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Growing Your Business WITH GROW FACILITIES

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PLANTING SEEDS FOR FUTURE SUCCESS IN A GROWING MARKET

In these days, new opportunities to grow your HVACR business are undoubtedly welcomed. Grow facilities are a major growth area for HVAC contractors. And while many immediately think marijuana market — which is certainly a big part of it — it can mean so much more. Indoor farming encompasses many different products.

The ACHR NEWS produced this supplement on the topic to help contractors decide if it is a market for them.

On page four, *The ACHR NEWS* talks with contractors who are having great success in this area and are willing to share their secrets. On page 11, we investigate how to navigate all the paperwork to make sure you are earning a profit. Finally, on page 14, we have highlighted some products that might help you successfully navigate this market.

Kyle Gargaro
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As Legal Cannabis Grows In More States, Contractors See Opportunity

Jobs working with the HVAC side of marijuana require the right skill sets

LET IT GROW: Despite the plant's unusual legal status, cannabis grow facilities have most of the same requirements as other indoor agriculture operations.

BY TED CRAIG
***ACHR NEWS* STAFF**

The cannabis industry is growing quickly as more states legalize marijuana for both medicinal and recreational use. And the industry has a high demand for HVAC services. More and more contractors are stepping forward to meet that need, and as with any new field, contractors need to make sure they are prepared for the specific needs and challenges it requires.

Advance Air in Freetown, Massachusetts, entered the cannabis industry a few years ago. The state fully legalized marijuana use in 2016. Advance Air President Karen DeSousa said the firm had a long history of commercial work, serving food distributors, specialized manufacturers, and surgery centers. This gave them experience in meeting specific environmental parameters — such as temperature, humidity, and air quality — in order to avoid negative impacts to patient health, product, income, and time.

"Our background in these other areas makes the cannabis industry a natural progression for our team," DeSousa said.

It's a similar story for others in the business. Northern Weathermakers, an HVAC firm located in Northbrook, Illinois, worked on clean rooms and surgery centers before it started servicing the cannabis industry. Los Angeles-based Critical Climates Inc. had a background in data centers. Owner Markus Kashinsky said he entered the field when contacted by a client they had worked with on a yoga center.

DEMANDING ENVIRONMENTS

Kashinsky said grow centers are some of the most demanding

KEEPING IT CLEAN: Like surgery centers and clean rooms, cannabis grow facilities require exact humidity control to avoid fungus outbreaks that can kill thousands of dollars' worth of crops.

> We want to team up with companies that have the same quality standards as we do because we want to partner with them into the future. My advice to HVAC contractors looking to get involved in the cannabis industry would be to find an engineering firm with knowledge and experience and become their partner in assisting with design and implementation. Build those relationships.
>
> - Karen DeSousa
> president, Advance Air

environments to try to condition. The environment changes day to day and throughout the growth cycle of the plants. Grow facilities lack a static load, as the living contents constantly change the conditions by expelling up to 85 percent of the water they consume. As a result, the chances of a failure are high, so Climate Controls has to run full emergency service. Also, the high moisture increases the risk of fungus developing, and HVAC workers need to use caution so they don't spread something that can destroy thousands of dollars' worth of crops. The plants require intense lighting to replicate sunlight, said Mike Lee, president of Northern Weathermakers. This impacts the temperature as well.

Lee said one of the biggest issues he faces with jobs involving marijuana grow facilities is odor control. Cannabis emits an extremely pungent smell, and this arises as the biggest objection among neighbors during the vetting of a proposal. Lee said HVAC contractors must assure their clients that they will be able to control the smell.

Adding to the challenge, all this work needs to finish in a short amount of time, Lee said. The licenses granted in many states place a strict deadline for opening a facility. The upside of this is operators often open only what they need and leave room for growth, leaving future work for HVAC contractors. As the cannabis business matures, it's becoming more professional, and Kashinsky said he's seeing more facilities built for the long term.

THE LONG VIEW

The cannabis business today resembles the dot-com industry of the 1990s. Players emerge daily, and the publicly traded companies have

been on a wild ride on Wall Street. Kashinsky said he expected a building boom when California's recreational regulations went into place. That didn't happen. Instead, shops opened without any cultivators licensed to supply them. This caused issues with Climate Control getting paid, since the customers found themselves without any cash flow.

Still, DeSousa sees long-term potential in the marijuana industry. She said working with companies on their initial set-ups can lead to relationships for ongoing emergency service and maintenance.

"Starting a relationship from installation and carrying it through to ongoing care and maintenance is a way to ensure quality and longevity right from the start," DeSousa said.

The cannabis industry remains entrepreneurial. Lee said he gets most of his work through word-of-mouth.

HEAT AND LIGHT: Grow facilities require large amounts of artificial light. In addition, the plants give off their own heat. This creates challenges in temperature control.

He also speaks at a lot of events, including trade shows and roundtables. Early on, Lee learned whom he needs to impress at the cultivation facilities — the growmaster. This person functions like a brewmaster or a vintner at a winery.

"It's really the grower who is in control," Lee said. "They carry more weight than the CEO of the company because they're responsible for the product."

LOCAL KNOWLEDGE

DeSousa said finding qualified engineers who understand the requirements of the business to do initial designs proves the most challenging part of working with cannabis customers.

