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ALSO IN THIS ISSUE:

Beating the Houston Heat:
A Performance-Based Home Run

Heat: The Last Step in Airside Performance – Part 5

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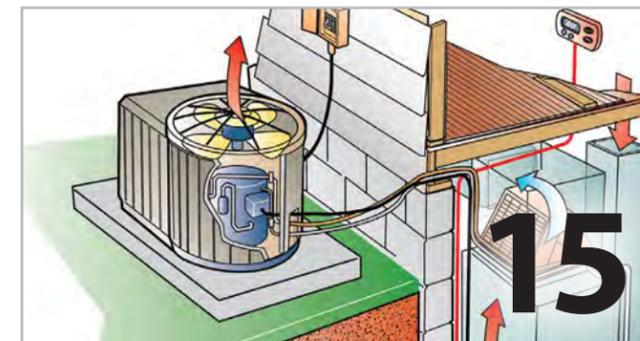
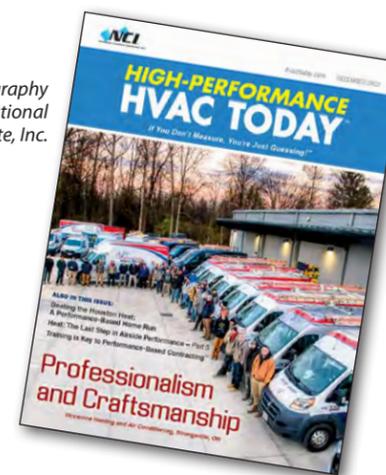
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HIGH-PERFORMANCE HVAC TODAY™



MANAGEMENT:
**Beating the Houston Heat:
A High-Performance Home Run**
One Performance-Based Contractor uses the skills learned in training to totally solve a sticky situation.

Cover photography
by Mike Weil, © National
Comfort Institute, Inc.



TECHNICAL:
**Heat: The Last Step on the PATH
to Performance (Part 5)**
Why is Heat the last step? David Richardson explains in this month's continuation of our six-part series.



TRAINING:
**Training is Key to
High-Performance Contracting™**
Getzschman Heating, LLC trains on purpose. Authors Ron and Scott Getzschman tell you why they do it and what its impact is on their business.

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The Year We'd Love to Forget, But Won't ...



Mike Weil is editor-in-chief and director of communications and publications at National Comfort Institute, Inc. He can be reached at ncilink.com/ContactMe

It's finally December, the last month of the year I want to forget. As the door swings shut on 2020, many of us want to sigh with relief and look forward to a much better, safer world in 2021.

But can we truly forget the year when the entire world became engulfed in the COVID-19 pandemic that wreaked havoc on our lives, our livelihoods, and our society?

Let's have a look at where we were and why we won't forget this year anytime soon.

THE PANDEMIC

The spring shutdowns, social distancing, and face mask requirements hit small businesses very hard, and some won't recover. Though things did ease up a bit, with the onslaught of the second and third waves of infections and more than a quarter million deaths, it is still a dangerous and scary world.

Early on, HVAC contractors were categorized as essential and were allowed to remain open to help their customers stay comfortable and safe in their homes. But many were forced to completely change how they conduct business.

With more people than ever forced to cancel trips, work from home, and home-school their kids, the need for better indoor air quality and system maintenance went through the roof and continues doing so even today.

Many High-Performance HVAC companies added new wrinkles to their service offerings like using low-contact services. For example, they used virtual walk-throughs to help determine what was happening in a home or building before dispatching techs to the site.

Others focused on community service – using MERV-13 filters to create masks donated to their communities which helped build customer confi-

dence, protect them, and made it easier for their technicians to enter homes and do their work.

TRAINING ISSUES

On the downside, general and technical in-person training simply stopped. At least for a while.

But luckily organizations like National Comfort Institute, ACCA, and others very quickly developed virtual capabilities so they could help contractors continue training their people despite limitations imposed by the COVID shutdowns.

SOCIAL CLIMATE

This year was a year of panic, social activism, and an extremely divisive presidential election that left this country reeling. As a result, we've seen an increase in vandalism, thefts, and other issues that make it difficult to keep employees, tools, and equipment safe.

Oh, let's not forget that shutdowns across the country clobbered the delivery channels and we saw HVAC equipment shortages that still linger today.

Despite all this, the industry persevered.

We learned how to use new technology to train our people and keep our customers informed. We changed protocols to help consumers feel safe while we worked in their homes. And the changes implemented throughout this industry will help make it stronger once we get past the pandemic.

Yes, 2020 was a tough, sometimes ugly, and seemingly endless year. But I hope the positives will carry us forward and help make 2021 a better one. Check out Dominick Guarino's *One More Thing* column (ncilink.com/2021) for some thoughts on where next year may take us.

In the meantime, Happy Holidays from all of us to your teams and families. Best wishes for a better, even more successful 2021.

Written By HVAC Professionals for HVAC Professionals

Fieldpiece MR-45 Digital Recovery Machine

Big yellow's done it again! Fieldpiece Instruments is no stranger to raising the bar for functional, durable, and accurate technician tools. Their affordable instruments allow thousands of technicians to accurately perform their jobs.

Recently I had the privilege of installing two HVAC systems for a close friend. It was a lot of fun because I got to go tool shopping!

I needed a refrigerant reclamation machine for this project, so I began doing my research. I remembered the great track record of all the previous Fieldpiece tools I've purchased. Their MR-45 Digital Recovery machine just made sense to me.

The lightness of this machine surprised me. It weighs only 22 lbs. despite

having an extra-large condenser which cools faster, especially on hot days. And, it is water-resistant and can work in direct rain.

Another standout MR-45 feature is its digital control panel with an input and output pressure display, plus several buttons to control and set up the instrument.

Built-in Bluetooth makes it nice to turn the MR-45 on and walk away. I could focus on other tasks while keeping an eye on its progress remotely. That is a total productivity win! Built-in safeties also protect the instrument from catastrophic failure and promise a long life.

As always, Fieldpiece included one of the easiest operation manuals in the business. One cool attribute: no setup is necessary. It's pretty much plug-and-play.



Even though I won't use it as much as most other techs out there, I know this tool will still come in handy. By the way, Fieldpiece stands behind its products, and for that, I strongly recommend the MR-45 Recovery Machine.

Go to ncilink.com/MR-45 for more information.

— by Casey Contreras, Field Coach, National Comfort Institute

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New Construction High-Performance: Professionalism and Craftsmanship

Gino Viccarone is a lifer. From the time of his graduation from the West Side Institute vocational school in Cleveland, OH, to where he is today, he has only worked in the HVAC Industry.

His first job was with a local HVAC contracting company where he worked for slightly more than eight years as a service technician. The hours were long, the work could be grueling, especially during the hot, muggy Cleveland summers. Eventually, he was given the opportunity to do some installation work and he fell in love.

In 1994, he decided to start his own company, and Viccarone Heating and Air Conditioning was born. He operated the business from his home.

