

R.F. KNOX  
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ADJ SHEET METAL  
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revolutionary in their potential for comfort and energy savings.

Instead of manually having to turn on or even program buildings' mechanical systems, sensors hooked up to internet-connected computers can take over such tasks. Sensors can turn on lights if a room becomes occupied or automatically lower the temperature if a space is empty for an extended period. Such systems can also adjust temperatures to compensate for outdoor weather conditions, ensuring that more air conditioning reaches the sun-soaked warmer side of a building or making occupants more comfortable on high-humidity days.

The \$400 million PNC tower was so pioneering in its smart and ener-

gy-saving design, it was designated as LEED-Platinum from the U.S. Green Building Council (USGBC) in its Leadership in Energy and Environmental Design (LEED) green building rating program. It's often called "the greenest office building in the world."

### Part-time Net-Zero

The building's design allows the tower's HVAC system to be effectively net-zero in its energy use for up to 30 percent of the year. A thermal or solar chimney running through the core of the building removes excess heat without using traditional mechanical ventilation. Extending almost the whole height of the building, it's the largest such chimney in a

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*MGM's extensive boiler system.*



*ADJ Sheet Metal exhaust flues.*

## Maryland Casino Lauded for Being 'Green'

In Oxon Hill, Maryland, a short drive from Washington, D.C., the MGM National Harbor

has been recognized as one of the "smartest" — and greenest — casino resorts anywhere in the world.

That's not a reference to the money that changes hands on the casino floor. The 3 million-square-foot structure has earned a gold-level certification from the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) building rating system.

The property incorporates numerous smart technologies to ensure it minimizes the resort's environmental impact and keeps its occupants healthy and comfortable. In contrast to the old image of a relatively dark, smoke-filled gambling palace, the MGM property is bright and non-smoking and features high-efficiency water, lighting and HVAC systems. Building commissioning was used during the design and construction process and system software continuously analyzes energy performance.

The resort's boiler system was installed by workers from SMACNA Mid-Atlantic chapter member ADJ Sheet Metal of White Plains, Maryland. ADJ was responsible for installing the casino complex's thousands of feet of large, 34-inch-diameter exhaust flues from Schebler Chimney Systems of Iowa, as well as the breechings that connected the boiler and generator to the chimney.

To ensure the structure met the LEED-Gold rating it was aiming for, ADJ workers also had to ensure the duct and flues that were to be connected to the boiler were kept clear of construction debris by sealing the open ends prior to installation.

The casino uses a computer program to control the boiler system's many valves.

"There were many important valves in the system that were computer-controlled," said Mike Doerk, the executive vice president at ADJ who was involved in the casino project.

The building also features a white roof to cut down on the urban heat island effect and reduce the load on the building's HVAC systems. On its interior, the property employs several technologies that help improve the indoor environment, including low-VOC (volatile organic compound) paints and carpeting.

# Testing and Balancing: Making a Difference in Energy Efficiency

**S**MACNA's testing, adjusting, and balancing contractors are expanding their businesses by focusing on building systems and helping building owners and operators utilize their HVAC systems more efficiently.

Testing, adjusting and balancing (TAB) contractors provide professional, objective testing of a building's heating, ventilation and air conditioning systems. The information shared with customers comes from a series of evaluations of a building's HVAC system. In addition to evaluating operations, TAB contractors conduct duct leakage tests and perform systems commissioning.

Energy Balance and Integration (EB&I) of Albuquerque, New Mexico, seized the opportunity to optimize energy efficiency for companies in several different ways — by partnering with engineers to test systems, by assessing systems while balancing a job, and by testing hospital and lab rooms for positive air pressure to keep room environments hygienic.

A building needs to be seen as a holistic system. "A lot of the time the customer looks at the building from the standpoint of just being an individual room, when there's really a whole system working within a building," said Anthony Kocurek, EB&I's owner and SMACNA National vice president. "When you can make a whole system work more efficiently that's where the real energy savings come in."

EB&I will help engineers improve air efficiencies, thereby reducing the loads on fans and other motors. "We will test and balance for an engineer who

wants to know how a building is working and he has been given the task of fixing it," Kocurek said. "They will ask us to go in and do some auditing and figure out where things are at."