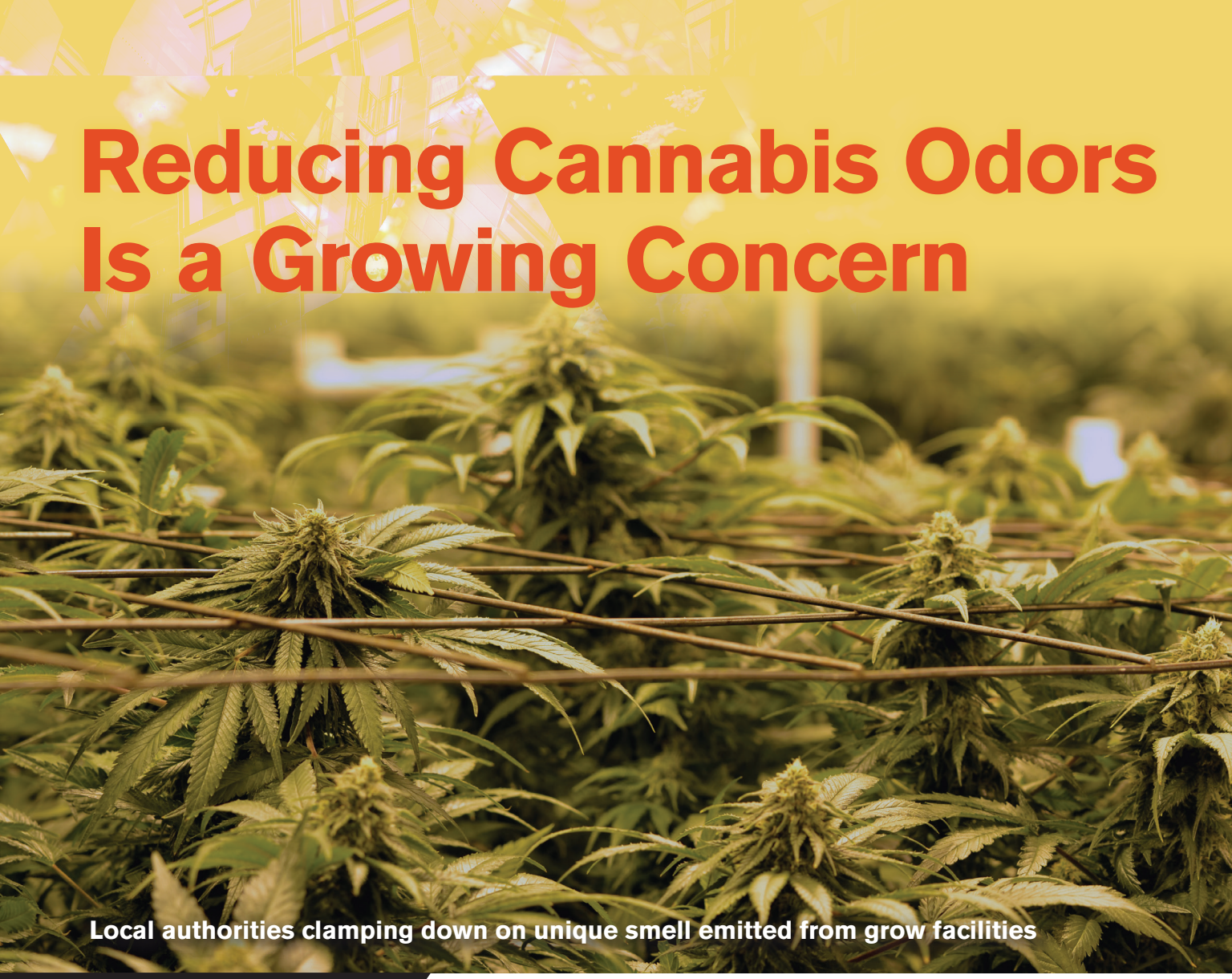
"In Massachusetts, these facilities did not exist before a few short years ago, so the engineering and code is new to us," she said. "From the perspective of the HVAC installer, we've got the easy part. Once designed, we have the experience and knowledge to install and make sure that it performs to specifications."

One issue Lee runs into is that many of the engineering design firms are located out West. They often lack the local knowledge to adapt their plans for less moderate climates.

DeSousa said having qualified, experienced estimators, technicians, and supervisors to ensure consistent quality on every job requires careful planning, scheduling, and coordination. She said Advance Air looks for well-planned projects where it can partner with a professional engineering firm with experience and a great reputation.

"We want to team up with companies that have the same quality standards as we do because we want to partner with them into the future, not just on one installation project," she said. "My advice to HVAC contractors looking to get involved in the cannabis industry would be to find an engineering firm with knowledge and experience and become their partner in assisting with design and implementation. Build those relationships."

Reducing Cannabis Odors Is a Growing Concern



Local authorities clamping down on unique smell emitted from grow facilities

BY JOANNA TURPIN
***ACHR NEWS* STAFF**

INTENSE SMELL: Cannabis will emit odors in the form of terpenes at virtually all stages of growth. However, the odors are more intense during the flowering stage of the plants.
PHOTO COURTESY OF FOGCO ENVIRONMENTAL SOLUTIONS

Cannabis farms are cropping up around the country, often encroaching on existing communities, and property owners are starting to complain about their distinct smell. In response to these complaints, local governments and municipalities are mandating new laws — or even suing the growers — to significantly reduce the smells emanating from these facilities.

This is an ongoing challenge for cultivators, many of whom are more familiar with growing high-quality cannabis than addressing odor issues. Fortunately, odor mitigation is possible with a variety of air cleaning technologies that are designed to alleviate the strong, pungent cannabis odors that can severely impact the property values in the surrounding community.

NEVER-ENDING SMELL

Cannabis grow facilities can produce a constant source of odors, but there are certain times in the plant's cycle when odors are more pronounced, such as when the flower is budding, said Aaron Engel, vice president of business development at Fresh-Aire UV.

"The terpenes and terpenoids are typically the source of the odor and are produced by the cannabis plants," he said. "Even the different types of cannabis can have different odor profiles. For example, Cannabis indica is often described as skunk-like, whereas Cannabis sativa is described as sweet or spicy. Although strains may vary, their complex chemistry makes odor control within the facility challenging."

While cannabis plants usually become more pungent during the last six weeks of growing, some farms harvest year-round, which means they are generating odors continuously, said Trent Thiel, business development manager - North America at Camfil's molecular contamination control division.

"Another challenge is that odor is usually not generated in just one location of the facility," he said.

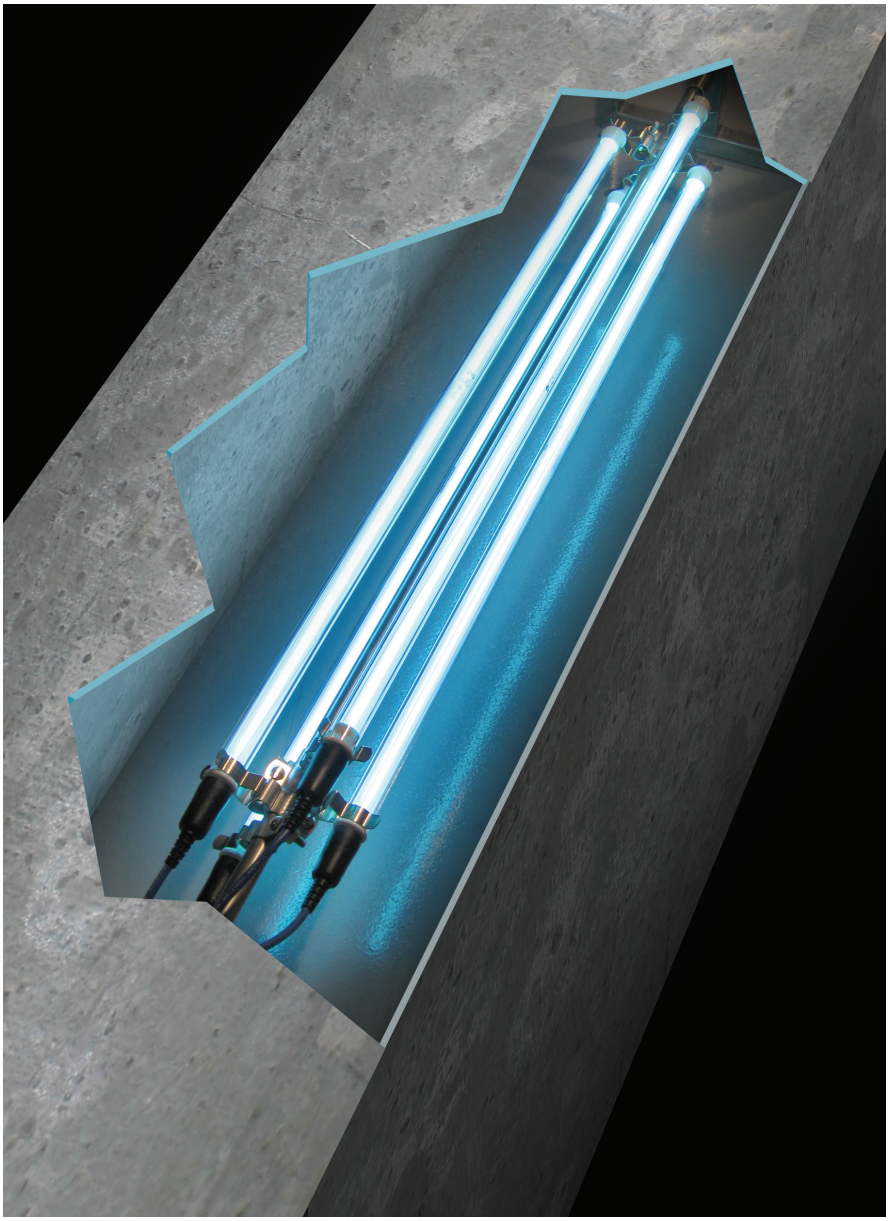
"There are three sources of odor: the final weeks of growing, the drying process, and the trimming process, so the odor needs to be controlled at each of these stages of production."