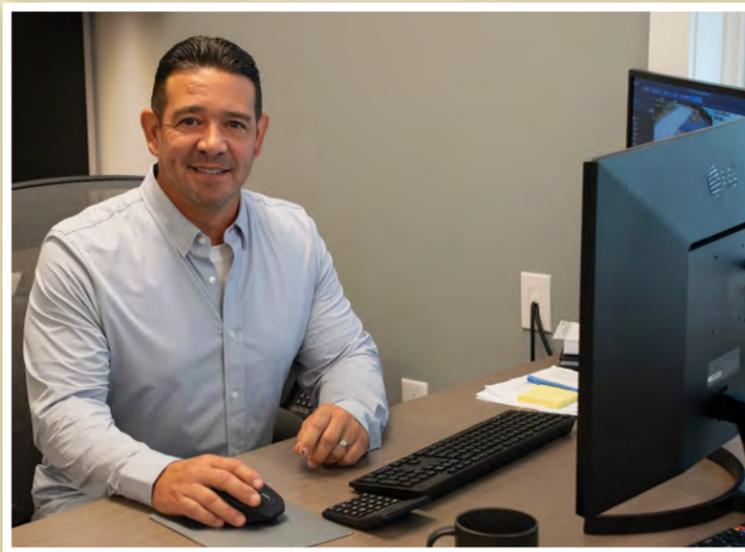
“My father was retiring from his job at the Cleveland Plain Dealer newspaper and he decided to volunteer four years of his time riding along with me in the truck. He refused to let me pay him. He often would buy me lunch, especially on those days when I was getting frustrated.”

THE EARLY YEARS

In the beginning, Viccarone did a lot of commercial work and as the busi-

ness grew, he needed to get out of the house. In those early days, he worked a lot for an industrial manufacturing company in Cleveland, OH known as Kirkwood Industries doing, as he says, “whatever they needed.”

Much of that work was servicing and maintaining their rooftop units,



Gino Viccarone sits in the “command center” in the newly constructed headquarters.

ness grew, he needed to get out of the house. In those early days, he worked a lot for an industrial manufacturing company in Cleveland, OH known as Kirkwood Industries doing, as he says, “whatever they needed.”

Much of that work was servicing and maintaining their rooftop units,

closed up shop and moved operations out of the country and Viccarone lost his biggest source of income. As providence would have it, one of Gino’s friends asked for help on a home he was building.

Up to that point, Gino had never done new construction work and says

he was always willing to try new and challenging things. When that project was done, Gino says he knew that new construction was where he wanted to be.

When that project was completed, Gino’s friend helped him land a job with a national home-building organization – Kimball Homes – and that is the point in this story where Viccarone Heating found its footing and focused on residential new construction.

“When it comes to the HVAC systems we put into homes, I have always believed in delivering the highest quality possible so that customers get the most from the money they spend,” Gino explains. “I always used my training and what I learned on the job to do the best I could. There was no corner-cutting. It had to be done right.”

His reputation for quality work and resultant customer accolades led, one

day, to a representative from Ryan Homes visiting one of Viccarone’s job sites. This Ryan representative saw how Gino designed and installed ductwork and wanted him to work for Ryan Homes. Two or three months later that is exactly what happened.



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VICCARONE HEATING TODAY

Gino Viccarone says that over the years, he’s found that if he wants to design and install quality systems, he has to be completely self-reliant – no subcontracting any part of the HVAC project. So practically from the beginning he invested in his own sheet metal shop and creates his own ductwork, elbows, returns, and more.

“We design everything and custom-

ize it to deliver the best airflow possible for the customer. To that end, I’ve invested heavily in the fabrication equipment necessary and the trained fabricators who do that work.”

Viccarone’s sheet metal shop is equipped with plasma cutters, benders, brakes, and more. Plus, Gino even invested in state-of-the-art dust removal and air cleaning systems in his warehouse/sheet metal shop to protect co-workers and create the safest and cleanest work environment possible.

It is this approach to business and air delivery systems that lead to Ryan Homes asking Gino’s team to take on more and more work.



A bird’s-eye view of the sheet metal fabrication shop and the state-of-the-art dust collection system.

“My father used to tell me to never turn down work because you never know when it will dry up,” he says. “Over time this led to working for other builders as well.”

Today Viccarone Heating has grown with two additional branch locations besides the Strongsville headquarters. The Cleveland operations gross between \$9 and \$10 million and employ between 52 and 55 people.

Gino says they have a branch in Chicago (Viccarone Heating and Cooling of Illinois) that grosses around \$3 million and employs 12 people. The other branch is in Columbus, OH. It has six employees and grosses near \$1 million.

“Our expansion is the direct result of how we approach projects and our relationships not only with builders but with suppliers and inspectors as well,” he says.

BUT WHAT ABOUT SERVICE?

When it comes to service, Gino says, “My motto, at first, is that we will only



This is an example of the high-quality fabrication that Viccarone brings to the table. This is a commercial duct radius.

service what we install. The reason: we know the equipment, the ductwork, and everything that went into that system. We know how to fix anything that goes wrong.”

Viccarone eventually grew a service division that operates as a full-service company. Gino empowered his service manager to grow that business. That required making sure the service techs are properly trained and can do the job without falling back on the main new construction business.

Service quality and airflow are the focus in this division and Viccarone Heating not only test, measure, and diagnose the complete mechanical system, they also always replace all the ductwork near the furnace with radius fittings for optimal airflow. It’s part of their standard pricing. They do this because they can produce metal so fast and cost-effectively.

TRAINING AND CERTIFICATION

Success is contingent upon continuous education, training, practice, and hard work. All of Viccarone’s technicians – installation and service techs – receive airflow testing and diagnostics, air balancing, combustion performance, and CO safety training/certifications from Nation-

Pictured is a standard Viccarone furnace installation using custom-made inside/outside radius plenums for optimal airflow.



Photos by Mike Weil, © National Comfort Institute, Inc.

al Comfort Institute (NCI). They also are trained and licensed in refrigeration and Gino brings in trainers from wholesalers and manufacturers as well.

He tells the story of his first encounter with NCI. Early in his career he was doing work for New Century Homes and had just designed and installed what he thought was an incredible system using all his knowledge and craftsmanship. The customer had it checked by an NCI-trained High-Performance contractor who found the ductwork vastly undersized and static pressures nowhere near what they needed to be. That is when Gino learned about the High-Performance approach and changed his path to do that kind of work.

“The biggest thing I’ve learned from NCI is that proper airflow is everything. The balancing hood doesn’t lie. Plus, we use NCI’s static pressure kits and have one on each of our trucks. Our tech team just loves it. They send me pictures when the systems they install hit the static pressure marks. It’s almost competitive as to who will get closest to .5-in.”

He points out that traditionally designers ran square duct on return systems. They would then cut in a takeoff and drop the return out of it.

“I wanted to try something different to increase airflow. So, I had one of my best lead installers nest two 90° (inside/outside radiuses) returns on the top. Then instead of just running ductwork, I had this installer treat it like a supply and then drop down to a nice long 90° radius into the furnace. By doing that, static pressure dropped significantly.”

He adds, “This virtually eliminated air turbulence inside the duct and helped it flow smoothly into the furnace. If you gently guide which way air must travel, static pressures drop. When air must fight other airstreams to get down the trunk, static rises and you will have problems.”

OTHER TOOLS OF THE TRADE

Furthermore, Gino says they’ve become masters at finding and sealing duct leaks. He says 15 years ago, you were considered a hack if you covered your joints.

Gino invested in and uses an Aero-seal system (ncilink.com/aeroseal) when they need to seal leaks.

