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Touch-free Hygiene Best Practices for Restrooms in Education Facilities

American Rescue Plan funding facilitates many improvements in school restrooms to reduce the spread of illness.

November 1, 2021

The role of hand hygiene in reducing the spread of illness in educational settings was well-established before COVID-19 brought the issue to unprecedented prominence. According to the joint initiative between the American Cleaning Institute (ACI) and the Centers for Disease Control and

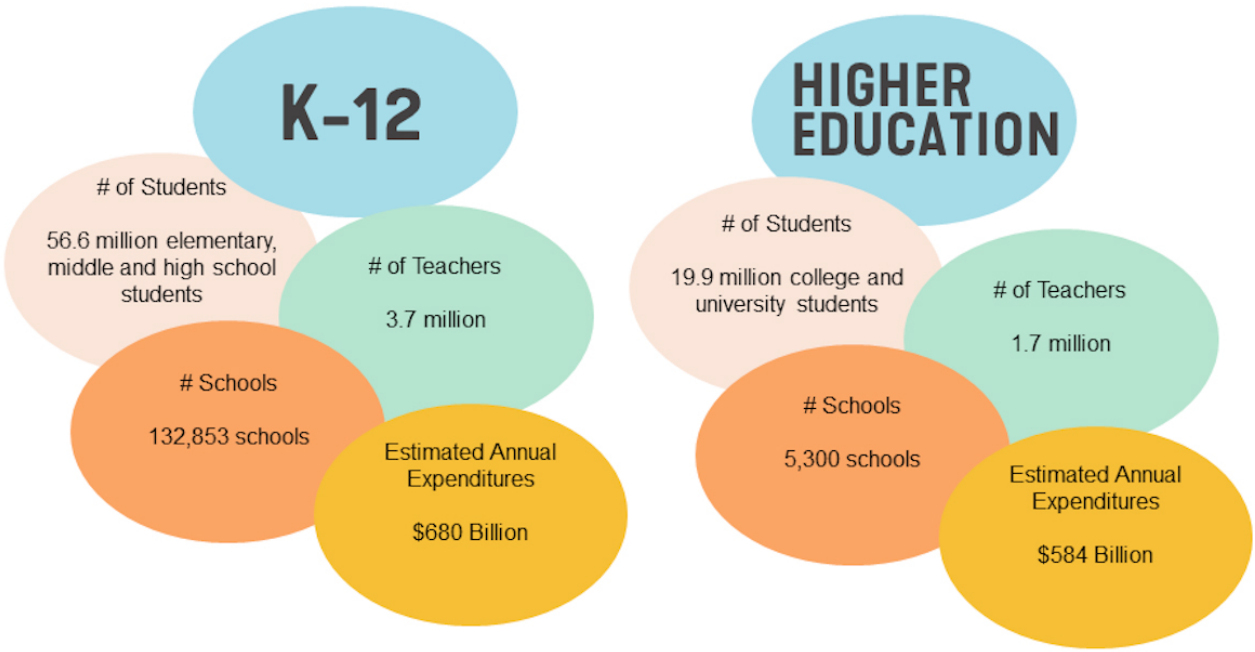
Prevention (CDC) called Healthy Schools, Healthy People (https://healthyschoolshealthypeople.org), the impact of infectious diseases upon our national educational system is highly significant.

The introduction of best practices for hygiene can have a statistically significant and proven positive benefit. Healthy Schools, Healthy People has documented and quantified the correlation between hand hygiene and best cleaning practices and the prevention of the spread of infectious disease and reduction of sickness-related absenteeism.

This article presents some of that data and will detail several restroom technologies, trends and best practices supporting positive outcomes. We also will describe a number of American Rescue Plan (ARP) programs that are available to help fund restroom upgrade initiatives in the education sector.

Infectious Disease Impact on National Educational Infrastructure

A statistical snapshot of the educational sector in the United States underscores the enormous number of locations, facilities and students served (see Figure 1).



Source: National Center for Education Statistics (Fall 2019)

According to Healthy Schools, Healthy People, infectious disease accounted for millions of lost school days and costs the United States $120 billion each year.

Teacher illness costs time and money — not to mention the negative effects that teacher absences may have on student learning. In fact, teachers can be absent from school more days a year than students. One study found that teacher illness-related absences averaged 5.3 days a year, in contrast to an average of 4.5 days a year for students.

Students don't clean their hands often or well enough. In fact, one study found that only 58 percent of female and 48 percent of male middle and high school students washed their hands after using the bathroom. Of these, only 33 percent of the females and 8 percent of the males used soap.