The type of structure involved can cause challenges, too, noted Thiel, as greenhouses are designed to breathe, which makes odor control more difficult.

The same is true for indoor operations that are housed in retrofitted buildings that are poorly sealed or have improper air balancing, which allow the odors to bypass the odor control devices and escape through fugitive routes.

While most cities, counties, or municipalities require grow facilities to have an odor mitigation plan in place before they will issue an occupancy permit, they rarely define which type of system a grower needs to utilize, said Gary Wintering, president of Fogco Environmental Solutions.

"They do require that the system work effectively, and they can shut down facilities that have an ineffective odor system in place," he said. "Typically, the municipality leaves the choice up to the grower, although we have seen more municipalities asking us for specific documentation confirming our system's effectiveness. Field-based testing is the only objective way to obtain this level of certification."



ODOR DESTROYER: Odor Exhaust Oxidation (OEO) system uses high-output UVV oxidation lamps to destroy odors as they exhaust to outside. **PHOTO COURTESY OF FRESH-AIRE UV**

UV SOLUTION

There are various technologies available that can help address odor issues both inside the facility and, more importantly, those that may be exhausted to outside, said Engel. These typically include carbon filtration, masking or neutralizing agents, air treatment systems, and oxidation systems.

"Many facilities are not overly concerned about odors within the building but are very concerned about the odors being exhausted," he said. "Depending on municipal regulations, the facility may require an in-line IAQ system to address the exhaust odors. Activated carbon and oxidation systems are ideal for addressing these odors."

Care must be taken with high-output oxidation systems, noted Engel, as these produce ozone, which — along with other reactive oxygen species — should not be used within the envelope of the building, as the aggressive oxidizers may damage the sensitive plants.

Fresh-Aire UV offers another solution — the APCO carbon ceramic UV system, which is designed to disinfect and control odors within the grow facility. Installed within the air-handling unit, the UV-C light disinfects the surfaces and airstream, and the subsequent photocatalytic reaction between the UV and carbon ceramic cells mitigates odors within the facility.

"For high-level odor control for exhaust applications, Fresh-Aire UV uses the Odor Exhaust Oxidation (OEO) systems," said Engel. "These are specially designed high-output UVV lamps that produce ozone, oxidizing the outgoing air. What's great about the Fresh-Aire OEO system is that it can treat the air with

DISINFECTING WITH UVC: The APCO disinfection-odor control installed in the AHU disinfects and reduces odors with proprietary UV-C and carbon ceramic lifetime tiles.
PHOTO COURTESY OF FRESH-AIRE UV

no airflow restriction, and the only consumables are the UVV lamp that needs replacement every two years. It's a low-cost, easy installation that works exceptionally well."

NEUTRALIZERS

Odor mitigation systems using neutralizers are also used in cannabis facilities, and they can typically be classified into two different categories: perimeter treatment of a facility or point-of-source treatment of the odor, said Wintering. Perimeter treatment includes an oil-based neutralizer that is used with either a water-based evaporative system or a water-based high-pressure fog system. Point-of-source systems involve air filtration combined with water-based high-pressure fog and an oil-based neutralizer.

"The point-of-source odor mitigation is more commonly applied in cannabis facilities, because it addresses the odor at the source, which can eliminate the possibility that the odor is dispersed outside the facility," he said. "The most effective point-of-source odor mitigation combines the use of high-pressure fog with a specially developed oil-based neutralizer."

This type of system is designed to address the odor exiting the facility via the individual exhaust fans. It can be designed so that each bay of a greenhouse and each fan is a separate zone, and each zone will only run if and when an exhaust fan within that zone is turned on, explained Wintering. The system's operation is tied to the individual exhaust fan start signals and will automatically turn on whenever an exhaust fan is turned on.

"The newest technology for point-of-source odor mitigation is the use of a vaporized oil-based neutralizer," he said. "The advantage of this technology is that is does not involve the use of water, so it is better suited for environments where freezing can occur."

It is important to note that the oil-based neutralizers offered by Fogco are not a masking agent, said Wintering; instead, they eliminate odors through a process called subtractive odor control, which simply means changing the way a given odor smells.

"Essentially, when these oils are dispersed within the fog or vapor system, they come into contact with the odor molecules, and through a combination of chemical reaction, antagonistic pairing, and absorption/adsorption pluralistic effects, the odor is neutralized and eliminated as the air exits the facility," he said.

Fogco also designs and manufactures both high-pressure fog and vapor systems.

MOLECULAR FILTERS

For indoor growing facilities, another odor control option is the molecular filter, considered to be a gas phase air cleaning device, said Thiel. Molecular filters contain a media designed to adsorb a specific subset of molecules to eliminate odors, irritants, and toxic or corrosive gases. In this case, they target beta-myrcene, which is the terpene (aroma-

POINT OF SOURCE: The majority of Fogco systems utilize the point of source odor elimination concept, so they are incorporated into the operation of the exhaust fans of a facility.

producing organic compound) most frequently found in cannabis.

"The term 'carbon filtration' has been commonly used for all odor control," he said. "Carbon filters are a type of molecular filter and a term commonly misused to categorize all molecular filters. A filter should be designated by its function and not the type of media in the filter; for example, activated carbon is a type of media."

Molecular filters are typically incorporated into an HVAC system, and they can either be initially supplied with the system or else retrofitted at a later date. In an exhaust system, a face velocity of 250 fpm is desired for maximum lifetime and removal efficiency, said Thiel. However, if 250 fpm is not achievable, a maximum face velocity of 500 fpm cannot be exceeded.