Another tool that is becoming more useful to Viccarone Heating is NCI’s



Photos by Mike Weil, © National Comfort Institute, Inc. Jacob Viccarone working the bender in the sheet metal fabrication shop.

ComfortMaxx™ cloud-based software (ncilink.com/CMaxx). Right now it is mostly used by the service division.

“Several years ago, we attended a ComfortMaxx class and the techs were really gung-ho on it. They continue to move further in that direction,” he says.

“I want to start using it on the new construction side so we can show customers how we can guarantee their comfort without overwhelming them with tech speak. The problem is it slows our crews down. I’m not going to have my guys do something if they aren’t going to do it right. So, I have to figure it out.”

MOVING FORWARD

The new construction business was very good and profitable for Viccarone Heating, but as Gino says, it is a tough business.

“It is hard to maintain the level of

professionalism and quality if you can’t find the right people to help you,” he explains.

Within the last few years, Gino was seriously thinking about retirement and selling the business. But then his son, Jacob, joined the company, and everything changed.

“Jacob came in with fire in his belly. He wanted to learn everything and do anything. I put him in charge of our sheet metal shop. He brought in several new guys and between them all, they put the “Q” back in quality,” he explains. “There was no job too big, or turnaround too fast for them. They never complained. They constantly want more work.

“This changed everything. This is why we can make custom inside/outside radius fittings and get them onto the job so fast. My son and the fabrication team are the right people at the right time and without them, we wouldn’t be achieving the levels of quality and growth we enjoy today.”

Furthermore, he currently feels his administrative team is on point and believes he has the best lead installers in the business.

Gino says he is finally at peace with where they are and where they are heading.

One of the results: Viccarone and his son decided to build a next-generation building to better accommodate the company’s growth. They designed it together, oversaw the 20,000 sq. ft. facility’s construction together, and were able to move in during the waning days of August 2020.

REINVENTING THE WHEEL

For Gino Viccarone and his team, the importance of the customer, the

team, and their families is their focus. To be the best they can be, education, training, and having a can-do mindset are the only way to achieve that.

“It’s our culture to strive towards perfection. I know there is no such thing as perfection, but it’s the striving that’s important. We can’t provide the best, most comfortable, and most energy-efficient systems unless we measure everything.

“From that perspective,” Gino says, “I believe that NCI has had a huge impact on my business. I took my first air balancing class in 2006 and there was no looking back. NCI taught me that I was using the wrong numbers in my static measurements, mostly because I didn’t truly understand what the numbers meant.

“Their training made that crystal clear and our accuracy is vastly improved as a result.

“So I came back and reinvented the wheel. I told my guys that I didn’t care what size the furnace was, we had to bring in more air using big returns with inside/outside radiuses. No more vertical filters. They were all to be installed horizontally. We must give every furnace ALL THE AIR IT WANTS.”

“That’s one of our biggest secrets,” he concludes. “I think contractors should focus on doing things right for customers at all times. The key to this is communications and relationship building. Will you always get it right? No. But you must learn from your mistakes and always move forward.”

It is for these and many other reasons that **High-Performance HVAC Today** is pleased to add Viccarone Heating to our list of Contractor Spotlights. Congratulations. NCI



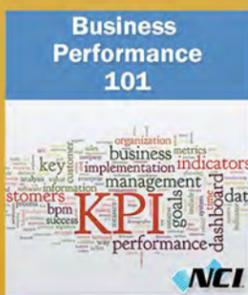
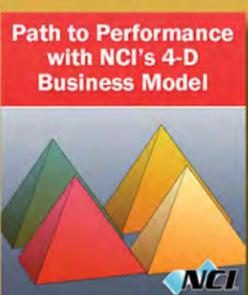
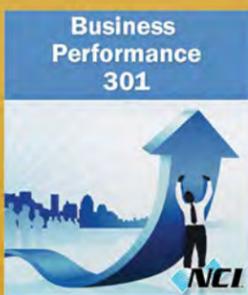
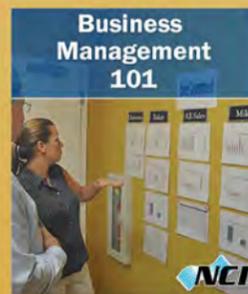
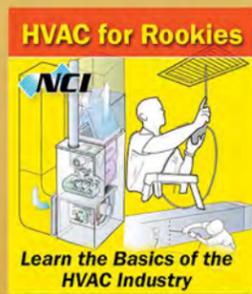
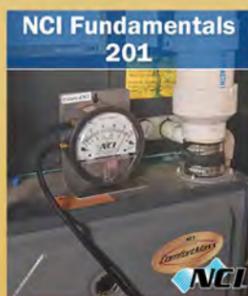
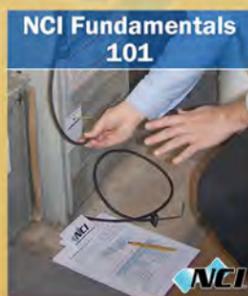
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- Training available from fundamentals to advanced courses

NCI's Online University

The National Comfort Institute, Inc. (NCI) Online University offers several online training options to super-charge your journey towards becoming a High-Performance HVAC Contractor. From self-guided online training, to recorded webinars, the Online University provides technical as well as customer service and business management courses.



NCI members receive a discount on every course and webinar in the University. You can add the Premium or Learning Excellence Online package to your membership and get unlimited access to the entire University!

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Beating the Houston Heat - A Performance-Based Home Run

You may have heard of “Hot-lanta” Georgia. Well, the Greater Houston area is also well known for its heat *and* humidity during the summer. In fact, it's classified as a humid, subtropical climate. It can be a tough place to live if your indoor environment isn't properly conditioned and controlled.

Our customers, the Nichley family, were looking for a “forever” home that was large enough for their three young children and in which Michael and Lindsey Nichley could settle down and grow old together in comfort. After shopping around, they decided to move from Houston proper.

Thirty miles due west from Houston, in the city of Katy, TX, they found such a house. Situated on a golf course, its idyllic setting and beautiful aesthetics drew them in.

The house is a 5,756 sq. ft. custom-built Georgian-style colonial with an attached garage. It was built in 1986 and has four bedrooms and a play-room on the second floor, with the master suite on the first floor.

The comfort system consisted of three air conditioning units. The systems were single-stage, basic units with standard 80% AFUE gas furnaces.

According to Michael, practically from day one, they had a hard time controlling the temperature throughout the house. He says the kids' bedrooms were so inconsistent that there often was a 10°F difference between them.

He and his wife both complained that the master suite was often very humid. The master suite has a southern exposure with many windows which contributes to the heat and humidity. The owners' newborn baby stayed mostly in the master bedroom suite, so it needed to be clean and quiet in there.

High-efficiency air filtration was also necessary because of the baby and Michael's allergies.

In addition to the issues described above, the

family room downstairs has vaulted ceilings as does the entry hall, all of it conditioned by the first-floor system. Getting air down to the occupant level was a challenge. We found high airflow resistance and poor air distribution. The systems were trying to cram all of the air into just a few, under-sized, “wandering” ducts.

SEEKING HELP

Michael and Lindsey knew they needed help and sought the advice of Lindsey's parents. Her parents recommended Crossway Mechanical because of a long-term relationship we had taking care of their home's systems.

So, we came out and did a walkthrough with Michael and Lindsey, listened to their comfort issues, and began formulating a plan of action to help them.

