



*(Photo: James Steinkamp Photography)*

# CONTENTS

02	Introduction
03	Facility Management: The Healthy Buiding
04	The Basics: Hands and Surfaces
06	Coronavirus and Surfaces: How long does it survive?
16	Virus for Young Learners: Triangle Structure and Design for Efficiency (An Educational Sidebar for Students)
18	Paper Towels Better Than Air Dryers To Stop Virus Spread
20	Copper's Virus: Killing Powers Were Known Even to the Ancients



# BEST PRACTICES FOR RE-OPENING SCHOOLS AFTER PANDEMIC: AN OVERVIEW

Issues in Education / Cordogan Clark Group / Ittner Architects



(Photo: Ballogg Photography)



(Photo: Ballogg Photography)



(Photo: Ballogg Photography)

How can school boards and administrators prepare for re-opening after the recent outbreak and prolonged closure? What maintenance and safety protocols are recommended for your school building? As architects and engineers specializing in architecture for education, we look at recommended “best practices” for helping establish and maintain a healthy school building, with a special emphasis on Federal and CDC Guidelines.

We recommend following the CDC and EPA Guidelines for cleaning, disinfecting, and operating community facilities. With budgets likely to be constrained, school systems might not be in a position to hire additional custodians or pay overtime for their current custodial staff. This means K-12 leaders will have to be creative when establishing and enforcing new cleaning routines. Consider how you might alter the schedules of existing staff, as well as enlist other help within the school community.

These Guidelines offer no guidance on the exact timing to reopen a school, though they do provide guidance on when to close it. Reopening prior to available vaccines is more a matter of political judgement than architecture and engineering.



## Enforce new distancing policies.

When students return to school, they should be kept apart as much as possible to reduce the risk of further contagion. Establish distancing rules or guidelines for students at school, such as having students sit at every other seat in the cafeteria or stand a few feet apart in lines. Use reminders such as placing tape on the floor to mark how far apart students should stand to help them maintain proper distancing. Encourage students to spread out as much as practical.

Rethink how to organize activities that involve large groups of students, such as lunch, recess, physical education, athletics, or assemblies. Form smaller class sizes or groupings where possible. You might have to repurpose some areas of the school for learning that are currently being used for other activities. Hold classes outdoors if you can.

Limit or prohibit physical contact, substituting elbow bumps for hugs, handshakes, and fist bumps. Consider having students wear masks, sit at semi-private carrels, or use folding dividers when seated together at tables.

## FACILITY MANAGEMENT: THE HEALTHY BUILDING

### The Healthy Entry

- Ensure schools are fully locked down during closures
- Enact Access Control policies for reopening
- Use the vestibule to screen people who might disrupt building operations (those disinclined to follow school protocol and procedures)
- Limit nonessential visitors. Limit the presence of volunteers for classroom activities, mystery readers, cafeteria support, and other activities
- Use vestibule to screen for illness
- Enforce new cleaning policies, beginning at the entrance and throughout the building, as well as transportation to and from school

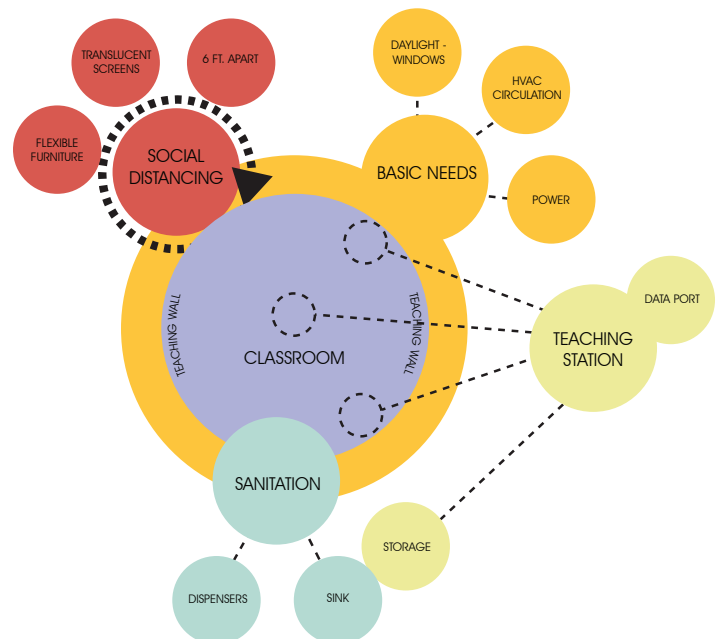
Julie Mudge, head nurse at University of Chicago Hospitals, writes us:

*"I envision: Temps take every morning for all who enter building, all kids, faculty, etc. wearing cloth masks, classrooms at 1/2 capacity with 6' in be-*

*tween desks, Purell on walls everywhere and handwashing stations. I worry more about teachers - so anyone over the age of sixty(65), or with heart disease, lung disease, immune compromised, etc. should only do online teaching. So maybe they would lead the zoom for the classroom lesson, and a younger aide could be in the classroom, support with demonstrations on the board, etc... Do not have kids in the hallways changing classes. Likely need to stay in one room all day. Stagger start and end of day to avoid clusters of kids in hallways. Janitors will need to do deep cleans every night. This would all be dependent on the curve staying flat this summer. Otherwise we will have to continue all online classes . . . Ugh."*



(Photo: Ballogg Photography)



- New Technologies: Buyer Beware. Thermal Imaging cameras have been in great demand as a means for detecting COVID symptoms, and are a new technology that at first seemed promising, but experts say they do not work:

*“The idea is that thermal cameras can ferret out sick people in a crowd by finding those who have elevated temperatures, according to 11 surveillance companies NBC News found marketing the technology as a form of coronavirus detection. Fever is a symptom of COVID-19, the disease caused by the coronavirus.*

*“But the problems with this technology, according to thermal imaging and virus surveillance experts, is that thermal imaging is an imprecise method for scanning crowds and doesn’t measure inner-body temperature.*

*“They also noted that the coronavirus only produces a fever after a person is infected for days if there are symptoms at all. A recent study in Iceland looking at tests from a sizable portion of the population found that 50 percent of everyone who tested positive were asymptomatic.” (April Glaser, 03-27-2020, NBC News)*

### **Who should be in school?**

Require sick students and staff to stay home. Establish procedures for students and staff who are sick at school. (CDC GUIDELINES)

- Establish procedures to ensure students and staff who become sick at school or arrive at school sick are sent home as soon as possible.
- Keep sick students and staff, particularly those with symptoms of respiratory illness, separate from well students and staff until they can leave. Plan to have areas where these individuals can be isolated from well students and staff until they can leave the school.
- Remember that schools are not expected to screen students or staff to identify cases of COVID-19. If a community (or more specifically, a school) has cases of COVID-19, local health officials will help identify those individuals and will follow up on next steps.

## **THE BASICS- HANDS AND SURFACES:** **Establish strict cleaning routines and communicate healthy hygiene habits**

K-12 administrators and school boards should implement and enforce strict cleaning routines that are more frequent and thorough than before, at least until the COVID-19 threat is over. All items students regularly come in contact with, beginning at the main entrance and extending through all classrooms, should be thoroughly cleaned and disinfected every night. High-touch areas (door-knobs, technology, phones, hands-on materials, and desk/table surfaces) should be disinfected throughout the school day as well.

Teach and remind students throughout the school day to follow healthy practices for not spreading germs: such as washing hands regularly, covering all coughs, and not touching their faces. Make it easy for students to practice healthy hygiene by making spray bottles or disinfectant wipes available in classrooms, or in other ways. Have students share with their families about what they can do to keep themselves and others safe. Engage local organizations that can help with this effort.



(Photo: James Steinkamp Photography)