"It is recommended that a minimum of MERV 9A particulate prefilters be installed ahead of a molecular filter to ensure that the active sites are not unnecessarily filled with particulate," he said. "A dusting filter is not necessary unless there is a concern for activated carbon dust from the exhaust stream."

For greenhouses, molecular filtration may not be enough on its own, said Thiel, so the recommended method is to combine two technologies: molecular filtration deployed in a recirculating air cleaner inside the greenhouse and a dry-vapor system that neutralizes the fugitive emissions externally. This type of system is offered by Byers Scientific & Manufacturing, which treats over 9 million square feet of canopy throughout North America, including the world's largest permitted cannabis facility in Canada.

"The Byers' system uses patent-pending technology to emit an odor neutralizer formulated specifically for cannabis around the greenhouse or other grow environment, such that the airborne cannabis gases emitted from the facility mix with the neutralizer, thereby eliminating the odor," said Marc L. Byers, owner of Byers Scientific & Manufacturing. "We employ Camfil scrubbing media as part of a comprehensive approach: vapor for the outdoor applications and Camfil molecular filtration on indoor applications in order to fully sequester terpenes wherever possible."

Thiel added that for odor control, customers should be encouraged to purchase equipment that offers proof of performance. Molecular filtration solutions, for example, should have their performance validated in accordance with ASHRAE Standard 145: 2015 and/or ISO 10121: 2014, which are recognized test standards for gas phase air cleaning devices.

As can be seen, there are a variety of methods available to control odors in cannabis grow facilities. For HVAC contractors just starting in this market, the choices may seen daunting, but they don't have to be, said Wintering.

"Look for vendors with backgrounds and experience in industrial odor control who have also been involved in the cannabis industry for at least the last five years," he said. "Do your homework. Talk to growers. And finally, get input from multiple odor mitigation suppliers to be sure you are getting what you need."

Navigating Paperwork and Protecting Profits

Compliance and contractual detail can become sticky topics on cultivation projects

BY ROBERT BEVERLY
***ACHR NEWS* STAFF**

Contractors typically do more design execution than design, but a solid understanding of the cannabis-specific design requirements for any project can avoid inadvertent violations and their consequences. Adjustments on the fly due to unforeseen obstacles or "value engineering" that might be fine during another project may not be lawful in this setting.

For that matter, knowing what cannabis projects often entail in the way of permits, codes, and even more exotic contractual considerations can affect how a contractor prices a bid — or even whether or not a contractor decides to pursue the work in the first place.

"The biggest mistake that HVAC contractors make is considering this as just another job," said Robert Shannon, a Red Seal certified HVAC designer in British Columbia, Canada, with extensive experience on Canadian cannabis projects. In his experience, installing equipment for cannabis projects simply costs more.

"I have seen costs skyrocket on builds that weren't properly designed from the beginning," he said.

Even with a proper design, the contractor has more to consider ahead of a bid.

"The discussions with health regulators, inspectors, and facility heads add up to a lot of unexpected hours" for those not prepared, he cautioned.

IN THE CODE

In California, a state as well versed as any in the legal cannabis industry, the primary ventilation rate for cultivation areas is 15 cfm, the same as the requirement for other types of indoor spaces.

After that, the requirements for a project echo the old real estate slogan: location, location, location. While localities may draw on some of the same templates and boilerplate language for cannabis facility codes and permit requirements, they can also add their own requests, stricter or more flexible than others.

The City of Santa Rosa in California published a building code reference for cannabis-related occupancies. Contractors may find passages in their own local codes similar to the following Santa Rosa sections.

4. Building elements separating the cannabis agricultural area from other occupied portions of the building must be air sealed to prevent odor migration into adjacent spaces.

Another application-specific detail affects ventilation placement.

6. The inlet for the ventilation system shall be located in the area(s) of the highest contaminant concentration.

An entry about structural load specifies that mechanical systems may not weaken the building or structure. That much is not unusual. However, cannabis grow facilities may use special lighting, including LEDs that have their own system to stay water-cooled. Contractors working on grow facilities might avoid trouble for the owner or themselves just by keeping extra contributors to structural load in mind, along with the occasional extra bit of plumbing or piping to work around.

Despite its seemingly comprehensive title, even the Santa Rosa document states that "the requirements below are intended to assist the applicant with some of the requirements applicable" (emphasis theirs) and should not be considered all-inclusive.

Adequate knowledge may require an extra call or contact. Contractors should check on the latest local codes every time out, given local governments' latitude and the reality that many contractors work across more than one jurisdiction.

ODOR CONTROL

The most obvious cannabis-specific concern for mechanical work is odor control. Everyone involved wants to avoid odor issues, but haste and lack of expertise can create difficulties.

"Some cities have started issuing building permits for cannabis cultivation facilities without appropriate odor standards in place," relayed Bruce Straughan, P.E., of Straughan Forensic, LLC in Arvado, Colorado. Straughan has worked with many clients in the cannabis industry himself and has presented to ASHRAE audiences and elsewhere.

That kind of bureaucratic oversight can create avoidable neighbor complaints. Straughan said some localities have learned their lesson and require odor control plans up front. Contractors in some areas may even have opportunities to rectify odor control for facilities that began under a less-then-comprehensive regulatory environment.

Charcoal "air scrubbers," i.e., activated carbon filters, remain a popular tool that any contractor will want to be familiar with for cannabis projects.

"Ozone is also effective," said Straughan, "but it can only be used on

exhaust air and not recirculated air," due to potential unwanted effects on both plants and people.

Neighbor complaints can turn into inquiries from code officials. Those can turn into callbacks for the original contractor, whether the real issue is an installation problem or what might have been originally insufficient guidance from local government.

More unnerving, the nature of the odor involved and what Straughan describes as the limitations of modern odor-related equipment mean that the difference between OK and actionable can often come down to the nose of a given official on a particular visit.

Shannon said this scenario is just another reason why contractors who win the job should give an initial design some thorough study.

"It doesn't hurt to being voicing your concerns of inadequate filtration or design before the build is to happen," he said. "Doing so will save you a lot of headache and cost in the future."

Shannon advised contractors to initiate that discussion with designer and/or owner, and follow up with an email summarizing the conversation.

"You will be surprised how far this will go," he said.

GIVE IT SOME GAS

Mechanical system support for modern cannabis cultivation often involves a couple of other components not found on other projects.

Many enterprises use CO_2 enrichment programs to increase the speed of plant growth. Shannon describes a typical approach.

"We use liquid CO_2 holding tanks outside and run low-pressure piping into the rooms where a solenoid controlled by a direct digital control system is used for distribution."

Familiarity with the concept and with the controls is critical because if things go seriously wrong, the result can be asphyxiation for anyone in the space.

For that reason, Straughan reports that some cities will require the building owner to apply for a special operating permit for those systems, which means another technical and administrative point of note for the HVAC contractor doing the job.