At first, they wanted to figure out how to piece-meal a solution, looking at what they could salvage, and what needed to be replaced. Two of their air conditioning units were oversized and the third stopped working.

For other HVAC contractors, this project could be very simply done. But the team at Crossway knew there was more to it, especially since they had recently completed training and earned certifications in Duct System Optimization from National Comfort Institute.

Our Technical Excellence manager, David Small, also has air distribution expertise as one of the technical committee members that collaborated on the NATE Air Distribution exam

Because there was no builder floorplan for the house, Crossway had to create one using Elite Software RHVAC9.



Leyla and Brian Wright (front, third and fourth from left) pose with the Crossway team.

A Home Like Heaven on Earth!

By Mike Weil

It's always fun to speak with homeowners who have just experienced an HVAC project done using Performance-Based Contracting™ methodology. I interviewed Michael Nichley to see how things went and how he feels about his home a year after the work was completed.

He told me doing things right has always been his mantra and based on the "detailed and scientific approach" of the Crossway team, he felt this was absolutely the best way to go.

"The execution by Crossway was phenomenal," he says. "Totally white glove. They brought in a team and they didn't bother me or my family once. They had a plan and they executed it beautifully. The entire project was done in three days and the end-product is just beautiful – a veritable work of art."

He went on to explain that his goal was NOT getting a return on investment. "I did it for comfort," he explains. "The result has been amazing. Our home is heaven on earth. We are so much more comfortable both upstairs and downstairs. We can maintain a constant temperature throughout the house.

"We don't have to think about it anymore. We have zero humidity issues and in Katy, TX that is saying something. Our relationship with Crossway continues as we have a service agreement with them, and they have kept these systems humming as well today as the day they finished installing them.

We recommend them all the time to our friends, family, and work colleagues. I really can't say enough about them."

And that speaks volumes.

Congratulations to the team at Crossway Mechanical.



The attic space in the Nichley home was, as the customer described it, a 'superhighway of duct' rendering the space unusable for anything else. Until Crossway completed their work!

(along with Rob Falke of NCI).

We had several months of using that training in the field when we approached Michael and Lindsey on this job and asked if we could use their project as a live test.

The Nichleys agreed.

We then performed a full load analysis, full duct design, and so on. We followed the NCI processes and tracked the hours we worked.

DOING THINGS THE "NCI" WAY

Because the Nichleys wanted to look at a repair versus a replacement, we spent a lot of time upfront putting together a price of what we could do to fix what was already there. We also gave them the option of having us come in to test and measure the entire system.

The latter included testing the existing system's static pressures, temperatures, airflow, and so on. We used **iManifold™** digital testing instruments that do the calculations and produce real-time data. We found a lot of deficiencies impacting the overall system performance.

First, the ductwork was very poorly designed, poorly supported (lots of sagging going on), and we found a lot of holes.

Plus, Michael Nichley says the attic looked like "a duct superhighway

making the two-story space unusable." He wanted it fixed so he could one day turn that space into a bonus room or rooms.

Unfortunately, the house didn't have an existing floorplan for us to refer to. So, we used Elite Software's RHVAC9 program to draw floorplans based on our physical measurement of the home. We also used it to perform the heat load estimates and calculate airflow requirements. (Now they have a floorplan!)

In the past, we had mostly used static pressure testing for troubleshooting. We didn't fully comprehend how everything worked together until Brian took the NCI Duct Optimization and Air Balancing classes. After all our training, static pressure testing is NOW part of our daily routine.

The result is we now knew how to properly correct the ductwork, all the undersized returns, and so on.

Once all the measurements were completed, we crunched the numbers and presented the Nichleys with two options: they could spend \$20k to try and fix what was there, or for \$60k they could get a complete renovation.

Note that before this project, we had never presented a proposal that was that big in scope on a residential retrofit project. It was also the first propos-

al that had ALL the details documented – both the design work and the potential outcome. Plus, we offered a great financing package to them.

MAKING THE BEST DECISION

Michael Nichley is a financial advisor. He understood what the numbers meant right away.

The first option was to fix the existing ductwork, replace the non-functioning air conditioning unit, and do other repairs to try and get the existing system to perform better. The cost was around \$20,000.

The second option was a complete renovation, replacing all the equipment and visible ductwork with ones that are properly sized and customized to meet the owners' requirements.

That price was more than \$60,000 and we guaranteed we could eliminate their comfort issues.

In Michael's words, "The numbers that Brian Wright and David Small shared with me made sense. And with the financing Crossway made available, I could afford to do the job right, which is what my goal always was. So, we opted for the full renovation, worked with Crossway to get the price down to around \$56,000, and they went about the work."

"Their approach was the most detailed and scientific process I have ever seen with any contracting firm. They listened to what we wanted, they went over my options with me, and even made allowances in their calculations for the new windows and attic

insulation I was planning to install!"

THE END RESULT

We solved the comfort and air distribution issues by dividing the home into three zones:

- Downstairs living area/kitchen
- Downstairs master suite
- Upstairs bedroom and playroom.

We replaced the three existing units with Amana two-stage 18 SEER communicating outdoor units and 96% efficient, two-stage gas furnaces with ECM blowers. We redid all the ductwork using R-8 flexible ducts connected to really long extended plenums – designed with the "static regain" method. All flexible ducts were properly supported using duct saddles.

We added new vent piping, new re-

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EQUIPMENT STICKERS

frigerant lines, drain pans, condensate drain piping, humidity controls, as well as April Aire 1510 extended media high-efficiency filters and Reme-Halo air purifiers in all systems.

The final touch was the Honeywell Pro Wi-Fi thermostats provided for each zone.

When we finished the renovation, we commissioned all three systems by testing airflow with an air balance hood, took all the system static pressure and other measurements, and balanced the system to assure the Nichleys it was delivering what we promised them.

The furnaces were commissioned using a Bacharach combustion analyzer and NCI protocol. We use the iManifold™ tools and reports as part of our High-Performance Contracting busi-

ness model. This allows us to show our customers the before/after performance results ... to help them see in real numbers the value for which they have paid.

By the way, the result is a new system performing at .52-in. W.C. of total static pressure!

THE PROJECT AS A TEMPLATE

The Nichley home was a template for us to truly use our training in a real setting. The experience taught us how to quote the work, price it, do the work, and deliver a quality end-product. It was a business decision to invest in new processes and tools to take our company AND our customers to a new level.

It's the NCI approach to High-Performance contracting that has helped

us in all this. And the best thing is that we find ourselves being so excited about it! This process has helped to re-energize us about our work, our thirst for more knowledge, and our creativity. Contracting is fun again. And, we are progressively "carving out a niche" in this kind of work in our market. 



Brian and Leyla Wright are the owners of Crossway Mechanical, a Houston area contracting firm employing 14 people and grossing \$2.1 million in sales. The company is mostly a residential replacement and service firm with three NCI trained and certified technicians on staff. **David Small** is the manager of Technical Excellence who holds the NATE Senior Efficiency Analyst certification and is a NATE proctor as well. Crossway Mechanical is a NATE Recognized Training Provider and Testing Organization.

The PATH to Performance: Part 5

Heat: The Last Step to Airside Performance

Heat is the last step on the PATH to performance. If you have put the previous steps of pressure, airflow, and temperature into practice, Btus are the result. They are an indicator of true installed HVAC system performance.

