AVIGILON™

Developing an effective vape detection solution

Get an in-depth understanding of vape detectors and how to integrate the technology into your current security system.

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What are vape detectors?

Vape detectors are specialized sensors designed to detect the presence of vaping, particularly in areas where it is prohibited. While multiple types of vape alarms are available to business owners and facility managers, most devices function similarly, with sensors configured to identify specific particulates associated with vaping.

Vape sensors and tobacco detectors are commonly installed in private businesses, colleges, schools and other locations where smoking and vaping are prohibited by law. The deployment of vape smoke detectors is intended to support facility managers in better identifying and addressing vaping incidents and act as a visible vaping deterrent.

How do vape detectors work?

Vape detectors work by continuously monitoring the air in a specific environment for signs of certain chemicals and particles associated with vaping. Most vape sensors measure the concentration of vaping particles in the air and then compare these values to normal air quality data to determine whether vaping is taking place.

If the detected concentration of vaping particles surpasses a predetermined threshold, alerts will be sent to stakeholders remotely requesting a response. In addition, audible alarms may be triggered to warn offenders of their infractions and highlight the event's location.

Common types of sensors used in vape detection systems include:

Particulate sensors

Laser scattering technology detects vape aerosols suspended in the air, including fine vegetable glycerin, propylene glycol and nicotine particles, the presence of which will automatically trigger the sensor system's alarms.

Gas sensors

The presence of specific gasses associated with vaping and smoking are detected either by changes in electrical resistance or the absorption of infrared radiation; if levels surpass a predefined threshold, connected alarms will be activated.

Combination sensors

Some vape monitors use a combination of particulate, gas and additional sensors like THC oil and temperature sensors to improve the accuracy of detection processes and identify a wider variety of smoke-related incidents.

Integration with wider security technologies can strengthen vape sensors and nicotine detectors. For example, Internet of Things (IoT) sensors may be linked to vape monitors to add extra context to readings, while existing IP security camera systems may be connected to nicotine sensors to automatically flag footage of suspected vaping incidents.

Why vape detector technology is in high demand for businesses and educational spaces

Vape detector technology is becoming more in demand due to changes in smoking habits among workers, school children and others in public spaces. In the past, cigarette smoking was a critical security issue for schools and businesses to deal with, but now trends show that it's being replaced by vaping.

In fact, vaping is now more common than cigarette smoking among young people, too. Between 2020 and 2022, monthly sales of vape products grew from 15.5 million to 22.7 million units, a 46.6% increase. As of 2024, Single Care estimates that 1 in 20 Americans vape, with youth usage increasing by 1,800%.

As the prevalence of vaping among teens within educational settings increases, many security leaders are turning to vape detectors to curb unwanted usage in these spaces.

There are many reasons vape detector technology can be a vital asset for your security team, including:

- Automatic detection can work as a deterrent and make it much easier for security and staff to identify vaping while saving time and resources.

- The technology eliminates the need for manual searches, making it safer to police the usage of these unwanted products.