GET IT IN WRITING: Removing contractors from responsibility for any design defects and laying out the commitment for fine-tuning ventilation are two areas to sort out ahead of time. PHOTO BY NICK YOUNGSON, CC BY-SA 3.0.

"National standards are scarce in the cannabis industry," Straughan said, but he steered contractors to the 2018 Edition of NFPA 1, Fire Code, Chapter 38 — Marijuana Growing, Processing, or Extraction Facilities. That text does address CO_2 enrichment, fumigation, and cannabis oil extraction.

GET IT IN WRITING

"Humidity control is perhaps the most difficult technical challenge with indoor cultivation," Straughan asserted.

Even the design engineers, he said, may not fully understand the dynamics of latent loads from transpiring plants or associated evaporative cooling effects.

Nevertheless, he noted that lawsuits remain a possibility for team members if the finished facility winds up with undersized dehumidification equipment and/or inadequate humidity control performance.

Straughan advised that "installing contractors should ensure that construction documents are written such that they will not be held responsible for design defects."

After what might normally constitute the work being "done," Shannon reminded contractors, the nature of cultivation means it isn't really over. A lead technician could spend a lot of time working with the facility manager or head horticulturist to tweak conditions.

"Just air balancing doesn't work," he said. "Each room is a living organism that needs to be treated case by case. Any turbulence in the room from hitting a fixture or anything can cause hot spots on the vegetation or limit plant growth in that specific area," he explained.

Contractors or consultants with any background in horticulture as well as HVAC automatically have a leg up when it comes to that degree of ventilation-related concern. In practice, this level of attention means that "it could take up to a month to dial in each room to the owner's specifications," according to Shannon.

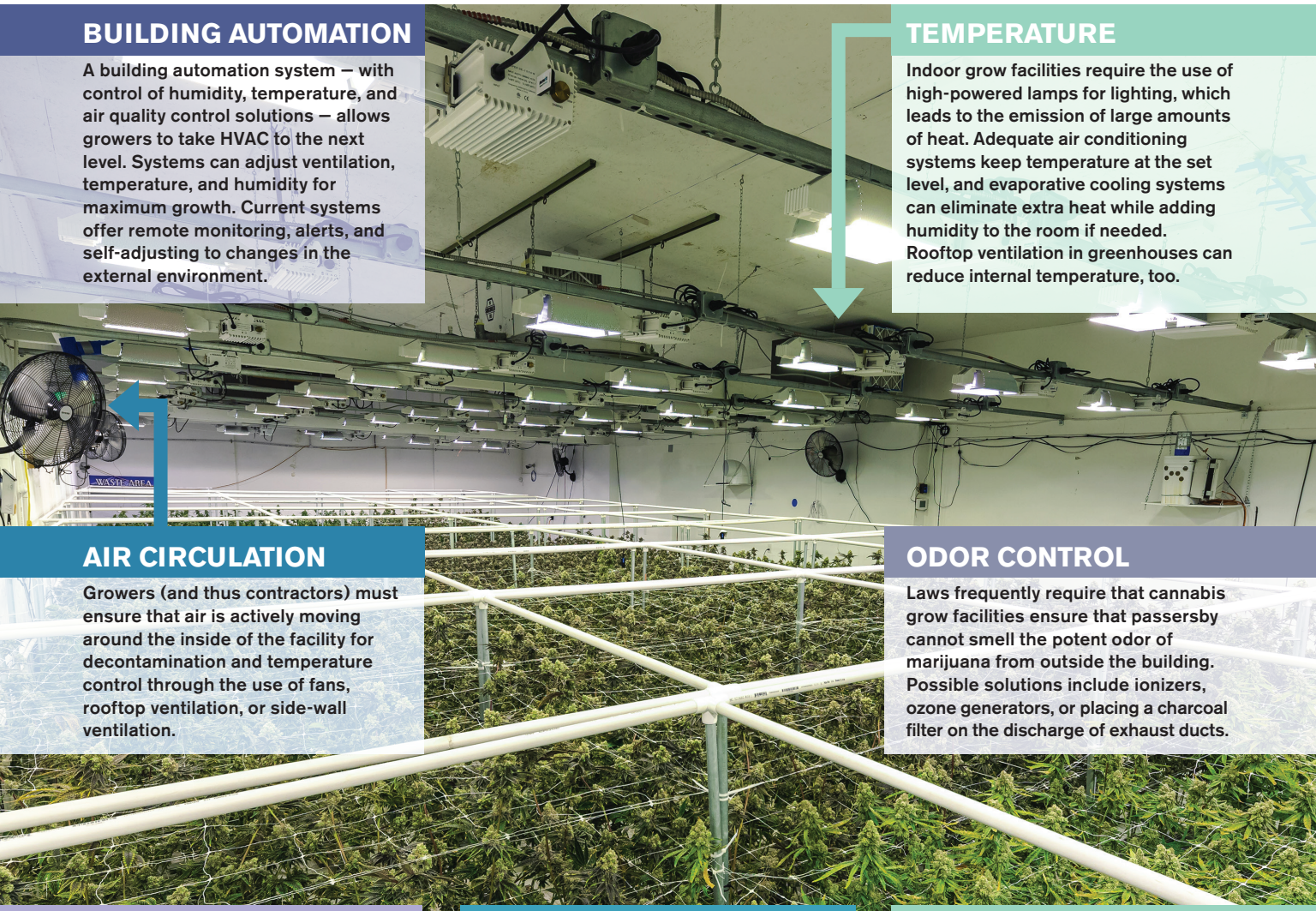
Preparing for and negotiating this part of the process falls more on the contractual side than the permit side, but it can still make a key difference for the contractor in terms of resources and profit margin.

The terms for this sort of fine-tuning are "best explained at the beginning of the contract so some sort of understanding can be reached for compensation," Shannon recommended.

In fact, he said, "this might best be served as a separate contract after the commissioning of said units."

THE ANATOMY OF A GROW FACILITY

Grow facilities entail unique HVAC challenges and needs. Regardless of what the facility grows, whether cannabis, vegetables, or something else, contractors must be aware of a number of interweaving needs. Plants are an example of the need for precision HVAC care — small imperfections in ventilation, air quality, humidity, and temperature will have direct results on the yield and quality.



BUILDING AUTOMATION

A building automation system – with control of humidity, temperature, and air quality control solutions – allows growers to take HVAC to the next level. Systems can adjust ventilation, temperature, and humidity for maximum growth. Current systems offer remote monitoring, alerts, and self-adjusting to changes in the external environment.

TEMPERATURE

Indoor grow facilities require the use of high-powered lamps for lighting, which leads to the emission of large amounts of heat. Adequate air conditioning systems keep temperature at the set level, and evaporative cooling systems can eliminate extra heat while adding humidity to the room if needed. Rooftop ventilation in greenhouses can reduce internal temperature, too.

