

Onsite Hypochlorous Acid in Schools and Campuses

Safety, cost, the evidence, and the rules that apply, for pre-K, K-12 districts and college campuses. Written for facilities directors, custodial managers, school nurses and business officers. October 2026, revision 1.

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What this paper claims, and what it does not

An EcoloxTech system is a device that produces a hypochlorous acid solution on site. It is regulated by the EPA as a device, and we make no efficacy claims for it or for the solution it produces.

Laboratory and published findings are reported as findings about hypochlorous acid under the conditions stated, attributed to the laboratory that produced them. Documented disinfection claims come from HOCl-AS200 (EPA Reg. No. 101112-1) used according to its label, and from nowhere else.

The number of schools and campuses using EcoloxTech systems comes from our own customer records, and is labelled as such. Cost figures are labelled by source: EcoloxTech list prices and an illustrative district model, each with its assumptions shown. We do not claim that our equipment prevents illness or reduces absenteeism, and the section on what onsite generation does not fix sets out its limits.

Executive summary

More than 15 schools and campuses already produce their own hypochlorous acid on site with EcoloxTech systems, in place of delivered quat concentrates, bleach and wipes. The case in education is different from a hospital or a food plant: it rests less on chemistry than on people, budgets and public accountability.

Three things decide school sanitation. How many custodians the district or campus can keep. How much of the budget reaches the cleaning line. And whether a parent, a board member or a residence-hall director would be comfortable with what is being sprayed in a room full of children or students. Onsite generation speaks to all three:

1. **Safety first.** Hypochlorous acid at use strength is a dilute, near-neutral solution that calls for splash goggles as good practice and no gloves or respirator in normal use, per the HOCl-AS200 SDS. There is no concentrate stored in a building full of children, and no mixing step that can go wrong: no measuring by a short-staffed team, and no chance of the chlorine or chloramine gas produced when bleach meets acids or ammonia.
2. **A cost per litre low enough that cleaning frequency stops being rationed.** When solution is expensive, high-touch rounds quietly shrink. When it is on tap, the policy the school already has can actually be carried out.
3. **A handling profile suited to occupied rooms.** Custodians can work through classrooms during the day instead of saving harsh products for after hours, when the surfaces that matter have already been touched all day. That is a handling observation, not an efficacy or health claim.

Where a health-office procedure or a state rule requires an EPA-registered disinfectant, the registered product HOCl-AS200 is used to its label. In the illustrative district in this paper, eight buildings spending \$46,000 a year on sanitizer, wipes and handling move to about \$6,000 a year in running costs, with payback in about 19 months. Below roughly \$20,000 a year of replaceable spend, a single unit for the largest building is the better first step.

The operational problem

In education, the binding constraints on sanitation are people, budget and public accountability before they are microbiological. Each setting adds its own.

Setting	What makes it different	Why it matters for sanitation
Pre-K and childcare	Toddlers on floors and mats, shared toys, diapering, naps on cots; state childcare licensing rules	Surfaces are mouthed and touched constantly; licensing often sets stricter sanitizing and disinfecting steps than school policy
K-12 classrooms	Occupied all day; shared desks, devices and supplies	Products that need ventilation or PPE get pushed to after hours, so daytime high-touch cleaning does not happen

Setting	What makes it different	Why it matters for sanitation
Cafeterias and kitchens	A regulated food operation under school meal rules and the locally adopted Food Code	Food-contact sanitizing has its own concentration limits, test-kit and inspection requirements
Athletics and locker rooms	Mats, weight rooms, shared pads and helmets, showers	Skin organisms on mats and benches need coverage and contact time between sessions, the step most often skipped
College residence halls	Shared bathrooms, lounges and laundry on a 24-hour schedule	No empty shift; cleaning happens around occupants every day of term
College dining and student health	High-volume dining operations and clinical surfaces	Dining runs at food-plant scale; the health center follows its own clinical procedures
Buses and fleet	Rails, seat backs, driver areas	Cleaned at the depot between routes, and under-served in most districts

Three things cut across every setting.