Adult hand-cleaning behaviors also need improvement. In another study, 92 percent of participants said they always wash their hands in public restrooms, but only 77 percent were observed doing so.

The Healthy Schools, Healthy People initiative also cites comprehensive data proving that proper hand hygiene is key to good health for the whole school community. Amongst the studies cited in their research was a four-week handwashing program for a class of first-grade students that was associated with fewer absences and prescribed antibiotics than were reported the previous school year.

Another study involving Detroit school children showed that scheduled handwashing, at least four times a day, can reduce gastrointestinal illness and related absences by more than 50 percent.

Because the benefits of proper hand hygiene in educational settings is well-understood, and because the size of the educational sector gives it extreme importance in the overall arena of public health, the conversation post-COVID becomes one regarding best practices for enabling proper hand hygiene and how to best pay for these initiatives.

Restroom Equipment Selection for Educational Facilities

Educational facilities are routinely considered to be "worst case use and abuse" sites by plumbing manufacturers. For this reason, only vandal-resistant fixtures and fittings designed specifically for commercial applications should be considered. The use of residential fixtures and fittings to save money rarely has a successful outcome.

Because design and hygiene are linked, restroom design needs to facilitate what are known as "standard precaution best practices" to maximize hygiene. Primarily this means that proper hand hygiene is supported by ensuring that sufficient water volume and flow duration are available.

In most public facilities, this means a faucet flow rate of 0.5 gallons/minute (gpm), or 1.9 liters/minute (lpm), for at least 20 seconds. Flow rates can be lower (0.35 gpm/1.3 lpm) in LEED-compliant applications or higher in specific usage such as surgical scrub. The duration is influenced by ADA guidance for users with mobility issues.

In order to achieve the recommended CDC-compliant handwashing regimen, a convenient soap supply and drying procedure should be readily available. Preferably, all three activities of washing, soaping and drying would incorporate touch-free interactions to minimize or eliminate contact with frequently touched surfaces (see Figure 2).

These activities should be concentrated in a specific area around the sink basin to prevent dripping and splashing onto countertops and floors — reducing the potential for slip and fall injuries.

The drive toward lower water consumption in fittings and fixtures (both manual and sensor) has had a significant environmental impact relative to water savings, but at the same time has led to concerns about water stagnation in distribution lines and drain carry issues. Older facilities designed when the average faucet flow was 2.2 gpm (8.3 lpm) and the typical toilet flush volume was 5.0 gallons/flush (gpf) (19 liters/flush (lpf)) had much larger piping sizing to match the increased water consumption.

As the facility converts to today's 0.5 gpm (1.9 lpm) faucet flows, 1.28 gpf (4.8 lpf) toilet flush volumes, and 0.125 gpf (0.47 lpf) urinal flushes, the larger pipe becomes a potential liability due to slower water velocities and longer residence time for water in the pipe.

Water conservation and water efficiency in commercial restrooms and educational facilities have been encouraged for more than a decade. With these efforts becoming more commonplace and successful, new technologies should be considered for the overall water health of the building.

Stagnant water is a potential problem. The risk of water stagnation due to lower flows (or less frequent use) involves the reduction in residual disinfectant (chlorine, for example) over time. The U.S. EPA recommends a free chlorine level of between 1.0 and 4.0 parts/million (ppm), but the estimated time it takes for free chlorine to diminish below recommended levels in stagnant systems is 1.5 days in galvanized piping systems, 4.5 days in unlined cast-iron systems, and 10-14 days in lined systems.

Refreshing water supplies takes energy and must be programmable to occur on a regular basis. Today's sensor-operated fittings and fixtures can support that function and limit the potential for stagnation. They also can use programmable flushes to clear undesirable fluids and combat odors

in drains, limit dwell times and resultant metals contamination, and ensure water is maintained in p-traps over time.

Important Considerations When Upgrading to Automatic Operation

The most critical precondition for successful transitions to touch-free are designs that ensure that use is intuitive and enjoyable. Students and staff are less likely to use restroom fittings and fixtures that they don't want to touch or don't understand how to use. Regardless of whether fittings and fixtures are manual or automatic, their design can either help or hinder proper cleaning.

The CDC offers comprehensive guidelines for proper restroom cleaning and disinfection on its website and stresses the minimization of hard-to-clean surfaces (porous materials and wood are examples of surfaces that are very difficult to sanitize) and designs with difficult-to-clean recesses or angles. Since proper disinfection might include chemicals that are acidic or alkaline, resilient materials are key.