"While we're up there, we will take a look in the ceiling and look at how the ducts are run and how the connections are connected. If there is any known leakage, you will feel the air blowing around," he explained.

"And as we start going through an analysis, we notice how the systems are working. If there is a VAV (variable air volume) box we will look at how the boxes are set up to see if the set up makes sense," he said. "These are all things that can easily be corrected, and they make a big difference in the systems' efficiency," he said.

At that point, they give the engineer not only the results of the test, but also their recommendations for improving the building's energy efficiency.

James Hall, P.E., president and owner of Systems Management and Balancing in Waukeg, Iowa, said that in many cases they will also team up with the design professional. Hall also serves on SMACNA's Board of Directors and Technical Resources Committee.

"We'll take a consulting role in a team approach," Hall said. "Typically, the design professional will get us involved and say they would like to get some measurements and data here and there and learn our thoughts on how the system is operating to see if we can make some system modifications," he added.

Systems Management also troubleshoots system problems. Most of the time it's a comfort issue or a



*A technician performing a duct traverse test in supply ductwork.*

building operational issue — such as negative pressure or high humidity. "Buildings sometimes have pressure problems, which is interesting because it translates back to energy efficiency," Hall said.

EB&I also tests hospitals and laboratories to ensure that rooms maintain positive air pressure. Isolation rooms, for example, require an environment where no contaminants can enter. "There are certain amounts of offset to supply air and exhaust return so you maintain room positive when the door is closed," Kocurek noted.

To measure a room's "tightness" or air pressure, they will install a blower door with fans in the door frame that pressurize the room. "It blows air into the room and we measure the amount of air being used to pressurize that room. Our goal is to create the least amount of air leakage as possible. It makes it very efficient. That has been an incredible savings for the engineers," Kocurek said.

Hall's company also performs testing, adjusting, balancing and commissioning as a third-party to verify that the building's systems are operating efficiently. "We are the eyes and ears of the design professional to make sure it is doing what he or she wanted it to do," Hall said.

"If something is not operating as designed, and not meeting design intent, we get into a semi-consultative role and work with the design professional and say, 'here's what we see and here's



*A blower door measuring "room tightness."*



ENERGY BALANCE AND INTEGRATION  
[WWW.EBINM.COM](http://WWW.EBINM.COM)

SYSTEMS MANAGEMENT AND BALANCING  
[WWW.HVACTAB.COM](http://WWW.HVACTAB.COM)

what might help for next steps," he noted.

"Lots of times energy efficiency relates back to making sure the building is operating as intended," Hall added.

"We have the good fortune to have the opportunity to help make the system work," he reflected of his company's role. "Every job we have is an opportunity to learn and we try to share that knowledge with our customer base. Every project we do is like a learning laboratory."

"The future of energy efficiency goes back to helping educate the industry on what's really happening with how a system operates," he said.

# A Green Roof Springs to Life

continued from page 3

“One of the biggest challenges was gaining the trust of the architect, owner and construction management team to allow us to take the lead,” Davis continued. “The frustrating part was waiting for the design team to approve our drawings so we could move forward with the drawing and detailing for fabrication – converting the two-dimensional plan and elevation drawing into a three-dimensional drawing that would work.”

Davis said one of the reasons he believes Ernest D. Menold Inc was given the lead role in the drafting portion of the project was because they use the 3-D software Inventor, an Autodesk product. “We even

coordinated the LED lighting bollards (landscape post lighting) on the platform,” he added.

While green roofs have been popular in Europe for decades, the use of this green construction feature wasn’t particularly common in the U.S. until relatively recently. Incyte is just one of the big name businesses propelling the eco-roof trend. Facebook, for example, made headlines last year when the company installed a 3.6-acre rooftop garden with trees and pathways on top of its Menlo Park, California headquarters.

Ernest D. Menold Inc. hopes the trend will bring in more green roof work. Davis said working on



Installing upper staircase with supports below.

the Incyte project was fun and the green project attracted a lot of attention. It’s gaining attention from Incyte’s employees too, who stroll along its pathways, practice their putting, and pause for contemplation among its landscaped gardens.