- **Asthma.** About 7.5% of U.S. children have current asthma, according to [CDC survey data from 30 states and DC](#), roughly one in thirteen. Cleaning and disinfecting products are a recognized trigger: the [California Department of Public Health](#) names quaternary ammonium compounds and bleach among disinfectant ingredients linked to work-related asthma, and the clinicians' association AOEC [lists two common quats as asthmagens](#). The research is not settled: a [2019 review](#) found individual case evidence but inconsistent population studies. The practical point stands either way: products people find harsh get used less, later, or weaker.
- **Custodial staffing.** Teams are thin and turn over. Any step that depends on careful dilution or judgment drifts, usually toward weaker solution that nobody tests.
- **Budget and scrutiny.** Budgets are annual and public, and a capital purchase competes with textbooks. A business case has to survive a board meeting, and a parent's question about what is being sprayed near their child deserves a plain answer.

Safety first: hypochlorous acid against conventional chemicals

In a building full of children, the largest difference between onsite hypochlorous acid and conventional chemistry is not cost. It is what staff handle, what is stored in the building, and what can be mixed by mistake. Onsite generation removes the concentrate, the dilution step and the chemical store; what reaches the bottle is already at use strength.

Product	Form in the building	Handling, per label and SDS	Storage in the school	Mixing risk
Hypochlorous acid, generated or HOCl-AS200	Dilute solution at use strength, near-neutral pH (5.0–6.5)	Splash goggles recommended as good practice; no gloves or respirator required for normal use, per the HOCl-AS200 SDS	No concentrate; food-grade salt and a filling point	No dilution step. Still never combine with acids or ammonia
Quaternary ammonium (quat) concentrate	Concentrate diluted by custodians or a dispenser	Concentrates can cause serious eye damage and skin burns; goggles and gloves while diluting	Locked chemical store with controlled access	A daily dilution step, where errors are usually too weak and go untested
Sodium hypochlorite (bleach)	Corrosive concentrate diluted by staff	Goggles or face shield, gloves, apron, ventilation	Locked store; corrosive to fabrics and finishes	Mixed with acids it releases chlorine gas; with ammonia, chloramine gas
Hydrogen peroxide concentrate	Concentrate or ready-to-use	Concentrates are strong oxidizers: goggles, gloves, protective clothing	Oxidizer storage away from other chemicals	Dilution step for concentrates

Product	Form in the building	Handling, per label and SDS	Storage in the school	Mixing risk
Disposable wipes	Pre-saturated, single use; often quat-based	Per the product label	Cases in stores and canisters in classrooms, often within children's reach	None at the point of use, but label contact times are routinely ignored

General properties from labels and safety data sheets; specific products vary. Follow the label and SDS for the product you use.

Toxicity

Hypochlorous acid is the same oxidant the body's own white blood cells produce to kill microbes, and at use strength it is a dilute, near-neutral solution. That is why the HOCl-AS200 SDS asks for splash goggles as good practice and nothing more for normal use, against the gloves, goggles and ventilation that concentrated quats, bleach and peroxide require. It is still an oxidizer and a chlorine compound: it is not to be swallowed, sprayed at faces or used without regard to the label. The comparison that matters is the one custodians face every day. Two widely used quats are [listed by the clinicians' association AOEC as asthmagens](#), and California's public health department names both quats and bleach among disinfectant ingredients linked to work-related asthma.

No concentrate stored in the building

Every jug of concentrate is a container of hazardous chemical in a building full of children. Accidental exposures are not hypothetical: in the first three months of 2020 alone, U.S. poison centers took [45,550 calls about cleaners and disinfectants](#), up about 20% on the year before, and CDC's advice included storing chemicals out of children's reach. Onsite generation takes the concentrate out of the school entirely. The inputs are salt and water; the output is made as needed and is not stockpiled, because hypochlorous acid decays with light, heat and time.

No mixing

Conventional programs depend on someone mixing correctly every day, and the failures run both ways. Too weak, and nothing is achieved. Wrong combination, and the result is toxic gas: bleach mixed with acids releases chlorine gas, and bleach mixed with ammonia

releases chloramine gas, which is why [federal Poison Help guidance](#) says never to mix bleach with other cleaners. Generated solution comes out of the machine at use strength, so there is no measuring and no mixing step for a short-staffed team to get wrong. One rule still applies to hypochlorous acid as to any chlorine chemistry: never combine it with acids or ammonia, and print that on every bottle label.