AIR CIRCULATION

Growers (and thus contractors) must ensure that air is actively moving around the inside of the facility for decontamination and temperature control through the use of fans, rooftop ventilation, or side-wall ventilation.

ODOR CONTROL

Laws frequently require that cannabis grow facilities ensure that passersby cannot smell the potent odor of marijuana from outside the building. Possible solutions include ionizers, ozone generators, or placing a charcoal filter on the discharge of exhaust ducts.

FUMIGATION

Fumigation can be used by growers to control pests and mold growth. However, the use of fumigation can require a permit, as chemicals can present a danger to anyone entering the fumigated space or to passersby if the chemicals leaked from the closed space.

HUMIDITY

Fog machines can be used as a humidity solution, since a fog system leads to a layer of mist forming on plants' leaves. The mist controls the transpiration rate of the plants, which reduces wilting. When humidity is too high, air conditioning systems can be used to keep the humidity levels at a proper level (though a separate unit for dehumidification may be needed when the lights are turned off).

CO_2 ENRICHMENT

Growers can use CO_2 enrichment systems to elevate the carbon dioxide level in a facility, leading to increased photosynthesis and plant growth. However, enriching a room with too much CO_2 can lead to health hazards, so systems come with controls and alerts to prevent excessive CO_2 levels in the grow facility.

Sources: "Marijuana Facilities: Codes, Standards, and Managing the Hazards – Expert Article" from Robson Forensics, by Stanley Jaworski, et al, March 9, 2016.
"13 Tips for Better HVAC," from *Cannabis Business Times*, by Sheila Bhattacharya, June 06, 2018.

Agriculture and Livestock Climate Control Products

Growing indoor crops and caring for animals requires solutions designed for the industry

BY ANGELA D. HARRIS
***ACHR NEWS* STAFF**

Climate control for any grow situation is important. From marijuana crops to livestock barns, each application has its own set of special IAQ needs. When contractors start to work with these types of facilities, there are multiple considerations for successful product installs. One of those is facility location. Regional temperatures and humidity, for example, will dictate if evaporative cooling is acceptable or if another source of heating and cooling must be applied.

Other considerations for indoor agriculture and livestock are the type of building being used and its construction materials. These environmental factors will impact how the air reacts to different stimuli, including plants, soil, animals, water, and feed. Internal sources of heat gain must also be calculated, accounting for lights, people, and equipment; sources of moisture must also be considered. In essence, the contractor has a new set of building occupants to make comfortable, and it is no longer humans in an agricultural or livestock facility.

The following products are some examples of items that can be used in diverse applications for the environmental controlling of these facilities.

American Coolair Corporation

Suitable for poultry, dairy, pig, and greenhouse facilities, the Doublestack Evap Pad Cooling System features the company's open-top distribution system. It is available in heights from 7 to 12 feet. The product includes rigid pad supports that completely bear the weight of the upper Evap Pads, keeping them securely in place. This prevents the weight of the upper pads from causing the lower pads to sag. Modular Doublestack systems are available in lengths up to 60 feet and come standard with a PVC water return trough and PVC sump. Tank systems are available from 50 feet to 100 feet in length and require a separate sump tank to be purchased locally.

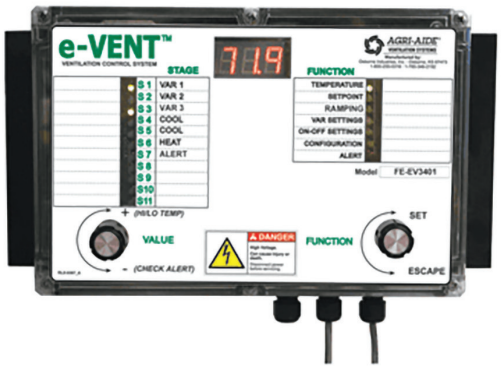
www.coolair.com

Autogrow®

The IntelliClimate automatically manages all aspects of grow room climate controls, from temperature to CO_2 to lighting to humidity, all in one controller. Designed specifically for the indoor grower, this product has nine outputs to 24VDC and RH resolution ±2 percent. Ratings of individual outputs are 3 amps, but the total draw from all nine outputs must not exceed the rating of the supply adapter. The CO_2 resolution and accuracy is 50ppm. It features built-in failsafes to ensure the room will continue to function if there is an equipment failure. Alarms are available on all settings, including an intruder alarm. The outside temperature sensor can be used with IntelliClimate to monitor outside temperatures. This is important if the application uses outside air to cool the room down. In warm climates, it is sometimes too warm to bring outside air in, so the unit will need to switch over to air conditioning. The light overtemp switch is useful where air-cooled lights are used. If the light-cooling fans fail and the room starts to overheat, the sensor contacts will open, the light is turned off, and the alarm is triggered.

www.autogrow.com

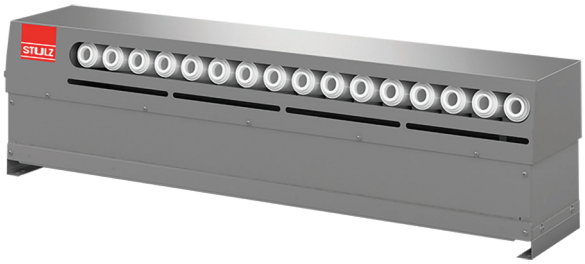
Osborne Industries Inc.



Agri-Aide Ventilation is a full line ventilation system for hog barns, pig production facilities, and other livestock housing. It includes fans, air intakes, ventilation controls, and specialized ventilation accessories. The company can use these products to deliver an integrated combination of exhaust fans, fresh inlets, circulation fans, and reliable automatic controls that match the building and the animals that are being managed. One of the primary controls family is the e-VENT™ line of integrated controls. The product can accomodate up to 11 different pre-programmed stages. Exhaust and circulation fans, heaters, air conditioners, misters, and curtains can all be integrated into one complete ventilation control, ensuring safe, comfortable animal growth. It features up to three variable speed stages, an EnergyMizer™ option for integrating air conditioning, automatic temperature ramping, and a two-knob data entry function. Its PowerUp™ temperature tracking and auto-off features protect animals from chilling if the temperature drops too low.

www.osbornelivestockequipment.com

Stulz



Used in vertical grow rooms to provide ultrasonic humidification, the company's direct room humidifiers (DRH) provide a clean, efficient, and precise humidity control solution. DRHs are designed for stand-alone room applications. They are typically mounted on a perimeter wall serving the grow space, or in an environment — such as dispensaries — where precise humidity control is required. The Stulz E2 Microprocessor controller allows integrated control operation of up to 16 humidifiers per grow room. This product produces 90 percent smaller droplets than nozzles. The adiabatic humidification process requires less than 7 percent of the energy required to boil water into steam using infrared technology. Features include mixed-bed deionization water treatment systems, and 100 percent of the demineralized water in the humidifier is utilized and does not require a flush cycle. Low operational expense helps shorten return on investment. The Stulz Ultra-Series proportional controller is engineered for single- or multiple-humidifier systems. It adds needed moisture in clone rooms.

www.stulz-usa.com

Surna®

The Surna ductless fan coil is a dual-chilled water fan coil, low-profile ceiling-hung unit that provides multidirectional airflow in the canopy. The unit is designed to treat the air in the space where it is installed, eliminating the need for ductwork. With minimal installation requirements, the product allows for a solution that can be deployed relatively quickly. Additionally, multiple fan coils are typically installed in a single grow room, providing inherent redundancy for the facility. Maintenance requirements are minimal, and there are very few components that can fail, which translates to more reliability for the grow.