ERNEST D. MENOLD INC.  
[www.menold.com](http://www.menold.com)

INCYTE GREEN ROOF PROJECT  
[smac.news/e5601](http://smac.news/e5601)

## Solar Power Harnesses the Sunshine

Roofs can serve multiple purposes besides being the foundation for green roofs. Harnessing the power of the sun, for instance, as a solar energy source for buildings and homes. Some SMACNA contractors are venturing into the solar market, offering their clients a clean, reliable, and cost-effective technology that can reduce utility bills.

Nowhere is the “power” of solar more visible than California. According to the Solar Energy Industries Association (SEIA), the number of California homes with solar installations is closing in on the 1 million mark. State policies and incentives are helping drive demand. California, for example, will require all new homes to have solar power, starting in 2020. Other states are considering their own solar requirements.

In the East Bay area near San Francisco, where there is a lot of competition in the solar market, SMACNA member ACS Air Conditioning Systems is getting a piece of the pie.

“In California it’s great, solar is everywhere. It is probably the best investment for your home,” said Justin Pratt, vice president of Air Conditioning Systems. “It’s tough to go wrong with solar.”

ACS got ahead of the curve, as they began offering solar power systems to their existing customers about six years ago. While HVAC is still their bread and butter, solar is a good value-added service for homeowners who



are drawn to the energy savings, environmental benefits and tax breaks. ACS installs roof-mounted panels that tie into the main electrical breaker box.

According to the ACS website, “with a modest solar array, you can cut your home electrical consumption by up to 50 percent, and thereby reduce your carbon footprint.”

Pratt said ACS is keeping up with advances in the roof-mounted panels as improvements are being made all the time. “Each panel is getting stronger and stronger,” he explained. “When ACS started with solar, a panel could produce 250 watts. Now they can deliver up to 400 watts. Solar storage batteries also allow owners to store energy and sell it back to the utility company when the rates are the highest.”

While some new solar products, like Tesla’s solar roof, seem expensive, average prices for

solar technologies have fallen 47 percent over the last five years, according to the SEIA.

Pratt said he hasn’t seen any Tesla solar roof tiles yet. Tesla solar roof tiles, not yet widely available for purchase, are mini solar panels made of tempered glass, and look like traditional roofing products. Other companies are also developing similar solar roofing products, as an aesthetic alternative to roof-mounted solar panels.

With a projected five billion years to go before the sun’s energy runs out, sunshine should prove to be a reliable and energy efficient source of power for years to come.



ACS AIR CONDITIONING SYSTEMS  
[www.acsystemsinc.com](http://www.acsystemsinc.com)

## TRAINING

### SMACNA Boston: Driving the TAB Industry Forward

About 20 technicians and sheet metal workers from Boston, Massachusetts recently studied the various applications of air flow measurement devices at the Sheet Metal Workers Local 17 JATC in March.

“This course was by far the best yet and the highest attended,” said Ryan Barrett of E.L. Barrett Co. Inc., who was part of the team that planned the seminar.

The seminar is part of SMACNA Boston’s efforts to nurture the most experienced testing, adjusting and balancing (TAB) technicians in the nation, efforts that began nearly 10 years ago.

“First and foremost, we are looking to foster the most well-rounded and most experienced balancing technicians in the nation,” Barrett said. “The second goal is to have the apprentices focus on preparatory measures to pass the ICB/TABB certification. This certification serves as a benchmark for TAB technicians.”

Back in 2010, a team of seven testing and balanc-



Boston TAB training session.

ing contractors, members of the SMACNA Boston chapter, got together to help expand TAB apprenticeship training and drive the industry forward. The group helped the JATC modify and expand their training curriculum to expose their apprentices to more in-depth, concentrated training, especially to those serving TAB apprenticeships.

“As the construction industry began to see a nice turn in the workload, along with an uptick in the

retirement of baby boomers, it became clear that the next generation of TAB technicians needed to be cultivated,” Barrett noted.

Since then, the group has worked with the JATC to construct a state-of-the-art testing and balancing lab at the apprentice training center to serve as the foundation for testing, adjusting and balancing training.