Schools and campuses already producing on site

More than 15 schools and campuses have already moved to hypochlorous acid generated on site with EcoloxTech systems. This figure comes from EcoloxTech's own customer records, not an independent audit, and it describes adoption, not outcomes: we make no claim about illness or absence rates at these sites.

What these operators changed is the supply model. In place of buying quat concentrate, bleach and wipes, shipping them, locking them in a chemical store and diluting them by hand, they make solution at use strength from salt and water, at the point where custodians fill their bottles. What they took on in exchange is a piece of equipment that needs suitable feed water, routine checks of concentration and pH, and a service plan.

The pattern among schools that switch successfully is consistent with the guidance on our schools programme pages: a pilot in one building for a term, the incumbent product kept available throughout, consumption and high-touch completion measured rather than opinions, and installation over the summer so custodians practice in an empty building.

What a generator is, and where it is used

An onsite generator is a device that produces a hypochlorous acid solution at a set concentration where it is used. It is regulated by the EPA as a device, and the solution it produces carries no efficacy claims of its own. It removes two failure modes that sit upstream of every cleaning policy: running out of product mid-round, and mis-diluting a concentrate.

On a school or campus it typically covers the routine volume, building by building:

Area	Typical surfaces	Notes
Classrooms	Desks, chairs, door handles, switches, shared supplies	Daily, plus targeted rounds during illness periods; check device makers' guidance before wiping screens and keyboards
Restrooms	Touchpoints, fixtures, partitions	The highest-frequency routine in any building
Pre-K and childcare rooms	Tables, toys, mats, cots, diapering surfaces	Follow state childcare licensing, which is often stricter than school policy
Cafeteria and dining halls	Tables between sittings, trays, serving lines	Kitchen food-contact surfaces follow the food safety program and the adopted Food Code
Gyms, mats and locker rooms	Wrestling mats, weight equipment, benches, floors	Between sessions, with adequate contact time; mat and floor makers' guidance comes first
Residence halls	Shared bathrooms, lounges, kitchens, laundry	Continuous occupancy suits a mild, use-strength solution
Buses	Rails, seat backs, driver area	At the depot, between routes

Two layouts work. **Per-building units** fill bottles at the point of use and suit dispersed sites and phased budgets. **Central generation** at a district facility or campus central plant suits operators that already run delivery rounds between buildings, but hypochlorous acid decays with light, heat and time, so it needs opaque closed containers, a short delivery cycle, and strength testing at the receiving building. Most large districts and campuses end up with a mix.

Where documented claims come from

Documented disinfection claims on a school or campus come from HOCl-AS200, EPA Reg. No. 101112-1, used according to its label. They do not come from the generated solution, which is used for routine cleaning and sanitizing.

The [AS200 label](#) lists 21 organisms, eight bacteria and thirteen viruses, each at a five-minute contact time on precleaned hard, non-porous surfaces. Several matter in schools: norovirus surrogates (feline calicivirus and murine norovirus), influenza A, respiratory syncytial virus, rhinovirus, SARS-CoV-2, *Staphylococcus aureus* and MRSA. The label also carries an emerging viral pathogen claim. If the product is not used immediately after production, it is tested first and not used below 149 ppm available chlorine.

What this means in practice:

- **Where a procedure names a registered disinfectant** — the nurse's office, a vomiting-incident procedure, a state childcare rule — use HOCl-AS200 to its label, or whatever the procedure names.
- **Food-contact surfaces** follow the food safety program and the Food Code edition your health authority has adopted, including its sanitizer concentration limits and test-kit requirement. Read that edition rather than a supplier's summary.
- **Organisms outside the label stay outside it.** *Clostridioides difficile* spores and *Cryptosporidium* are not on the AS200 label; *Cryptosporidium* in particular resists chlorine-based chemistry, so outbreaks in early-years settings are handled by exclusion, hand hygiene and the health department's guidance.

The rules that apply

None of these rules dictates which chemistry a school buys; they govern labels, food safety, worker protection and records. Map them before any change.