When used as part of a chilled water heating and cooling system in a grow room, Surna's ductless fan coil provides efficient cooling and dehumidification due to enhanced sensible heat ratios to a facility of any size. These units are small, versatile, and easy to install, requiring only a connection to chilled water and power to begin cooling. This ductless fan coil is designed specifically for open floor plans and cannabis cultivation environments. An easily replaceable Can-Fan component allows for easy maintenance and cleaning. The bi-directional discharge airflow eliminates the need for ducting to get optimal air movement when incorporated into a proper design.

www.surna.com

Air Purification Technology Brings Cleaner Air to Grow Facilities

Ionization can remove odors, kill bacteria and viruses, reduce particulates, and more

BY GORDON WHITE
***ACHR NEWS* STAFF**

Willy Gardiner, founder of The Garden grow company, knows about the importance of air quality in high-yield and high-grade cannabis cultivation. For most of human history, plants have been grown outdoors, subject to the whims of nature: inconsistent rainfall, severe temperature changes, and more.

But no longer.

When growing indoors, like Gardiner's company does, growers can have complete control of the agricultural environment through HVAC equipment and manipulating humidity, temperature, air circulation, lighting, and more to precisely ideal conditions.

Gardiner says it is also critical to keep air quality in mind, and he does this through Plasma Air's ionization technology.

Bipolar ionization, achieved by Plasma Air ionizers installed in growing, curing, and drying rooms, works by creating both positive and negative ions. These ions break down and remove impurities from the air in addition to reducing mold growth and bacteria.

Larry Sunshine, president of Plasma Air, said that the company offers two types of ionizers. Its needle-point ionizers are typically used in commercial applications like schools, offices, hospitals, and more.

The company's tube-style ionizers are used in environments with higher levels of indoor air pollutants and odors, like cannabis facilities, casinos that permit smoking, wastewater facilities, and others.

CONTROL: Growers can have complete control of an indoor agricultural environment by using equipment to create precisely ideal conditions for their crop.

Since installing Plasma Air units in his facilities in 2015, Gardiner noted that he has less mold buildup in a/c units, cleaner condensate, and a significant increase in cannabis yield and quality.

Willy Gardiner found Plasma Air when he was looking for a technology that could eliminate the smell of cannabis and improve grow quality. Initially, he asked his father (who worked in wastewater treatment facilities) for a recommendation for odor elimination. Gardiner's father recommended Plasma Air.

Gardiner said it was the right decision.

"If you size the unit right to the building, it would completely eliminate the smell," he explained. He's used Plasma Air units in more than 20 grow rooms, managed over 350,000 square feet of canopy, and advised on the development of a 600,000-square-foot facility.

Odor control is important, as this is often a regulatory requirement for cannabis growers, since the potent smell can leak out of the facility if not properly dealt with.

"It provides a healthier work environment for the employees," he said. "Overall, it's a cleaner environment with less dust everywhere. All the things they claim they say the technology can do, it does."

AIR QUALITY IS CRITICAL

Gardiner explained that not all growers realize the importance of air quality in a grow facility. They likely know the importance of lights and nutrients, he said, but do not understand the value of pure, high-

A PLANT LIKE ANY OTHER: Growing cannabis well involves taking into account air quality, temperature, humidity, lighting, and more, just like any other plant.

quality air. He explained that plants take in carbon dioxide and emit oxygen, but at night, the root zone takes in oxygen. Purifying the air allows for the roots to take in pure oxygen, aiding the growth. The Plasma Air units allow plants — not just cannabis, but any plant — to essentially "drink in" purified air all day long. For cannabis growers, this means a better growing environment and reduced financial risk.

"We have to grow cannabis in a specific way to maximize it," he said. "And air and water are what make up a majority of that plant." He credited much of The Garden's business success to the practical belief that marijuana is, in the end, a plant like any other, and growing it well involves taking into account air quality, temperature, humidity, lighting, and more.

Professional plant growing requires a lot of specific nuances, and he recommended that growers talk to each other to discover which pieces of technology work, and which ones don't. And while people have typically tended to undervalue the importance of air, Gardiner said that air quality is something people might start valuing more.

Speaking to contractors, he noted that the key to selling ionization technology to growers is being specific on how it could affect their business for the better.

"Growers are really specific on how they buy stuff, and if it's pitched the wrong way, people don't want it — but it's just because they don't understand," he said. To him, the benefits of the technology have been clear.

"Plasma Air is one of the keys to achieving and maintaining high potency and above-average yield per grow light," he added. "And in the long run, ionization is more cost effective."

HOW IT WORKS

Plasma Air ionizers can be easily installed in new or existing HVAC systems. According to Larry Sunshine, Plasma Air ionizers also reduce HVAC service and maintenance costs. The ionizers only require an annual tube replacement, he said, and since the products eliminate the need for a carbon/charcoal filter, filters don't need to be changed out several times over the course of a year.

The ionization technology, Sunshine explained, works by creating ions that can bond with airborne particles, leading to several results. First, the ions attach to particles like dust, pollen, dust, and cigarette smoke, causing the particles to agglomerate. The particles get heavier and then fall out of the breathing zone, getting sucked into the return grill where the filter can catch them. Ionization can also kill bacteria and viruses by creating ions that attach to cells and destroy their DNA.

The ions can also neutralize volatile organic compounds (VOCs), which is helpful in eliminating odors.

"VOCs and other odors are all over our industry and many times an annoyance to people, and they want to do something about it," Sunshine said. "Ionization can handle a variety of different air quality improvements with really one technology."

He added that the service and maintenance required for proper operation of the Plasma Air ionizers is minimal. Needle-point ionizers require little to no maintenance, and while tube ionizers require a tube replacement every year or two, the replacement process is very easy for technicians. In addition to grow facilities (cannabis and otherwise), the ionizers are also frequently used in schools to maintain clean air in a building with very high occupancy load.

In addition to tube ionizers, Plasma Air also offers portable products that have carbon filter and HEPA filters. Sunshine said these could benefit both a cannabis grow facility and any ancillary rooms that are used to support the facility that could use ionization.

"Plasma Air's air purification solutions are designed to help cannabis grow facilities resolve some key issues," he said. "If cannabis growers need to vanquish offending odors and VOCs while providing an ideal growing environment, this single, affordable technology is the way to go."