“This group has truly served as a launching pad for the progress made in the testing and balancing

## LEGISLATIVE

### NYC SMACNA Discusses Infrastructure with Rep. Velázquez

Members of the NYC SMACNA chapter recently met with Rep. Nydia Velázquez (D-7th-New York) in Brooklyn, New York, along with the Speaker of the U.S. House of Representatives, Nancy Pelosi (D-12th-California), and Rep. Hakeem Jeffries (D-8th-New York), chair of the Democratic Caucus.

During the event, which celebrated her birthday at the Wythe Hotel, SMACNA member Frank Narciso, principal of Contractors Sheet Metal, and John Contrubis, associate director of NYC SMACNA, discussed the congresswoman’s strong support of the construction industry and infrastructure projects in New York City. She has long supported the renovation and expansion of John F. Kennedy and LaGuardia Airports.



Pictured (left to right) Frank Narciso of Contractors Sheet Metal and treasurer of NYC SMACNA, John Contrubis, associate director of NYC SMACNA, and Rep. Nydia Velázquez.

industry over the past 10 years,” Barrett said.

During the recent seminar, participants learned about EBTRON air

flow devices and air flow measurements including pressurization, outdoor intakes, airflow paths, control strategies and verification basics along with techniques to improve building performance.

Sponsored by SMACNA member Buckley Associates Inc., the training session was offered to TAB technicians, fire and smoke techs, and to recertify TABB techs certified by the Testing, Adjusting, and Balancing Bureau (TABB).



Airflow measurement devices.

For more information visit [SMACNA Boston at smacnaboston.org](http://SMACNA Boston at smacnaboston.org) or [Testing, Adjusting and Balancing Bureau at www.tabbcertified.org](http://Testing, Adjusting and Balancing Bureau at www.tabbcertified.org).

## Welcome New SMACNA Member

Falls Metal Fabricators and Industrial Services LLC of Akron, Ohio

### TECHNICAL

## SMACNA's Revised Fire Smoke Damper Guide Available for Public Review



SMACNA's newly revised *Fire, Smoke, and Radiation Damper Installation Guide for HVAC Systems*, 6th edition, is available for public review on the SMACNA website at [smac.news/4f6ba](http://smac.news/4f6ba). The deadline to submit comments is May 15, 2019.

Members are invited to review and comment on the guide and its revisions online at [smac.news/5bd89](http://smac.news/5bd89).

The revised edition includes significant revisions including new breakaway fire damper connections and inspection and testing requirements for new and existing fire, smoke and radiation dampers. A revised chapter for the design professional is included along with a detailed fire, smoke and radiation damper matrix based on the model building codes to assist designers/code officials and contractors on the selection of these dampers.

The guide is available for public review until May 15, 2019.

SMACNA's technical manuals and standards address all areas of the sheet metal and HVAC industry. They are developed by SMACNA members and set the standards for the construction industry, the code community and government agencies around the world.

**Have you completed the 2019 SMACNA Safety Excellence Awards Program Survey?**

**Submit your entry before May 10, 2019**  
[www.smacna.org/safety/survey](http://www.smacna.org/safety/survey)

## Welcome 2019 Associate Members

### PLATINUM



### GOLD



### SILVER

SMACNA welcomes new Silver Associate Members Cadvantage Drafting Service Inc. of St. Petersburg, Florida, and Ruskin of Grandview, Missouri.



SMACNA's Associate Member program provides an opportunity for industry suppliers to build long-lasting relationships with SMACNA members, the industry's premier contractors. To learn more about becoming an Associate Member, visit [smacna.org](http://smacna.org) or contact Scott Groves at [smacna@naylor.com](mailto:smacna@naylor.com).

LEADERSHIP



# Developing Leaders Through Feedback

Collectively, companies spend billions of dollars for leader development, utilizing everything from public seminars to executive MBA programs at prestigious universities. While all of these have value, people sometimes overlook one of the simplest tools, available free to everyone—real-time developmental feedback.

Some people believe, “if you screw up, I’ll let you know” is all the feedback people need. When we speak of feedback, we aren’t talking about giving compliments or criticism. To paraphrase a superintendent I met recently, we aren’t talking about “delivering a size 12 steel-toed message to a strategic anatomical location.” We aren’t even talking about an annual review process, which is a topic for another time.

Performance feedback is usually delivered with the intent of getting someone’s behavior or performance up to a basic minimum standard. “If you’re late one more time you won’t be working here anymore” is an example of direct performance feedback.