Rule	Applies to	What it means for onsite generation
EPA product label (FIFRA)	Every registered disinfectant or sanitizer	Claims come only from the label of a registered product used as directed; the generator and its solution carry none
School meal program food safety rules (7 CFR 210.13)	K-12 food service in the National School Lunch Program	A written food safety program for every facility, at least two health inspections each school year, and the latest report posted publicly

Rule	Applies to	What it means for onsite generation
Food Code as adopted by your state or local health authority	All cafeterias, dining halls and kitchens, including colleges	Sets the permitted sanitizing conditions for food-contact surfaces and requires a test kit for the sanitizer in use
State childcare licensing	Pre-K, Head Start and childcare rooms	Often prescribes when to clean, sanitize or disinfect toys, tables and diapering surfaces, and with what; usually stricter than school policy
State school pest-management laws, such as California's Healthy Schools Act	K-12 schools and, in some states, childcare	Antimicrobials are generally exempt from posting and parent notification, but California requires training for staff who use disinfectants in schools and childcare; check your own state's rule
State green-cleaning laws	K-12 schools in states that have them	Usually require certified general-purpose cleaners and treat sanitizers and disinfectants separately; details differ by state
OSHA Hazard Communication and Bloodborne Pathogens	Custodial, food service and athletic staff at every level	Safety data sheets, chemical training, and an exposure-control plan for blood and body-fluid cleanup; fewer concentrates simplify all three
Device, floor and mat manufacturers' instructions	Chromebooks and tablets, gym floors, athletic mats	Manufacturer guidance on what may be used comes first; test inconspicuously and write it into the procedure

Colleges sit mostly outside the K-12 rules: no school meal program rules or school pest-management statutes in most states, but the same EPA labels, Food Code, OSHA standards and, for student health centers, their own clinical procedures.

Cost analysis

In an illustrative mid-size district — eight buildings, about 4,500 students — replacing \$46,000 a year of sanitizer, wipes and handling with onsite generation saves about \$40,000 a year, paying back a \$62,000 installation in about 19 months. The figures are hypothetical, taken from the [EcoloxTech district ROI model](#), and show the method rather than a quotation.

Line	Annual or one-off cost
Today: sanitizer concentrate, central contract	\$21,000 a year
Today: disposable wipes, central and school-level	\$16,000 a year
Today: freight, dispensers, storage, custodial handling time	\$9,000 a year
Today: total	\$46,000 a year
Onsite: salt, water, electricity	\$2,600 a year
Onsite: filters, service, test consumables	\$3,400 a year
Onsite: running total	\$6,000 a year
Installation: central unit, water treatment, filling stations, two satellite units	\$62,000 one-off

The saving depends on how much spend the system actually replaces. Holding installation at \$62,000 and running costs at \$6,000 a year:

Annual spend replaced	Annual saving	Payback	Five-year net
\$20,000	\$14,000	about 4.4 years	\$8,000
\$30,000	\$24,000	about 2.6 years	\$58,000
\$46,000	\$40,000	about 19 months	\$138,000

Annual spend replaced	Annual saving	Payback	Five-year net
\$70,000	\$64,000	about 12 months	\$258,000

Below about \$20,000 a year of replaceable spend, a system across all buildings is hard to justify on consumables alone; a single E-300 (\$9,999 list) for the largest building is the better first step. Above it, the question is layout rather than whether.

Three adjustments make the model fit each setting:

- **Pre-K and childcare centers** are usually single buildings with small volumes, so a single small unit, or HOCl-AS200 bought ready to use, often fits better than a district-scale system.
- **College campuses** add residence halls and dining at food-plant scale, which raises the volume replaced and usually favors central generation for dining and residence life, with satellite units elsewhere.
- **School-level spend is the number most often missed.** Individual schools often buy wipes and sprays from their own budgets. Ask several principals or building managers what they spend before finalizing the case, and have the business office confirm it independently.