Measuring Btus is the key change our industry needs to make. It can move us beyond just selling and servicing equipment to becoming providers of personalized comfort solutions. Not only does this provide new opportunities to better serve your customers, but it also enables you to show that your work does what you promised.

As we look at this last step, I hope you see the potential for what it can do for your company and our industry.

PRINCIPLES OF HEAT

Before you can measure Btus, it's a good idea to review what they are and how we define them. A Btu is the amount of heat it takes to raise the temperature of one pound of water, one degree Fahrenheit.

The purpose of every piece of heating or cooling equipment is to deliver or remove Btus from the conditioned space of your customer's home or office. Every equipment manufacturer provides detailed information about how many Btus their equipment can add (heating operation) or remove (cooling operation).

THREE TYPES OF HEAT

There are three forms of heat to be aware of. They are sensible heat, latent heat, and total heat. In heating mode, you will typically measure sensible heat only. In cooling mode, you will account for all three forms.

Sensible heat is heat that you can feel. It causes the temperature to change. When a system

adds sensible heat to the air, such as in heating mode, the temperature increases. When a system removes sensible heat from the air, such as in cooling mode, the temperature decreases.

Cooling systems also remove moisture from the air. As warm, moist air contacts the colder evaporator coil surface, moisture in the air condenses. It then runs into the drain pan where it flows down the condensate drain. The moisture removal is latent heat, and it causes no change in temperature.

Since a cooling system removes both sensible heat (temperature change) and latent heat (change in moisture), you need to account for both. Total heat is a combination of the two and how manufacturers rate cooling equipment total capacity.

APPLY THE BTU FORMULAS

Of the three forms of heat, it's easiest to measure and calculate only two of them. They are sensible heat and total heat. Each of their corre-

THIS IS THE FIFTH IN A SERIES OF ARTICLES BY DAVID RICHARDSON DISCUSSING THE PATH TO PERFORMANCE: PRESSURE, AIRFLOW, TEMPERATURE, AND HEAT.

The PATH to Performance: A Six-Part Series

We continue our series detailing the **PATH** (Pressure, Airflow, Temperature, and Heat) to Performance.

- Read Part 1 here: ncilink.com/PATH1 (Overview)
- Read Part 2 here: ncilink.com/PATH2 (Step 1: Pressure)
- Read Part 3 here: ncilink.com/PATH3 (Step 2: Airflow)
- Read Part 4 here: ncilink.com/PATH4 (Step 3: Temperature).

Remember, practice makes perfect. So, as Richardson explains, become proficient in each step before proceeding to the next. In the end, you will be able to deliver the greatest value in service and performance that your customers have ever seen.

And that will help you deliver the most well-deserved profits to your bottom line.

In his next article, Richardson will address what it takes to do all this and walk the PATH to performance. Stay tuned!

sponding formulas uses airflow and temperatures from an operating system to determine delivered Btus. I recommend you start with sensible heat and then progress to total heat.

The sensible heat formula is:

$$\text{Sensible Heat} = \text{CFM} \times \Delta t \times 1.08$$

- CFM = Airflow measured at the fan or supply registers
- Δt = The dry bulb temperature change
- 1.08 = A multiplier based on standard air conditions.

The total heat formula is:

$$\text{Total Heat} = \text{CFM} \times \Delta h \times 4.5$$

- CFM = Airflow measured at the fan or supply registers
- Δh = The enthalpy change in Btus per pound of air
- 4.5 = A multiplier based on standard air conditions.

Once you calculate sensible heat and total heat from a cooling system, you can estimate latent heat removal by subtracting your results from the two formulas. This is quick and keeps the process simple.

Your imagination will determine how far you can apply these formulas. The simplest place to master their use is at the equipment to see how well it's operating. From there, you can move to the duct system and see how well it works. With more advanced testing, you can estimate duct system losses and gauge the influence of outside air ducts and economizers.

The application of these formulas is the first step to assuring a system performs as designed. The second step is

to compare your Btu measurements to the equipment's rated Btu output. This is where you score the performance of an installed system.

SCORE INSTALLED SYSTEM PERFORMANCE

Once you have the Btu measurements from an operating system, you need to track down the manufacturer's equipment-rated output. If you're testing a furnace in heating mode, look at the rated Btu output on the furnace nameplate. This is the number that you will compare your measurements to.

If you measure in the cooling mode, you will need to gather more information than what's on the nameplate. You will need:

- Outdoor air temperature at the outdoor unit
- Dry bulb temperature entering the indoor coil
- Wet bulb temperature entering the indoor coil
- Airflow across the indoor coil.

With these four variables, you can determine the equipment-rated Btu output capacity at those conditions.

Once you have a system's measured Btu output and equipment-rated Btu output, you divide the two to come up with an installed system performance score. National Comfort Institute, Inc. (NCI) introduced this simple test method to determine installed system performance over 17 years ago – the System Efficiency Ratio or SER.

To score a cooling system you would use CSER (Cooling System Efficiency Ratio). To score a heating system, use HSER (Heating System Efficiency Ratio). In 2020, we refer to this method as a **System Performance Score (SPS)**.

A TRIP DOWN MEMORY LANE

To expand on how to score installed system performance, I thought it would be fun to look at the first test I did with this method back in the winter of 2003. Little did I know how much we would come to use these principles in the following years.

The home we tested in Central Kentucky had a 92% efficient, 100,000 Btu input, horizontal gas furnace. If everything was perfect, the duct system should deliver 92,000 Btus (92% of 100,000 Btu) of sensible heat into the home.

That would equal an HSER of 100%. Since we tested in heating mode, we used the sensible heat formulas. To complete it, we needed to gather system airflow and Δt .

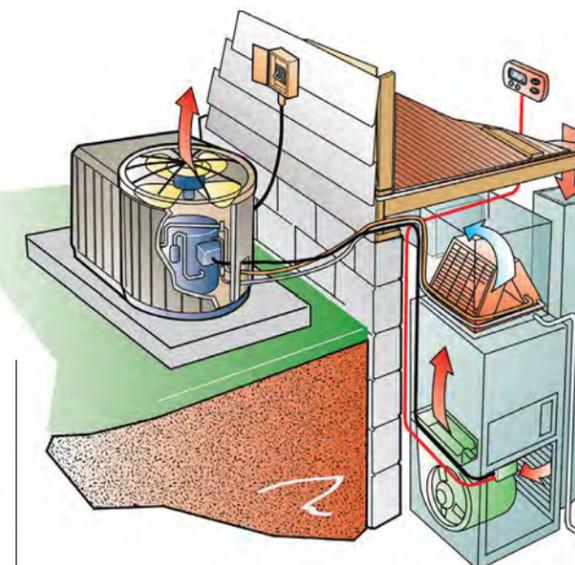
Our first step to determine heat-

Similar to the EPA's Energy Guide found on most gas-fired equipment, this System Performance Guide would highlight the Total System Performance Score.

ing system performance, or HSER, was to measure total supply register airflow. We used a TSI balancing hood and measured airflow from all the supply registers in the home. Once we had our readings, we added them together to get the **total delivered supply airflow of 1092 cfm**. This is the first piece of the sensible heat formula.

Next, we determined the system Δt . With an accurate and fast digital thermometer, we measured the average supply register and return grille temperatures in the home. We chose three supply registers across the duct system to take our readings and then averaged them. Our **average supply temperature was 120.3° F**.