We think of feedback as a simple but powerful means of creating better leadership behaviors and actions through specific affirmations and precise course corrections. To that end we teach two kinds of developmental feedback—Plus and Delta. Plus feedback means, “that’s really effective. Keep it up.” Delta (symbol for change) means, “You could be even more effective if...” Developmental feedback is always delivered with the intent of helping someone improve their performance.

The feedback loop is comprised of 3 steps. 1) Observation 2) Effect 3) Plan. Here’s an example.

1. A president of a specialty contractor observed his director of business development (BD) make a presentation to a prospective client that resulted in a lot of great questions and sustained dialogue.
2. The effect was they got a call the next day that they’d been selected for the work.
3. The plan for the BD guy going forward? Just keep creating well developed presentations and creating dialogues, not monologues.

Communicating this valuable information (along with a genuine “thank you”) took less than two minutes and was a powerful affirmation of great behaviors that will lead to continued success for the individual and the company.

I once asked a former big-league baseball catcher what’s going on when a catcher walks to the mound to talk with the pitcher. “It’s usually an issue of mechanics,” he said. Maybe his elbow is flaring a bit, or his windup is off, so his pitches are not quite where they need to be. He can’t see that kind of thing so I let him know what I’m seeing so he can make adjustments.” That’s about as good a definition as I’ve ever heard of feedback.

We’ve seen companies transform their culture by consistently giving (and receiving) Plus/Delta feedback, because people have clarity into which behaviors to continue, and which to alter. If you’re looking for an high return for a minimal investment with your leader development, you won’t do better than creating a culture of developmental feedback.

*Ron Magnus, managing director of FMI’s Center for Strategic Leadership with Ed Rowell, CSL consultant.*

Wages Representative Contract  
Overtime Productive Employer  
Unions COLLECTIVE Terms  
Costs BARGAINING Health Fair Salaries  
Issues Employment Agreement Groups  
Salary Participate Process Grievance  
Regulate Negotiations Establish  
Healthcare Employees Protection

LABOR RELATIONS

## Contractors Learn Basics of Bargaining

Contractors and chapter executives discussed how to prepare for the bargaining season and issues they would be likely to encounter at the bargaining table during SMACNA’s 2019 Collective Bargaining Orientation in Dallas, Texas, in March. About 30 SMACNA chapters are entering negotiations this year for new collective bargaining agreements.

In addition to discussing current issues in bargaining, Tom Keating, SMACNA National’s support representative and retired chapter executive of SMACNA Colorado, offered guidance on preparing for bargaining, demonstrated how to use research to support negotiating positions and shared industry data on evaluating the local industry and economy.

Carey Peters, executive director of the Construction Labor Research Council (CLRC), led a discussion on SMACNA’s current employment share numbers. He also explained the specific methodology that the CLRC uses to compare union worker numbers to total employment in the industry.

SMACNA legal counsel Michael McNally of Felhaber Larson led an in-depth overview of the legal framework for bargaining and how to prepare for impasse, should that possibly occur.

Deborah Wyandt, Esq., SMACNA’s executive director of labor relations, led a panel discussion on how to handle challenging negotiations with several seasoned chapter executives who have been through several bargaining seasons.

Panelists included Kim Best, executive vice president of the Sheet Metal Contractors of Iowa; Jim Bigham, director of labor relations of SMARCA of Minnesota - North Dakota - South Dakota; John Quarnstrom, executive director of SMARCA of Minnesota - North Dakota - South Dakota; and John Ferrante, associate executive director of SMACNA Boston.

*The latest employment share numbers were distributed to chapters in January. For a copy contact Jason Watson, SMACNA’s director of labor relations at [jwatson@smacna.org](mailto:jwatson@smacna.org).*

*To learn more, download materials from the 2019 Collective Bargaining Orientation on the Presentations and Reports section of SMACNA’s Labor Relations web page [www.smacna.org/labor](http://www.smacna.org/labor).*

LEGISLATIVE

## SMACNA Western Washington Discusses Top Priorities with Rep. Newhouse

Members of the SMACNA Western Washington chapter talked about workforce and infrastructure concerns with Rep. Dan Newhouse (R-4th-Washington) during an issues forum co-hosted by SMAC PAC and the Western Washington chapter in Olympia, Washington, in March.