- Vape detectors reduce unwanted vaping incidents, making public places like schools, businesses, restaurants and airports a safer place.
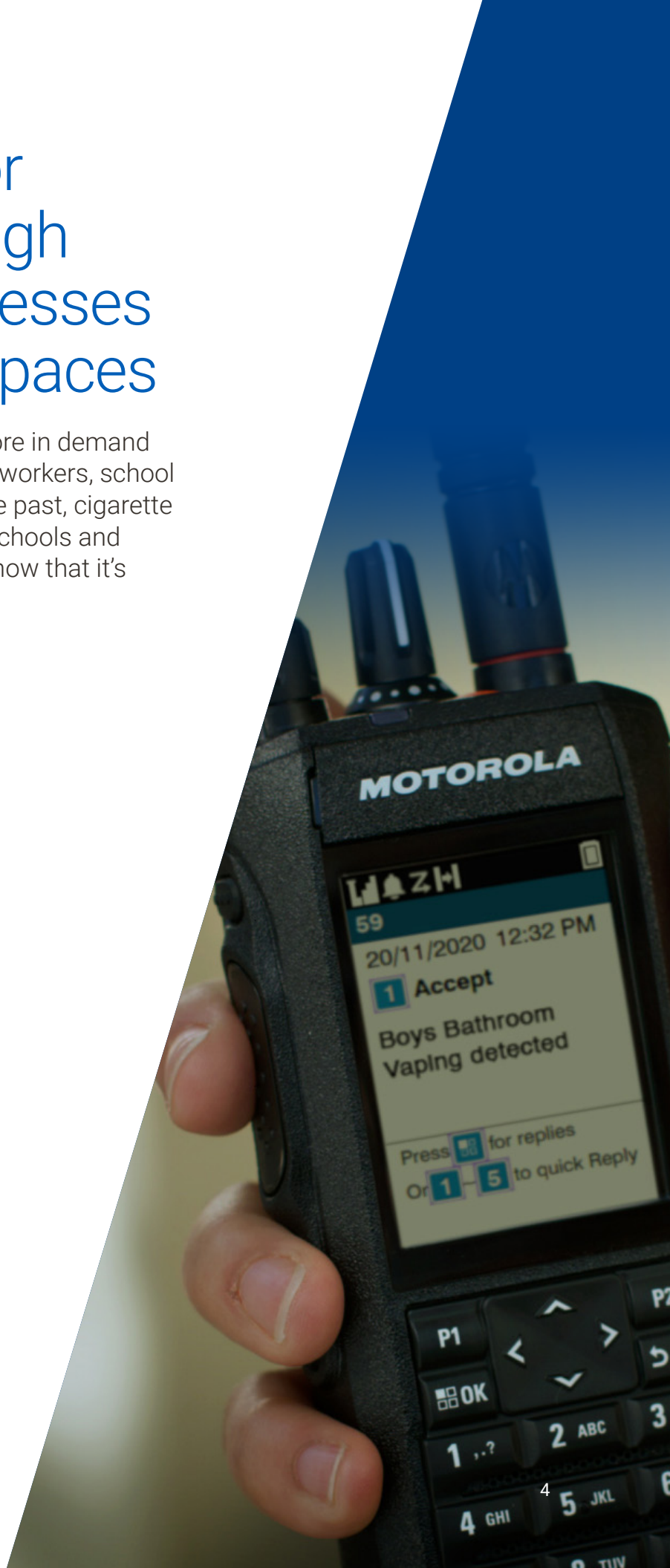
HALO Smart Sensor:
An all-in-one intelligent security device

Foster a safer and cleaner environment with Motorola Solutions' HALO Smart Sensor – a multifunctional security device that detects and observes vaping, air quality and safety. This solution is ideal for observing health and safety in privacy-concern areas, such as washrooms and changing facilities, where video and audio recording is not permitted.

Vape and smoking

The sensor uses a Dynamic Vape Detection algorithm to learn the environment and alert operators when vaping is detected. The HALO Smart Sensor will detect and alert security if an individual vapes or smokes. The device can also detect if the individual is intentionally masking vaping using aerosols.

Health

Observe health and air quality in an environment with the HALO Smart Sensor. From temperature and humidity to the presence of dangerous gases, such as carbon monoxide, this intelligent device can provide real-time alerts of potentially harmful conditions that could affect people and perishable items. These instant alerts enable your security team to respond to the situation, rectify it and establish a cleaner, safer environment.
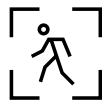
Safety

In addition to detecting vaping and health-related risks, the all-in-one HALO Smart Sensor can alert your security team to motion after hours, occupancy levels and potential safety-related threats. These include panic alarm triggers, fighting, discharging of weapons and device tampering detected through abnormal audible disturbances and vibrations.

The HALO Smart Sensor can also detect specific keywords spoken by a distressed individual seeking help and alert security to the situation right away. These pre-defined keywords, such as "help", are especially helpful in schools where bullying is a problem, teachers who need assistance, nurses and hospital patients and more.

The sensitivity and accuracy of vape smoke detectors

For business owners, school administrators, residential property managers, and any other persons considering the installation of vape detectors on their properties, it's essential to understand the abilities and potential limitations of modern devices. The simplest way to illustrate this is to briefly discuss both the accuracy and sensitivity of standard vape alarms.

Vape alarm sensitivity

While exact figures may vary depending on the specific types and number of vape sensors deployed within certain environments, some information regarding the sensitivity of modern vape detection devices is readily available. For example, one study found that the particulate matter yield emitted when vaping can be up to 10 times lower than values observed in cigarette smoke. This means vape sensors must be significantly more sensitive than smoke detectors.

Generally speaking, commercial vape detection systems can detect particulate sizes down to around 0.3 microns, but multiple environmental factors can impact the efficacy of vape detector installations. To ensure effective deployments, consider the following factors:

Airflow

Vape alarms rely on particulate matter passing through internal sensors to detect vaping. Therefore, devices must be installed with the natural airflow of a room in mind. If a room has too much or too little airflow, sensors may struggle to work as intended.