We also took two return grille tem-



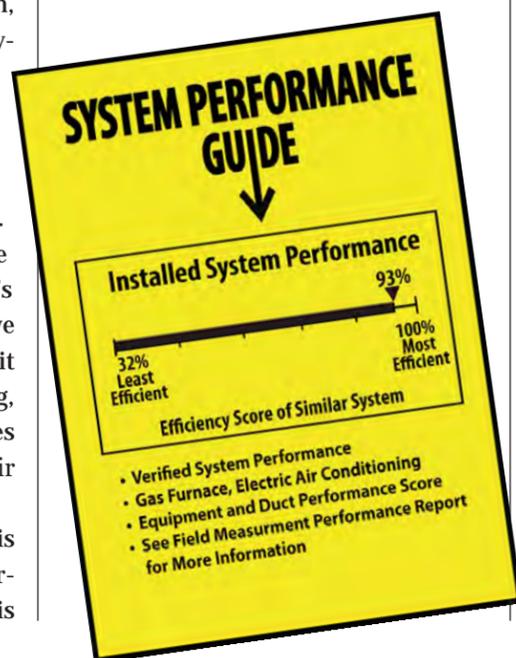
peratures in the same manner and averaged them. Our **average return grille temperature was 71.7° F**. To get our system Δt , we subtracted 71.7 from 120.3 to find a 48.6° F system temperature change (120.3 – 71.7 = 48.6). We now had the second piece of the sensible heat formula.

Next, we needed to determine deliv-

ered Btus from this system into the home. We plugged our total supply register airflow and system Δt into the sensible heat formula. We found the system was only delivering 57,317 Sensible Btus (1092 x 48.6 x 1.08 = 57,317).

To determine the heating system's performance,

we divided our system measured Btus of 57,317 by the furnace-rated output of 92,000 Btu. This meant the system was operating at 62% of its potential (57,317 ÷ 92,000 = 62%). This level of performance was unacceptable and not what our customer expected to see. Unfortunately, it's common in our industry because it remains hid-





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den without measurements.

The good news is, because we DID do these measurements, we were able to “fix the customer” with a complete duct renovation which greatly improved the overall system efficiency.

OBSTACLES IN THE PATH

When we first began to measure Btus and rate system performance, we didn't know the questions to ask until after we tested. It's impossible to account for every variable before you start. Don't let fear of the unknown prevent you from taking one step at a time.

If we had not mastered the principles of pressure, airflow, and temperature, I don't know if we would have been successful at implement-

ing Btu measurement.

Having that foundation is important to you because there are a lot of moving pieces that can frustrate you. You learn by doing, so get out there and start testing. You must get your hands dirty to master these skills.

It's important to understand that the equipment must be right before you can get the system right. If your combustion and refrigerant charge are off, there's no way you can get the Btus even with proper airflow.

Start with your installations, just like the other steps on the Performance PATH, and find what works and what doesn't. We put the steps in place in the NCI training classes, but every company must use each step in a way that works for them.

WALK THE PATH

In the next article, we'll look at what it takes to walk the PATH to Performance. We will revisit the importance of small steps and what it takes to build consistent habits, and what you need to know to add performance to your daily services. 



David Richardson serves the HVAC industry as a curriculum developer and trainer for National Comfort Institute, Inc. (NCI).

If you're an HVAC contractor or technician interested in learning more about airside performance, contact David at ncilink.com/ContactMe or call him at 800-633-7058. NCI's website www.nationalcomfortinstitute.com is full of free technical articles and downloads to help you improve your professionalism and strengthen your company.



Training is Key to High-Performance Contracting

In the world of Performance-Based Contracting™, training is the cornerstone to success. Even if you are not following the high-performance path, training is the secret weapon to keep your company ahead of the competition so it can better serve customers. Period.

Here at Getzschman, we believe that a company without training is a company destined for failure. Trained employees are ambassadors for your company. The more experience they gain from training, the more valuable they are to your entire team.

TRAINING ON PURPOSE

The key to putting together a program that keeps your technical team on top of the best techniques, skills, and processes is one that is done on purpose. It requires thought, planning, and of course, enactment. That requires you to have money set aside to cover the costs, and in our case, to pay our techs while they are taking training classes.

Sometimes, membership organizations have rebate programs you can use to help pay for training. For us, our membership with National Comfort Institute (NCI) has a benefit where a percentage of the dollars you spend doing business with their vendor partners are rebated back to you in the form of what they call **NCI Training Bucks** (ncilink.com/bucks).

We do a great business and buy a lot of equipment and tools through NCI's vendor partners. So, we earn a lot of NCI Bucks, which we use to help pay for nearly all the technical training for our team. We often use those bucks to bring trainers into our facility to train just our people. We believe that is the best way to train your entire team in the most correct methods for testing,

measuring, and diagnosing HVAC system performance issues in the field.

We also do a lot of vendor training as needed for new products, new equipment, and new tools. That covers our outside training.

Like many HVAC companies, we do a lot of internal training led by the company owners as well as our service manager. Our human resources manager keeps tabs on who has done what, who needs what, and maintains all the training records. That way we have all the information necessary when applying for licenses and permits.

Our service department meets weekly and the installation crews meet daily to cover job and code issues as they come up.

TRAINING IS A PROCESS

Training is a process that needs to be continuous for it to stick. It must be top-of-mind awareness. If you don't regularly reinforce the importance of those processes to your people, the process will suffer. This applies not only to training itself but to other processes like sales. For example, if we aren't always talking about maintenance agreements with our techs, they soon stop talking about them with customers. It's out of sight, out of mind.

The same goes for training. If we aren't continuously holding classes and teaching sessions, the lessons slip away, and techs tend to revert to old routines and habits. That is human nature.



Left-to-right: Ron and Scott Getzschman accepting one of many recognition awards over the years. This one is the **2018 Contractor-of-the-Year Award** from National Comfort Institute.

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It Doesn't Just Look Better ~ It Performs Better





National Comfort Institute Trainer David Richardson (right-front) leads a class on combustion and carbon monoxide safety for the Getzschman technical team in an offsite hall.

So for us, training is a process that must be maintained and nurtured continuously.

Furthermore, we use our training programs to determine a technician's capabilities. This helps us note his or her strengths and weaknesses and enables us to plan for the training necessary for them to grow. It is up to them to want to 'climb the ladder.' We provide the 'rungs.' The truth is, the more advanced a tech becomes, the more valuable he or she becomes.

TRAINING AND THE COVID PANDEMIC

We have made training a vital component of our culture. With the onslaught of the pandemic, however, our training regimen was seriously interrupted because the shutdowns and social distancing rules make it very difficult to get the teams together. In the spring, we missed many weeks of regular training and obviously missed NCI classes as well. We have noticed the impact of that on our operating efficiencies and in

company growth.

For example, when we look at whether techs are conducting static pressure tests on every call, we are finding they are slipping because we stopped getting together to talk about it. After all, there weren't any meetings and training sessions due to the COVID situation.

At Getzschman, internal virtual training has not been fully implemented. At the beginning of the shutdowns, we simply didn't have the technology or skills to set these types of sessions up. Because there is no end to this pandemic in sight, we are seriously looking into a virtual approach today and suggest that if training is important to you, you need to develop virtual capabilities as well.