Julie Muller-Neff, chapter executive of SMACNA Western Washington, and Jim Reynolds, a member of SMACNA's SMAC PAC and Legislative Affairs Committees, led the state, local and national issues roundtable, which was attended by SMACNA members and state and local officials.

A wide-ranging issues forum focused on SMACNA's top congressional priorities, including infrastructure improvements,



*Jim Reynolds (right) of Auburn Mechanical Corp. discusses state and national issues with Rep. Newhouse at the forum.*

workforce development and energy efficiency as well as other key issues in the state of Washington.

A construction industry advocate, Rep. Newhouse requested a tour of the Joint Apprenticeship Training Center (JATC) in Seattle. He expressed interest in meeting firsthand with JATC officials and apprentices and learning how the industry

is boosting the number of skilled workers in the HVAC workforce.

Rep. Newhouse is a GOP supporter of Davis-Bacon prevailing wage enforcement in Congress. He also supports Joint Apprenticeship Training Centers, which are monitored and certified by the U.S. Department of Labor, as centers for first-rate apprenticeship training.



*Pictured (left to right): Julie Muller-Neff, Rep. Newhouse, and Jim Reynolds during the SMACNA Western Washington – SMAC PAC issues roundtable.*

## 'Smart' Buildings Technology Growing More Common in HVAC Designs

*continued from page 9*

U.S. office building, according to officials. Its top is painted black to absorb solar rays and help draw out the building's hot air.

During cold months, the chimney helps heat the fresh outdoor air before it reaches the air handlers. Transfer wheels help add moisture and warmth to the air in the winter and remove it in the summer. The duct and piping are laid out to minimize transitions and fittings to lower pressure drop system wide, which improves efficiency.

Altogether, the Tower at PNC Plaza is estimated to consume about half the energy of a typical high-rise office building.



*The Tower's double-skin facade allows for natural airflow.*

And many of its 2,000 occupants have access to outside air, even on the higher floors. In some parts of the structure, office workers can use walkways that allow them access to the space between the two "skins" of the building — and the fresh air it contains.

For Wingertsahn and McKamish officials — no strangers to green buildings — it made the PNC tower unique.

"I have worked on many LEED projects, but not one that uses as much natural ventilation as this project did," Wingertsahn said.

The fact that a city once known for its steel mills and smokestacks is now home to one of the cleanest and greenest buildings in the world is not lost on area residents.

"I drive by the building about every two weeks while traveling to other work sites. It makes me extremely proud, as this is a showplace of the city," Wingertsahn said.

SMACNA's Strother agreed. "It's a beautiful addition to downtown Pittsburgh, that's for certain."

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## SMACNA CALENDAR

### MAY 2019

#### May 5-8

Advanced Project Managers  
Institute  
*Raleigh, North Carolina*

#### May 7-9

2019 CEA National Issues  
Conference  
*Hyatt Regency, Washington, D.C.*

#### May 10

Safety Surveys Due

#### May 19-22

Financial Boot Camp  
*Tempe, Arizona*

### JUNE 2019

#### June 2-4

Council of Chapter Representatives  
*Lake Tahoe, Nevada*

#### June 10-11

NJAB  
*Cleveland, Ohio*

### SEPTEMBER 2019

#### September 9-10

NJAB  
*Salt Lake City, Utah*

### OCTOBER 2019

#### October 20-23

76th Annual Convention  
*JW Marriott, Austin, Texas*

### DECEMBER 2019

#### December 8-10

Council of Chapter Representatives  
*La Quinta, California*

### FEBRUARY 2020

#### February 25-26

Partners in Progress Conference  
*Las Vegas, Nevada*

### MARCH 2020

#### March 1-5

Business Management University  
*Tempe, Arizona*

#### March 23-24

Collective Bargaining Orientation  
*Dallas, Texas*

### FUTURE SMACNA CONVENTIONS

#### September 27-30, 2020

77th Annual Convention  
*The Broadmoor, Colorado Springs,  
Colorado*

#### October 24-27, 2021

78th SMACNA Annual Convention  
*Mau, Hawaii*

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