Coverage

Most vape monitors can only accurately detect particulate matter within a specific area of coverage. The style and number of sensors will affect this value, though as a general rule, one sensor should be able to cover a 12' x 12' area.

False positives

Some vape detection devices may be accidentally triggered by fine particles associated with non-vaping stimuli; steam, aerosols, cleaning product fumes and dust particles can trigger some tools, so consider this when planning installations.

Vape detector accuracy

While there have been reports of vape and nicotine detectors being circumvented by actions like obscuring sensor units and filtering vapor through items of clothing, modern devices are considered to be highly accurate. This is primarily because modern vape alarms can identify particles much smaller than those filtered out by common clothing materials.

Other factors can impact the accuracy of e-cigarette detectors, but this mainly concerns the installation considerations mentioned above. Most modern devices should be highly accurate if vape detection devices are installed according to these considerations and wireless vape detectors are regularly checked for potential battery-related issues.

Challenges of implementing vape detection

Vape detection technology offers a practical, robust solution to prevent unwanted vaping in public spaces. Yet, several challenges must be considered to fully utilize the technology.

Consider these challenges to ensure your vape detectors are being used properly.

Technical challenges

Vape detectors need to distinguish between vapor and similar substances like steam or aerosol spray to prevent false positive readings. If a vape detector alarm is set off incorrectly, it can lead to a lack of trust and accuracy in the security measure.

Devices need regular maintenance to improve accuracy. This ensures they're calibrated correctly and that damages or other technical issues aren't compromising their performance. A faulty system may falsely detect regular changes in air quality as a sign of vaping, so maintenance is vital in building a system you can rely on.

Privacy concerns in sensitive areas

To ensure comprehensive coverage, vape detector technology must be installed in private areas such as changing rooms and restrooms. Although these locations see the most common vape usage, deploying the technology in these areas can raise privacy issues.

Clear communication about vape detectors and responsible monitoring practices can help avoid backlash. Vape detectors can track the time, location, and frequency of incidents. This data needs to be handled securely to avoid breaching privacy regulations.

Legal and ethical considerations

To use vape detectors effectively, you must ensure compliance with local, state, and federal laws. As they're a type of surveillance, regulations around vape detection technology must be followed to avoid problems.

Security and staff must also consider the ethical implications of finding unwanted vape usage in schools. Anyone under 21 is prohibited from purchasing vapes in the U.S., so alerts need to be dealt with appropriately.

Operational challenges

Comprehensive implementation of vape detectors across your entire building infrastructure can be expensive to set up and maintain. Overall costs can become a challenge for schools and businesses with limited funding, who instead may have to focus on strategically placing vape detectors in crucial areas.

Time and resources will also need to be spent training staff to effectively react to a vape detection alert and handle incidents correctly. This can incur additional costs that must be factored into budgeting for the equipment.

Environmental factors

Each environment in which a vape detector is deployed will be unique. This means that systems need to be bespoke for each specific area to ensure effectiveness. Even within a single building, factors like ventilation, humidity and air quality can differ, leading to specific calibration for each device.

A customized approach to vape detection technology ensures optimal operation and safeguarding.

Industries that benefit from vape detection systems

The deployment and utilization of active vape detection systems can assist facility managers and property owners across several major industries in measurably reducing the impact of unwanted vaping and smoking incidents. Provided installations are thoroughly planned, and vape monitors are continually maintained, such devices can benefit the following industries.

Private businesses

Vape detectors installed in customer-facing businesses like retail stores, restaurants, hotels and leisure facilities can help on-site employees better address vaping and smoking events. Stakeholders can identify and address vaping incidents promptly by positioning vape alarms in high-risk areas like bathrooms, changing rooms and secluded locations.

By developing a remote-access vape detection system, on-site security staff can be notified of suspected vaping incidents via automatic text alerts. Accurate time and location data can be sent to commercial security system teams to improve incident response times, while the presence of visible nicotine sensors can help business owners deter vaping offenses from occurring in the first place.

Educational facilities

Vaping incidents have become a major issue for many schools and colleges in recent years. One study found that almost 30% of high school students and over 10% of middle schoolers vape on a frequent basis. Administrators can better address this issue with support from live school vape detection systems and vandal-proof vape alarms acting as a visible deterrent.