The good news is that NCI and other organizations have developed virtual training and that certainly helps. A lot. But we still believe that live, face-to-face meetings work better because it gives our guys the ability to interact with each other and the instructors more fully. Plus, there is the hands-

on component which is so important when teaching technicians how to troubleshoot, take static pressure readings, install testing ports, and so on.

But for now, and in the near future, those types of meetings just aren't going to happen as regularly.

SEVEN KEY TIPS TO SUCCESSFUL TRAINING PROGRAMS

People often say, *'Training your people is just a waste of money because they will just leave you for a competitor anyway.'*

We don't agree.

You can spend money on training and while you have those employees, they will do the right things for you and your customers. We don't have a lot of turnover, possibly BECAUSE of the training we provide.

Here are seven tips that we've found work in our company:

Commitment to Training and the Process – That commitment must extend beyond classes you hold internally to those you need that are held in other locations. This includes

training provided by manufacturer reps and equipment suppliers, as well as third parties like trade associations and membership groups like NCI.

That commitment must include the willingness to attend such classes, even if they run much of the day. Many contractors won't make that commitment because it's inconvenient or takes the tech out of the field for a day.

But you have to look at this as an investment for the future of your company, as well as for the benefit of your customers and the techs themselves.

One of the biggest dangers is the rationalization that if something goes wrong, you can always go back and fix it. That is self-deception. Call-backs are expensive, eat into productivity and profits, and in the end, is still

training, though in a more negative way. It's still a learning experience.

Belong to a third-party training organization like NCI – This includes any national organization in this industry that can teach you better ways to operate your company, how to price your services, as well as manage people, time, and money. This helps to legitimize your efforts and reinforce it with your people and customers.

Redundancy – You can't just train once. Repetition reinforces – This goes back to commitment. You must commit to repeat training because that reinforces it with the technicians. For example, we spend time on basic electrical diagrams for furnaces. This is the basis for nearly every furnace manufactured. This teaches

the secrets of operation and what each component contributes to the overall comfort system.

The challenge comes from younger people who graduate from tech schools but don't understand control voltage and low voltage. It's rare to find someone with a strong control voltage background. So we teach it. Regularly.

A Maintenance Program is required for success – Getzschman has 3,000 maintenance agreements. This helps us not only through slow periods in terms of work, but also helps us manage our maintenance and service techs in terms of conducting performance testing and diagnostics on every call.

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port systems are also key. We have a service coordinator who manages that process – from sales to record-keeping and more.

Many contracting companies use a top tech for this function. We are among them, though we hate to take a top tech out of the field.

However, there are many benefits to having someone as a resource for younger techs who may need help while in the field. This top tech is who they call when something is causing them issues.

The top tech service coordinator is also the **guardian of the reminder** – reminding the field teams what they must or must not do on every job. The service coordinator can and does lead in-house training on the four working

systems we have in-house just for that purpose.

He teaches the techs how to troubleshoot, how to do CO (carbon monoxide) readings, take static pressure readings, and so on.

So we invested in taking one of our top techs out of the field and putting him in this position to be a resource and guide for all the other techs.

Warranties and Guarantees – Any business must have warranties and satisfaction guarantees. We don't squabble over anything with our customers. If a customer disagrees or is unhappy about something we've done; we take care of them – no matter the cost.

Community Involvement – Though not directly tied into training,

it is tied into our culture. You need to give back. That involvement is important to your success.

At the end of the day, training is one of the most valuable things we can do for our people. If someone DOES leave, they are going out into the industry knowing how to do things right, and that is good for the entire industry. So, it's a win-win.



Ron and Scott Getzschman are the owners of Getzschman Heating LLC., Fremont, NE. Their award-winning contracting firm has been recognized by national and local associations and trade groups for achievements in training, sales, and community service. Getzschman employs 60 people and serves HVAC residential, commercial, service, and new construction markets. To reach them, go to ncilink.com/ContactMe.



“Tremendous Prioritized Airflow”

— Nate Miller, Campbell and Co., Yakima, WA

Prioritizing airflow for this three-level home was key on this job. The original system simply didn't work. We relocated the system and used round throats and heels on the 90s, and priority placement on the square to rounds. The system is now cooling this house to perfection.

Nate Miller from Campbell and Company is the December 2020 winner of our Photo-of-the-Month contest, as voted on by the subscribers to **High-Performance HVAC Today** magazine and visitors to the website (hvactoday.com). He will receive a \$25 gift card.

You can too – submissions are always welcome. If you'd like to submit a photo for consideration in our Photo-of-the-Month contest, go to ncilink.com/POMSubmit and fill out the information as requested.

PHOTO-OF-THE-YEAR VOTING BEGINS DECEMBER 11, 2020

This is a run-off of all the Photo-of-the-Month winners of 2020. The winner, voted on by you, will receive a FREE registration to NCI's 2021 Summit in Branson, MO. Learn more at gotosummit.com.

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Welcome New Members

Membership in an organization like National Comfort Institute (NCI) is a step toward becoming a Performance-Based Contracting™ firm. It is a commitment that has an extraordinary

impact on your business and your team. So, it is our pleasure to recognize and welcome those new members who joined our ranks since April 2020.



Please join us in welcoming 23 newcomers! They include:

- Above and Beyond Heating, Edmond, OK
- Accurate Energy Ratings, Fullerton, CA
- AC Volt Electrical, Inc., Highland, CA
- All Valley Air, Palm Desert, CA
- Aquarius Home Services, Little Canada, MN
- Balancing Technologies, Inc., West Boylston, MA
- BLR Heating and Air, Woods Cross, UT
- Centrair Heating & AC, Edina, MN
- E.D. Miller Service, Dallas, TX
- Farris Electric, Durant, OK
- Frymire Home Services, Dallas, TX
- Gault Heating, Hubbard, OH
- Green Earth Industry, Ventura, CA
- Hayden's Armadillo Air, La Porte, TX
- HendrixAir Inc., Nahunta, GA
- Max Comfort AC, Houston, TX
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- PJ Mac HVAC Service and Repair, Drexell, Hill, PA
- Service Genius Corp., Chatsworth, CA
- SuperTech HVAC Services, Timonium, MD
- The Duct Cleaning Pros, Lincoln, CA
- Titanium Mechanical, Steinbach, Manitoba, Canada
- Top Tech Mechanical Services, Kennesaw, GA
- Worley Home Services, Yorktown, VA.

We are pleased you all opted to join our family and look forward to hearing from you, and possibly meeting you in September 2021 at our annual High-Performance Summit. The Summit will be held in Branson, MO (COVID-willing). Check out GoToSummit.com for more information.

If anyone has questions about their membership or the Summit event, please call our Customer Care line at 800-633-7058.



Interested in NCI Membership?
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Residential System Performance Training and Certification Now Live Online

For the first time, the HVAC Industry has training that addresses the vital importance of measuring delivered Btus of the total HVAC system at the equipment and into the conditioned space. By taking the certification exam after completing the class, you can earn NCI's Residential System Performance Specialist certification.

You get 16 hours of live online training over a four-day period – typically two days per week.

This online course features numerous hands-on demonstrations that include how to use the test instruments, where to locate the proper testing locations, and then conduct live testing and interpretation of readings.

Go to ncilink.com/LORezSysCert to learn more and sign up for the next class. If you have questions, be sure to call your Customer Care Rep at 800-633-7058.