Changing Laws Complicate Employee Drug Testing

Legalization, labor shortage make screening less appealing

BY TED CRAIG
***ACHR NEWS* STAFF**

Drug testing is a fairly common practice among HVAC contractors, with some even using their policies in their marketing campaigns. But as more states legalize marijuana in one form or another, testing becomes more complicated. There are 33 states that allow marijuana consumption for medical purposes and another 11 that allow recreational use. That number grows every year, even though marijuana remains illegal at the federal level.

Hillary Atkins, general counsel for the Air Conditioning Contractors of America, said she received numerous phone calls from contractors a few years ago when states first started moving toward legalization. The pace of calls has slowed, but the laws remain fairly unclear.

"It's still really complicated right now," Atkins said.

DOCTOR'S NOTE: Marijuana from a medical dispensary is treated differently under the law.

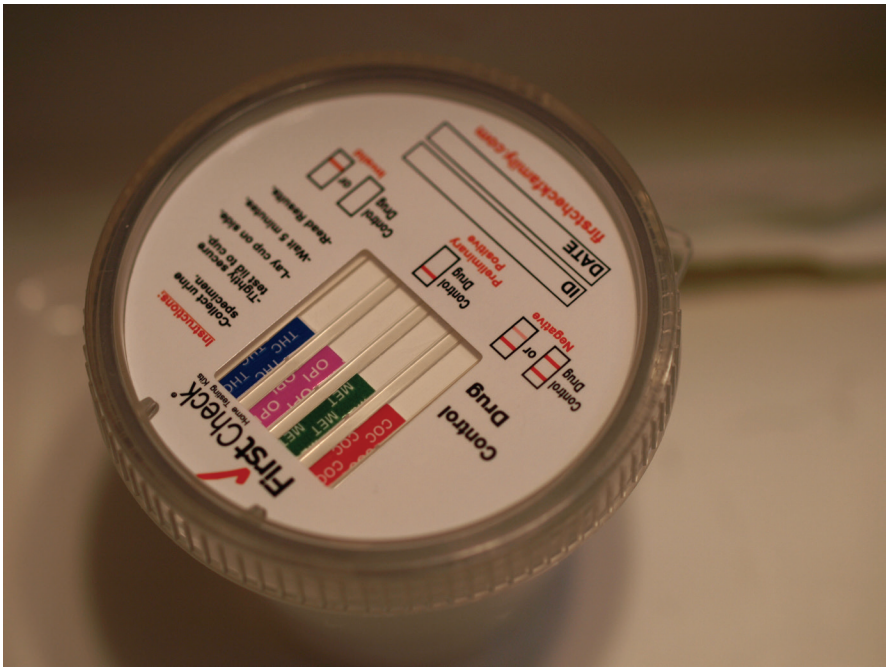
MED CARD

Ruth Rauls, an attorney with Saul, Ewing, Arnstein and Lehr, said she first started about the issue a few years ago, when a client had an employee fail a drug test and then handed him a medical marijuana card. Even the term "medical marijuana" proves complicated. States require a recommendation from physicians to obtain a medical marijuana card, but this isn't the same as a prescription. The card allows a consumer to then obtain their "medicine," but from a dispensary rather than a pharmacy.

Regardless of how the treatment is obtained, it's the underlying condition that creates issues for employers, Rauls said. Any condition that qualifies for a medical marijuana card likely falls under a state's law to protect employees with disabilities. Dozens of conditions are covered in some states. For example, Pennsylvania lists 21 conditions that create eligibility for a medical marijuana certificate. This means employers need to make reasonable accommodations for employees who use marijuana as a treatment.

It doesn't mean they can't place restrictions on their employees, especially when it comes to safety issues. HVAC technicians drive trucks containing mildly flammable substances to jobsites where they might find themselves working on rooftops. Many legal substances, including alcohol and opioids, can impair a worker's ability to perform their job in a safe manner. An HVAC contractor has the right and the responsibility to prevent this behavior.

The problem comes with testing when an employer suspects on-the-job intoxication. There is not a reliable on-site test for marijuana intoxication currently available the way there is



SCREENING SAMPLE: THC remains one of the substances employers screen for in both potential and current employees.

for alcohol intoxication. The devices on the market that claim to test for marijuana intoxication might be illegal in some states, Atkins said.

A blood test will show if someone used marijuana, but not when. It can show up weeks and even months after usage, so taking action against an employee because it was in their system creates legal risk. Walmart recently lost a case by an ex-employee with a medical marijuana card because it failed to prove that marijuana in her system contributed to an on-the-job accident.

Rauls said employers should document any visual signs of impairment in case an employee takes action against them, but this falls outside the expertise of most. Some states, such as Illinois, do provide a list of some of these signs to employers.

There remains some question of whether or not HVAC contractors can assign employees who use medical marijuana to jobs for the federal government. These jobs fall under the Drug-Free Workplace Act, and marijuana remains illegal at a federal level. But even this isn't clear. A Connecticut court recently ruled that a health care facility couldn't reject a medical marijuana user for employment on the grounds that doing so violated the federal contract. The court said the Act neither requires drug testing nor covers the use of illegal drugs outside the workplace.

RECREATIONAL

Recreational drug use is another matter depending on the state. California and Illinois made it clear that employers can still test for marijuana, even though recreational use is now legal. But other states and some cities are considering a ban on pre-employment drug testing for marijuana. A Nevada law that went into effect January 1 prohibits employers from withholding a job offer from somebody who tests positive for marijuana. There are safety exceptions within the Nevada law. A similar law took effect late last year in New York City.

In these new laws, safety remains vaguely defined. Many aspects of an HVAC contractor's job should fall under the safety provisions, such as working with certain chemicals or driving a work truck, but concerns such as entering customers' homes seem less likely to meet the legal requirements.

Drug testing of current employees is another matter, as legal precedent protects the privacy of individuals over the concerns of their employers. Atkins recommends a broad implementation of drug testing if contractors want to go that route.

TO TEST OR NOT

But do they? Hilary Weddell, an attorney with McManis Faulkner in California, said many employers in her state are finding it difficult to hire employees who can pass a test for marijuana usage.

"From a practical perspective, employers are finding legalization has a really big effect, especially in certain industries," she said.

This has many relaxing their standards.

"Some employers don't have a problem with their employees smoking socially on the weekends, as long as it doesn't affect their jobs," Weddell said. "Others may want to be very rigid about it because of their strong safety concerns."

Many HVAC contractors do have safety concerns, but are they enough to reject applicants when it's already hard to attract people to the business?

"The first question I always ask is, 'Why are you drug testing?'" Weddell said.

Contractors can continue testing and rejecting non-medical applicants in many cases. They can even have different standards for field employees and office employees, as long as they apply the same standards within those classifications, Weddell said. But they need to make sure their practices align with their policies.

Atkins said that because the laws vary so much by state, contractors need to consult with a local attorney. And since the laws are changing all the time, they need to make sure that attorney is up to date with the latest developments.