Educational facilities can also benefit from combination vape detection systems and installations featuring multiple sensor types, such as marijuana detectors, sound sensors and occupancy sensors. These school security systems can be configured to monitor a wide array of common threat factors with live alerts and automated responses helping teams to protect students and staff better.

Residential properties

Owners and managers of both short and long-term rental properties can utilize vape sensors to ensure units remain smoke and vape-free. Such apartment building security solutions can be particularly beneficial in large complexes and for property owners managing units remotely, with live alerts ensuring offenses will be identified regardless of whether manual checks can be performed.

Healthcare institutions

The utilization of vape detection devices in hospitals and similar healthcare facilities can help caregivers ensure a healthy and safe environment for staff and patients. Such developments can be particularly beneficial in hospital environments, as it's not uncommon for long-term smokers to attempt to circumvent no-smoking regulations by instead trying to vape indoors discreetly .

Much like in school environments, facility managers may integrate vape detection devices into broader healthcare security systems to improve the efficiency and efficacy of threat detection solutions. Vape sensors can be combined with existing IoT sensors, CCTV tools and access control systems to offer security teams with limited resources a more holistic view of what's going on in their facility.

Public environments

Public spaces like shopping malls, libraries and transit centers can be fitted with vape alarms to create and maintain vape-free zones. In many states and jurisdictions, vaping is prohibited by law in all public areas in which traditional smoking is banned. By installing vape detection devices in high-risk locations, stakeholders can maintain compliance with current regulations.

Tips for developing an effective vape detection solution

For property owners and facility managers interested in developing a unique vape detection solution customized to the needs of their organization, below is a selection of six tips and best practices intended to help teams choose appropriate devices and installation configurations.

1. Power source availability

Vape sensors are continuous monitoring devices that must always be powered to remain effective. If connecting sensors to a mains power supply is impossible in high-risk locations, wireless vape detectors should be considered, alongside plans to frequently check and maintain each device's battery supply during regular use.

2. False positive avoidance

When assessing where to install vape smoke detectors, teams must consider the presence of potential false positive-causing stimuli. For example, steam or aerosols may impact sensors in bathrooms and changing rooms. In this situation, particulate sensors are less appropriate than gas sensors designed to detect vaping chemicals.

3. Vandalism concerns

While visible vape and tobacco detectors can deter some offenders from committing offenses, others may try to tamper with sensors to avoid detection. When planning new installations, stakeholders must consider this possibility and either install sensors in difficult-to-reach areas or select tamper-proof vape detection devices.

4. Necessary coverage

Facility managers must consult vape sensor manufacturers regarding the coverage potential of different systems. Some high-risk areas may require the installation of multiple sensors to ensure no blind spots are present, while others may be negatively affected by environmental factors like airflow. Teams must consider these points carefully during the planning process.

5. Integration considerations

Modern vape monitors can often be integrated into existing security systems to help teams develop comprehensive threat detection and building management solutions. When connected to a broader cloud-based management platform, data collected from multiple solutions can be analyzed together. Some possible integrations worth considering include the following:

- Occupancy monitoring sensors
- Sound detection devices
- Motion and pressure sensors
- Temperature and humidity sensors
- Air quality index sensors
- Carbon monoxide monitors
- Video security system integrations

6. Maintenance and upkeep

To ensure your vape detection equipment's longevity and effectiveness, devices must be appropriately maintained. Some key aspects of maintenance include:

- Regular calibration and recalibration of devices to improve accuracy
- Routine cleaning of devices to prevent dust and grime build-up
- Software updates to eliminate potential bugs and improve performance
- Consistent inspecting and testing of components to identify faults
- Replacement of batteries for portable detectors
- Documentation of all maintenance activities

Securing grant funding for vape detection

Implementing vape detection technology can be costly.

Schools and businesses can leverage state and federal grants to help fund the implementation. An excellent resource for finding grants is the Grants.gov website. This database lists all the federal funding options on which you can search for grants dedicated to tackling vaping or improving school safety.

To obtain any grants, your school or business must create a compelling grant proposal. This should outline the need for this technology, its benefits and a detailed budget plan. Furthermore, including a detailed implementation and maintenance plan will increase your chances of getting the funding you need.