December 2020 PowerPack

It's here! The PowerPack provides you with some additional tools to help you conduct and market your High-Performance HVAC capabilities. Be sure to download and share them with your team.



This month we feature the following:

- **How to Perform a ComfortMaxx Air™ Test** (Online Training)
- **Master HVAC Pressure Diagnostics with Static Pressure Budgets** (Webinar)
- **ComfortMaxx™ Field Data Collection Report for Residential Package Systems** (Download)
- **ComfortMaxx Field Data Collection Report for Residential Split Systems** (Download).

Go to ncilink.com/PwrPak for access today. If you have any questions, or if you are unable to access any of the tools in this program, please contact us at 800-633-7058.

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Challenges and Opportunities for 2021 And Beyond



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Congratulations! You've survived 2020, the year everyone, I think, wants to put behind them. For some it was a year of deep personal loss, for some a year of financial loss, and for most just a really tough year to get through mentally, physically, and emotionally.

But as we always do, we must soldier on and put 2020 in our rear-view mirror. This means looking ahead at the challenges and opportunities we will face in 2021 and beyond. So let's break down some of these for our industry.

NEW TECHNOLOGY

The next few years show great promise from technology innovations. Refrigerants like R-32 promise to gain widespread acceptance over the next five years. This refrigerant has a third of the GWP (Global Warming Potential) and less required refrigerant pound-for-pound compared to typical HVAC systems with 410A and other blends. It also has a low flammability rating.

Of course, there will be challenges, including re-training and retooling your technicians to work with this new refrigerant. We will likely see other new refrigerants on the horizon as phaseouts continue.

Systems with inverter technology will continue to gain market share. They just make a lot of sense as they allow condensing sections to efficiently and effectively adapt to the constantly changing load in our homes and buildings.

Smart technology is becoming both more sophisticated and user-friendly at the same time. Integration with smart home technology and other appliances is becoming increasingly smoother. Consumers will not just become more used to high-tech on their HVAC systems - they will expect it.

Test instruments used in our industry are becoming smarter and easier to use with our mobile devices. It's getting easier to get good data in the format we need.

Steadily improving HVAC system performance verification software will allow you to verify perfor-

mance and evaluate systems with more speed and precision.

Take some time this year to learn about ASHRAE's just-released Standard 221, which is the newest "Test Method to Field-Measure and Score the Cooling and Heating Performance of an Installed Unitary HVAC System." In 2021 and beyond, ASHRAE 221 will make its way into both residential and commercial HVAC as the gold standard for installed system verification.

THE PANDEMIC

While vaccines will likely become widely available in the first quarter of the year, 2021 will still be heavily impacted by COVID-19. What can you do to help your customers?

While there are some new devices that can help mitigate the spread of the virus, the biggest challenge with indoor environments is getting enough air changes to prevent buildup and spread in the first place.

Dilution is the key. Start by learning everything you can about ventilation. Learn how to properly bring fresh air in while exhausting stale air at the same time in a balanced way.

Beware of black boxes and silver bullets that seem too good to be true - they usually don't live up to the hype.

CHANGING CUSTOMER NEEDS

Customers will continue to travel less, vacation less, and stay home more. Reports are showing that consumers are spending money on their homes that would have been used on vacations, trips, eating out, outside entertainment, etc.

You have a unique opportunity to help make their cocoons more liveable. Many have changed the purpose of different rooms in their homes to make things work with their new lifestyles. 

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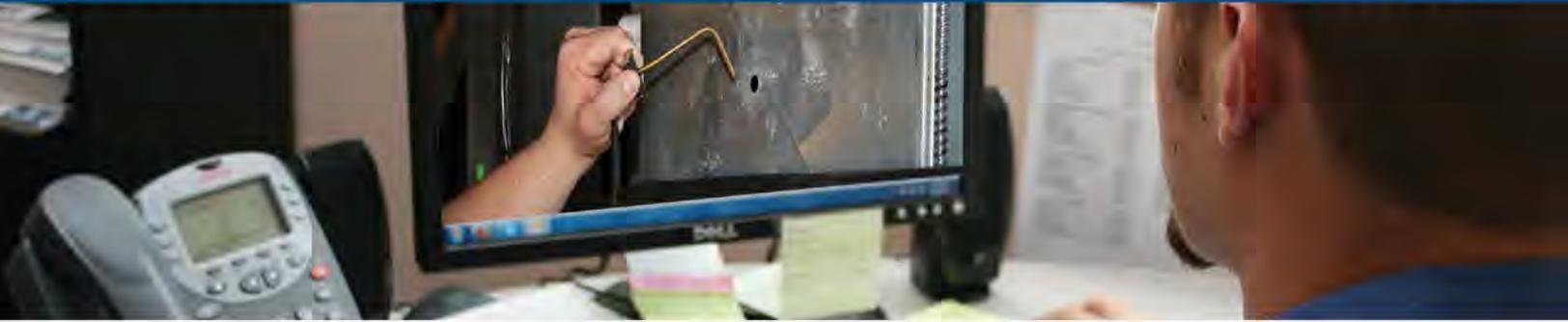
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California Utility Hosted Online Live Training for HVAC Professionals



NCI High-Performance HVAC training is now available to HVAC professionals throughout California. Southern California Edison, San Diego Gas & Electric, and Pacific Gas and Electric have partnered with NCI to provide advanced training and certification through its online, live classes.

These NCI classes also qualify for NATE (North American Technician Excellence), and BPI (Building Performance Institute) Continuing Education Credits.

Here's how the training works:

Certification classes: These online, live classes are provided in 4-hour blocks. For example our Residential Duct System Optimization and Commercial System Performance classes each consist of four, 4-hour segments of training over a two week period. Students who participate in these classes will also qualify for online-proctored NCI certification exams after the training.

Recertification classes: NCI-certified professionals can recertify for two years by participating in these online classes taking place over two consecutive half-days. We currently offer recertification training towards NCI residential and commercial certifications.

In addition NCI is offering several technical and sales non-certification classes.

National Comfort Institute thanks the following Investor-Owned Utilities for hosting this training for HVAC professionals throughout California:



December California Training Calendar

	
ncilink.com/sce	ncilink.com/sdge
<p>Airflow Testing & Diagnostics December 3-4 1 PM -5 PM Pacific 8-hour training program* Regular Price: \$395 Student fee: Just \$50 per student</p> <p>Duct System Optimization Certification Class** December 8-9, 15-16 1 PM - 5 PM Pacific 16-hour training program Regular Price: \$690 Student fee: Just \$100 per student</p> <p>Residential System Performance Certification Class** December 17-18, 21-22 8 AM - 12 PM Pacific 16-hour training program Regular Price: \$690 Student fee: Just \$100 per student</p>	<p>Explore HVAC Field Performance December 10: 8 AM-10 AM Pacific 2-hour training program Regular Price: \$95 Student fee: Just \$15 per student</p> <p>Airflow Testing & Diagnostics December 21-22: 1 PM -5 PM Pacific 8-hour training program* Regular Price: \$395 Student fee: Just \$50 per student</p>

* Qualifies for 8 recertification hours

** NCI Online Certification Exam included

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This program is funded by California utility customers and administered by SCE, SDGE, and PG&E under the auspices of the California Public Utilities Commission.