Anything that minimizes time and labor spent cleaning is of benefit to maintenance staff, as are designs minimizing indentations, angles, gaps and recesses where dirt can accumulate.

The best restroom designs actually facilitate proper maintenance. They use materials that support ease-of-repair, offer easy access to key components, use only standardized and not custom-manufactured components, and come with standard power supplies and back-ups.

What's the Worst that Could Happen?

If you ever want to engage in an eye-opening conversation, just ask school maintenance workers about some of the things they have seen in public restrooms over the years.

Stories abound of students who plug drains and toilets to cause flooding, manual faucets left on to create sink deck "waterfalls," items of every imaginable size and shape flushed down toilets, karate kicks to the faucets, jumping up and down on the toilet paper dispensers, explosives flushed down toilets, trash strewn throughout the restroom, defacing of walls and equipment, and much more.

Whether upgrading to touch-free hygiene or not, several key best practices will save much time and money down the road. Stick to manufacturer brands tried and tested in educational environments. Most facility maintenance personnel and commercial plumbers know which brands to include on any short list of reputable and long-lasting vandal-resistant equipment. These manufacturers are also the most likely suppliers of retro-fit kits to convert manual products to automatic function at minimal cost and with minimum disruption.

• When upgrading to touch-free toilets and urinals, always specify products that only release the amount of water they are set to release and not a drop more. If students can create floods by holding equipment open, they will. Fortunately, the best products will not permit this.

• When specifying sensor flush valves, make sure to select only products with true mechanical override. This feature prevents flooding even when there is no battery or line power available to the unit. Students can hold a button down as long as they like, but the flush valve will only dispense the amount of water it was supposed to — preventing a flood of water on the floor.

• Many sensor-operated faucets can be adjusted to set the amount of time they will dispense water each time hands are held in front of them. This is called the time-out feature. Adjustable settings not only save water but can also reduce potential flooding.

• If stagnation of water in distribution systems is a concern, automatic flushing to maintain residual chlorine levels and prevent metals buildup is an exceptionally useful feature in both faucets and flush valves. Some products permit settings adjustment wirelessly with a secure mobile phone app.

Regulatory Requirements

Several codes, standards and regulations govern the selection of faucets in educational applications, as well as best-practices guides published by experienced and authoritative experts. Most make no distinction between the selection of manual or automatic sensor faucets in educational facilities or other applications.

Education department mandates in states such as Texas can vary from the national norm, but most experienced maintenance staffs are familiar with these and how they can impact aspects such as toilet height or faucet reach.

The list of regulatory codes is listed in the August 2021 article titled "Sensor Faucets, Flush Valves and the Reduction of Waterborne Pathogens" (https://bit.ly/39UTViD).

When considering touch-free units, the questions you should ask yourself and your team are:

• Does the touch-free device being specified include the ability to set a regular line flush in order to bring residual disinfectant into the distribution system to avoid stagnation?

• Is the feature flexible enough to permit adjustment of both the frequency and duration of the line flush in order to meet the needs of a particular facility?

• To save time and minimize customer interruptions, can the settings of the devices be done wirelessly using a device such as a smartphone?

• Are the devices set up to deliver data such as water usage and verification of line flushes?