Prior to applying for a grant, you'll need to create a budget plan for your proposal, key steps include:

- Identifying all potential costs
- Conducting a cost-benefit analysis
- Saving funds for contingencies
- Breaking down expenses by category
- Setting clear financial goals

With this information and a suitable grant program chosen, school administrators must review the unique Request for Funding Proposal (RFP) instructions laid out by the awarding body for their chosen grant. The RFP contains essential information like:

- Required format and font size for the grant proposal
- Deadlines for the submittal of key documents
- Required attachments, evidence and forms
- Accepted submission methods for the grant proposal

Failure to meet RFP requirements is one of the most common reasons why grant proposals are rejected. So, it's important to carefully review these rules as a matter of importance.

One more thing to note is that some grants are awarded on the condition that schools match a percentage of the project's total cost using funds from their own budget. Known as a cash match, applying for a grant of this type requires administrators to provide evidence of necessary funds, and their ability to access them without issue, as part of their proposal.

Vape detection implementation checklist

Planning:

- Assess the extent of vaping issues in your location

- Gather data on past incidents.

- Define specific goals such as reducing incidents and improving health and safety.

- Create a budget covering initial costs, installation, maintenance and training.

- Conduct a cost-benefit analysis.

- Consult with key stakeholders about the implementation.

Implementation:

- Identify the key areas where vape detection will be beneficial.

- Identify the proper vape detection solutions for your needs.

- Confirm that the selected vape detection technology is compatible with your building layout.

- Confirm that the vape detection technology is compatible with your current IT systems.

- Ensure the vape detectors provide adequate coverage for the areas of concern.

- Calibrate each vape detection device for its specific area of use.

- Ensure there are sufficient power and network connections at installation sites.

- Configure the vape detection system to your particular requirements.

- Test the vape detectors to ensure they work accurately.

- Allow time for adjustments based on initial test results.

Legal and regulations:

- Review local and state rules about vape detection.

- Comply with data protection and privacy laws.

- Inform the public about the presence and purpose of vape detection technology.

- Create written policies regarding vape detection and data handling.

Training:

- Train staff to respond to a vape detection alert.

- Create a procedure to follow in the event of a vape detection alert.

- Train staff to monitor and maintain the devices.

- Schedule regular re-training.

Maintenance:

- Establish a calibration schedule.

- Plan periodic cleaning.

- Ensure timely system updates.

- Create an inspection and testing schedule.

- Obtain the equipment needed to make repairs.

Monitoring:

- Begin continuous monitoring and reporting in place.

- Establish a way to collect feedback about the vape detection system.

- Keep records of all incidents detected and actions taken.

- Analyze data to find trends for further prevention.

- Find out if the vape detection technology integrates with other security technology.

Find out how organizations utilized Motorola Solutions' Halo Smart Sensor to help prevent vaping and capture comprehensive health and safety awareness.

Plymouth-Canton Community Schools takes a proactive approach to school safety

With vaping a major concern for schools nationwide, Plymouth-Canton Community Schools (P-CCS) was proactive in combating this issue by installing the HALO Smart Sensor in areas where video security cameras would not be appropriate, such as washrooms.

With this solution, P-CCS can detect vaping in privacy concern areas in real-time and be alerted to events such as smoking and possible fighting. As a result, the school district has improved student safety and proved to parents that they are taking the issue of student vaping seriously.

Read case study

"Avigilon allows us to see not only what security solutions we need now but what's on the horizon. Avigilon is a partner for future-proof security evolution."

-Dr. Monica L. Merritt, P-CCS Superintendent of Schools

Avigilon solutions for vape detection

One of the key challenges of vape detection is that it often happens in areas where cameras cannot be installed for privacy compliance. The Halo Smart Sensor is a discrete device that does not record video or audio, making it a great option for areas like restrooms, locker rooms and other areas where cameras cannot be installed.

The Halo Smart Sensor can detect vaping, THC, smoke and chemicals, as well as critical changes to air quality or temperature. In addition, the device can alert admins to potential fights or emergency situations with alerts for abnormal noise and calls for help.

By integrating vape detectors like the Halo Smart Sensor with Avigilon Alta Video or Unity Video, organizations can enhance security and safety by providing comprehensive viewing and real-time alerts with visual evidence, all in the same dashboard.

Send automatic alerts to staff and enable faster investigation to ensure the individuals are identified quickly. In privacy-sensitive areas like restrooms, cameras can be placed immediately outside to provide visibility into who entered or exited the area around the time of the vaping incident.

An added benefit of the integrated sensor and Avigilon video security system is that you can view vape detection trends over time. With detailed reporting of where and when vaping incidents most often occur, you can better prepare staff to respond to potential vaping incidents, and help reduce the likelihood that they will occur on your premises.