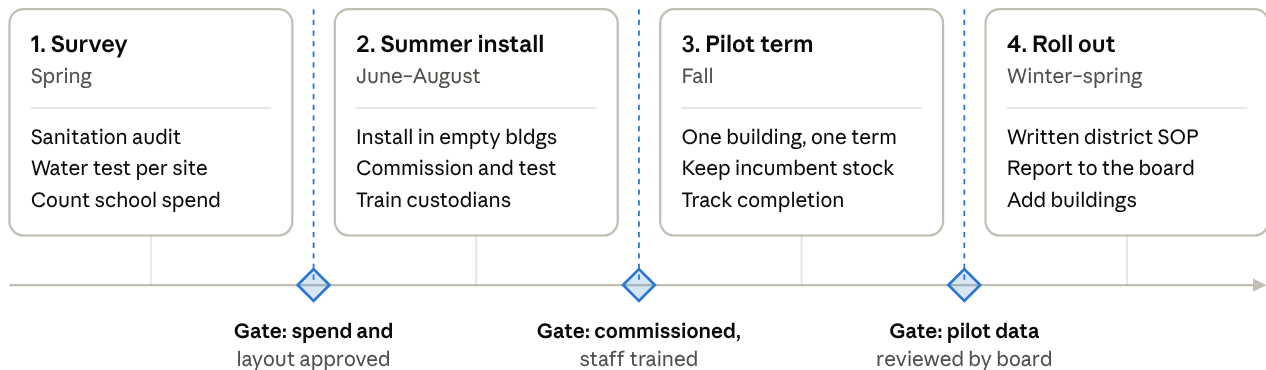
The model excludes HOCl-AS200 bought for tasks that need a registered claim, and general-purpose cleaners, which onsite generation does not replace. The larger value is not in the table: when solution is cheap and on tap, the high-touch round gets done as the policy describes. That can be measured in a pilot building by tracking high-touch completion alongside consumption.

Implementation roadmap

The school calendar sets the timeline: survey in spring, install over the summer while buildings are empty, pilot one building for the fall term, then roll out. Colleges follow the same sequence around their own academic calendar, installing in residence halls between terms.

Install over the summer, pilot for a term, then roll out

A typical first school year; diamonds are approval points



Implementation roadmap · 4 phases across one school year, 3 approval points

Keep the incumbent product available through the pilot, and measure consumption and high-touch completion rather than opinions. The failures are predictable: a district-wide switch announced in October with no pilot, a filling point placed where the installer found space rather than where custodians pass, and a change nobody explained to teachers, who then buy their own wipes.

What onsite generation does not fix

A generator removes stock-outs, dilution error and most of the concentrate stored in buildings. It leaves the rest of the problem where it was.

- **Soil.** It is not a cleaner. Dirt comes off first; oxidizer consumed by organic soil is not available to act on anything.
- **Respiratory spread.** Ventilation and case management do more than any surface program against respiratory viruses.
- **Hand transmission.** Norovirus moves on hands, and schools are hand-transmission environments above all. Hand hygiene and exclusion rules matter more than cleaning; a child back in class too early undoes a week of custodial work.
- **Organisms off the label.** *Cryptosporidium* resists chlorine-based chemistry, and *C. difficile* spores are not on the AS200 label.
- **Registered-claim tasks.** Where a procedure or state rule names a registered disinfectant, the generated solution does not qualify; use HOCl-AS200 or what the procedure names.

- **Staffing.** If the cleaning policy assumes hours the district or campus does not staff, the policy is the problem.
- **Equipment care.** The generator needs suitable feed water, concentration and pH checks, and a service plan; downtime sends a building back to purchased product, so keep a fallback stock.
- **Health outcomes.** Nothing in this paper shows that onsite generation reduces illness or absence, and we make no such claim.

Questions to ask any supplier

Ask these of us, and of anyone proposing a change to your cleaning program:

1. What is the cost per building per year, delivered, including freight and the wipes that schools buy from their own budgets?
2. What happens to our cleaning frequency when the budget is cut 10%?
3. Can this be used in an occupied classroom, and what does the label say about ventilation and PPE?
4. What concentrate would be stored in our buildings, and what dilution step would a custodian perform?
5. Which claims are on a registered label, and which are we relying on in our policy?
6. How does this fit our state's green-cleaning, school pest-management and childcare licensing rules?
7. What happens in a building when the equipment is down?
8. Which cost figures are your own data, and which are hypothetical?

Sources

The district cost example is hypothetical and shows the method; replace it with your own invoices before using it in a business case. The count of schools and campuses using EcoloxTech systems is from EcoloxTech customer records. This paper is not legal or regulatory advice; confirm requirements with your health department, state licensing agency and compliance staff.

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