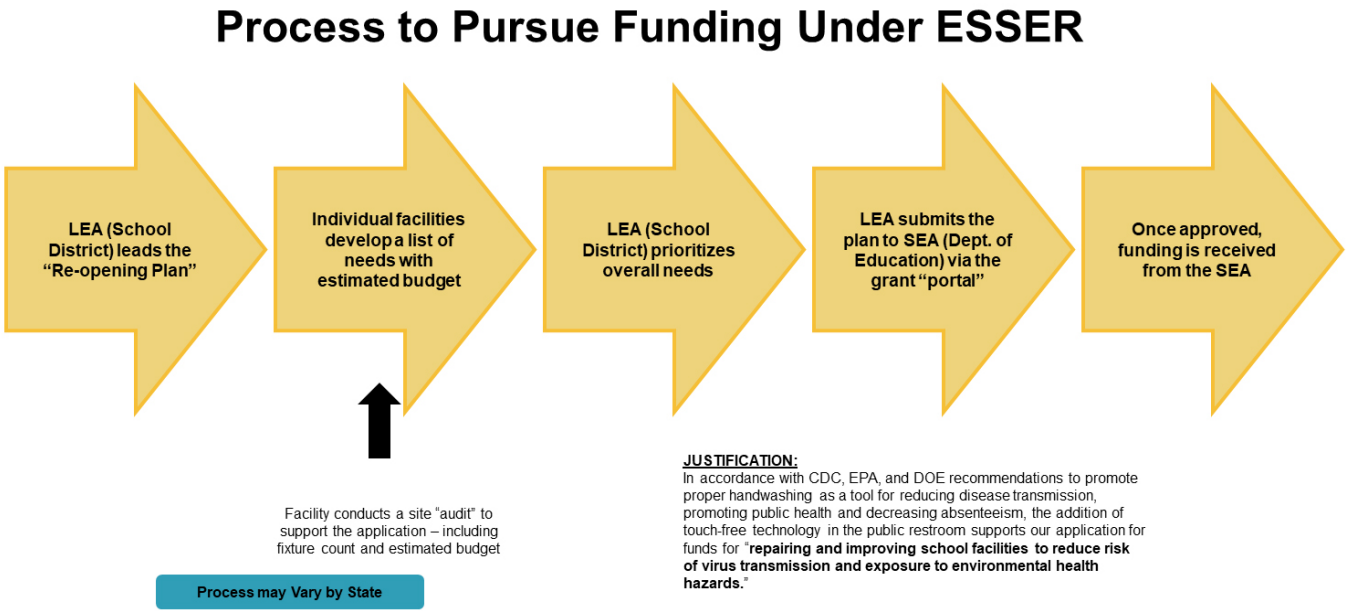
ARP Funding to Upgrade School Restrooms

In March 2020, the $2 trillion Coronavirus Aid, Relief and Economic Security (CARES) Act dedicated $31 billion for what was then called the Education Stabilization Fund. Since then, more money has been dedicated to the three primary school funding mechanisms below. For more information, refer to the respective fund websites (see Figure 3).

FUND	FACILITIES	AMOUNT	AVAILABILITY	PERMISSIBLE USES FOR RESTROOM UPGRADES	FUND WEBSITE
Elementary and Secondary School Emergency Relief Fund (ESSER)	K-12 facilities receiving Title 1 funding	$190.5 Billion ESSER 1 - $13.5B ESSER 2 - $54.3B ESSER 3 – $122.7 B	Retroactive from 3-13-2020 ESSER 1 – 9-30-2022 ESSER 2 – 9-30-2023 ESSER 3 – 9-30-2023	Repairing and improving school facilities to reduce risk of virus transmission and exposure to environmental health hazards. Purchasing supplies to sanitize and clean facilities	https://oese.ed.gov/offices/education-stabilization-fund/elementary-secondary-school-emergency-relief-fund/
Governor's Emergency Education Relief Fund (GEERF)	Local Education Agencies (LEA's) that are most in need - grants at the discretion of the State Governor	$7.0 Billion GEERF 1 - $3 B GEERF 2 - $4 B	Each Governor must award GEERF funds to eligible entities within one year of receiving the State's allocation. Retroactive from 3-13-2020	Governors may choose facilities that are "essential" or "most significantly impacted by coronavirus" to support their ability to continue providing educational services to their students. May include providing childcare and early childhood education, providing social and emotional support, and protecting education related jobs.	https://oese.ed.gov/offices/education-stabilization-fund/governors-emergency-education-relief-fund/
Higher Education Emergency Relief Fund (HEERF)	Higher Education Facilities receiving Pell Grants	$75.2 Billion HEERF I - $14.0 B HEERF 2 - $21.2 B HEERF 3 - $40.0 B	One year from the date the school's supplemental grant was processed to distribute the HEERF funds. Retroactive from 3-13-2020	To make non-permanent changes to existing facilities to ensure social distancing. Prevent, prepare for, and respond to Coronavirus, domestically or internationally	https://www2.ed.gov/about/offices/list/ope/caresact.html

Elementary and Secondary School Emergency Relief Fund (ESSER) and Governor's Emergency Education Relief Fund (GEERF) funding is administered by the respective state departments of education or governor's offices and is, therefore, subject to variations depending upon which state they are applied in. An example of the ESSER application process is presented in Figure 4. Refer to specific fund websites for more comprehensive and updated information.

A number of educational facilities also have contemplated using ARP funding for upgrades to ADA-compliant restrooms that were previously grandfathered in or for conversion to unisex bathrooms in anticipation of potential future mandates. The authors advise consultation with the various state departments of education regarding these uses.



Our intent has been to provide general guidance on best practices and practical considerations for upgrading public restrooms in educational facilities and potential ARP funding mechanisms for those upgrades. Examples of local districts using ARP funding for restroom upgrades are becoming more and more frequent. Our hope is that facilities contemplating these upgrades will be able to use this information to make the best choices for both students and staff.

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