See vape detector solution
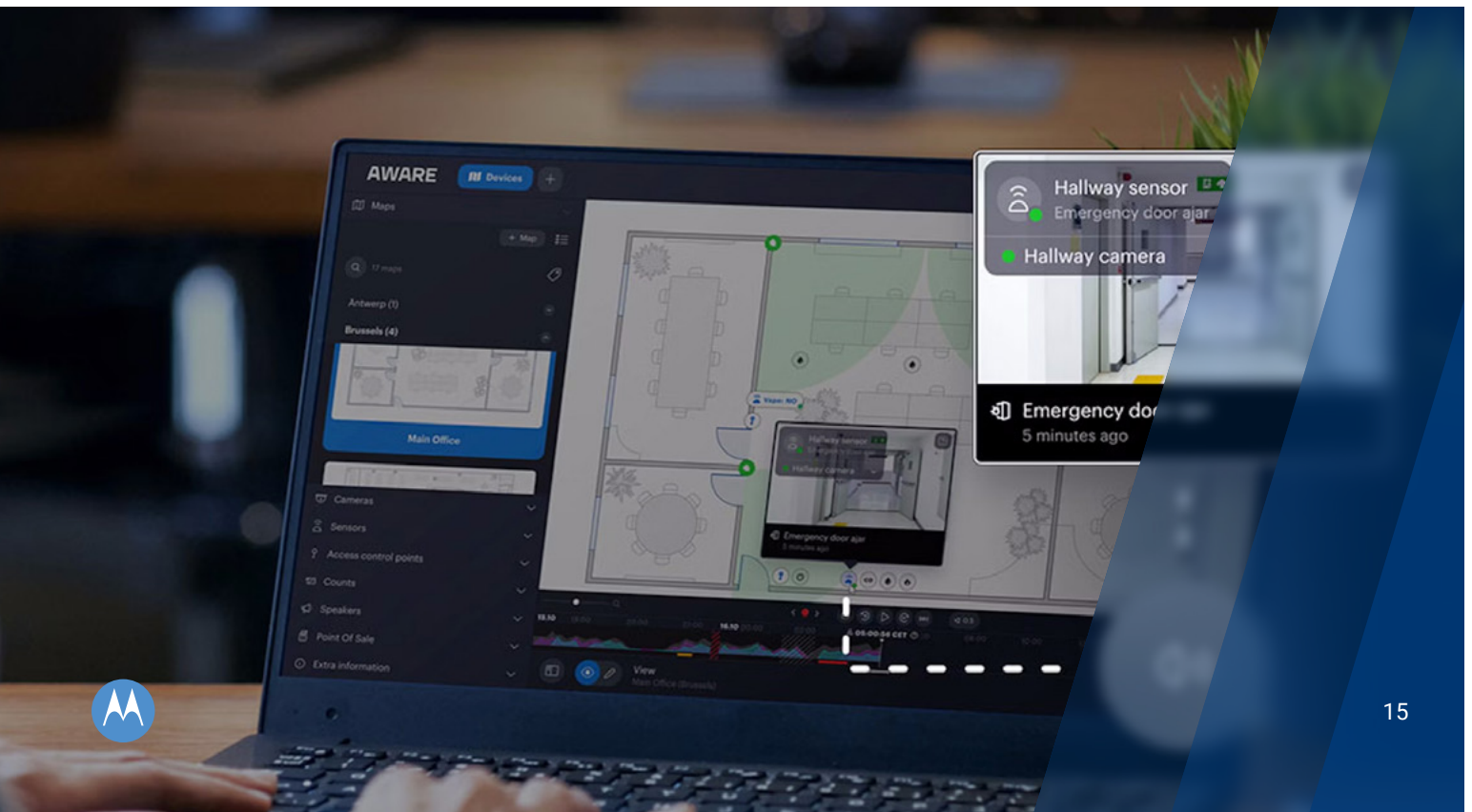
Summary

For property owners, facility managers and school administrators to comply with current vaping regulations and help protect their properties from potential vape and smoke-related damage, teams must find a way to detect and deter vaping incidents reliably. While in-person security can be effective, the subtle nature of vape smoke can make it hard to detect.

By installing specialized vape detection devices in critical locations, stakeholders can reliably identify the presence of vape smoke, as well as deter offenders from committing vaping and smoking offenses. Provided environmental factors and installation considerations are carefully reviewed, property owners can create unique vape detection systems designed to warn on-site teams of incidents in real time to best address vaping and smoking incidents.

Additional resources

[Get expert help](#)

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