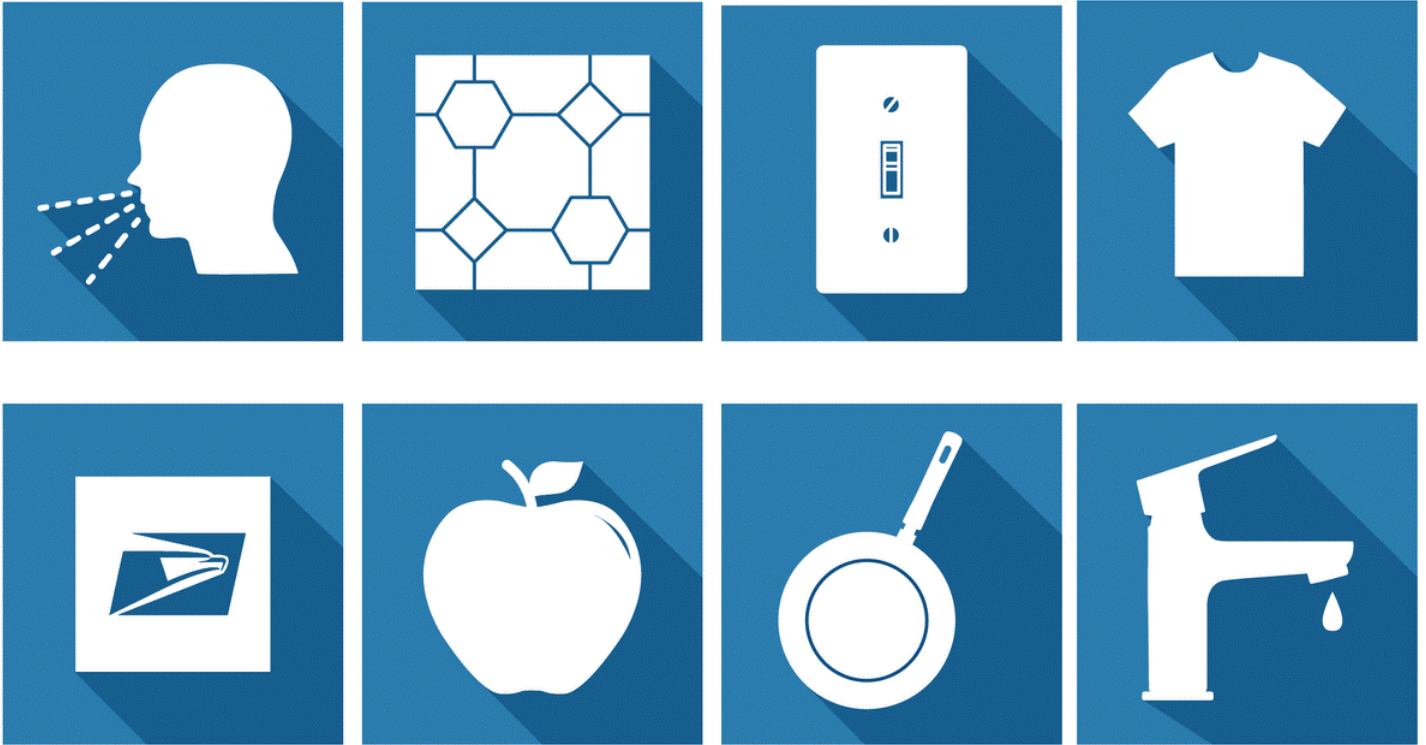
### ***The importance of handwashing:***

It is hard to get kids to wash their hands properly. Often, they just go through the motion. But 30 seconds of handwashing, with scrubbing, makes a huge difference.



- The above photos from Business Insider comparing hand sanitizer and handwashing show a marked difference and show how much of a difference it makes to rinse your hands for six seconds, or to scrub them with soap and water for 30 seconds.
- Health officials say it is important everyone has access to hand sanitizer for times they do not have access to a sink, but not to use it as a substitute if you do have the option of soap and water.
- Hand sanitizer, since it does not include scrubbing and wiping, leaves residue on your hands and is not nearly as effective as soap and water.

## CORONAVIRUS AND SURFACES: HOW LONG DOES IT SURVIVE?



(Graphic: Chicago Tribune)

Though COVID-19 is believed to be spread mainly by inhaling droplets released when an infected person coughs or sneezes, these droplets can also land on surfaces. A healthy person can then unknowingly touch those surfaces and the virus then gets a free ride to wherever and whatever the person goes and touches next.

Hands can carry the viral particles to different surfaces, even the face, where it can enter your body through your eyes, mouth, or nose.

Cleveland Clinic ([clevelandclinic.org](http://clevelandclinic.org)) asked infectious disease specialist Frank Esper, MD, how long the coronavirus can survive on surfaces and what we should know to keep ourselves safe. “The virus typically doesn’t like to live on surfaces that have a lot of holes or microscopic little grooves, nooks or crannies,” explains Dr. Esper. “It likes surfaces that are very smooth, like doorknobs.”

Early research has demonstrated that the virus’s survival depends on the type of surface it lands on. Outside the body, the live virus can survive anywhere between three hours and seven days, depending on the material.

Here is how long the virus typically lasts on common surfaces:

- Glass – **5 days**
- Wood – **4 days**
- Plastic & stainless-steel – **3 days**
- Cardboard – **24 hours**
- Copper surfaces – **4 hours**

The amount of live virus decreases over time on surfaces. The risk of infection from touching something that had the virus on it lessens after a few days; and on some surfaces, like copper, even faster.

“As you can imagine cardboard has little microscopic holes in it, so the virus doesn’t like it very much,” says Dr. Esper. “And it doesn’t last too long on fabric either, typically less than a day.”



## Figuring out COVID-19's infectious dose

Viruses cannot survive independently. A virus survives by invading a live host, hijacking it, and producing more virus. So when an infected person coughs and viral droplets land on surfaces around them, it's not the best outcome for a virus



(Photo: Ballogg Photography)

"If a virus lands on something like a chair or table, it starts dying pretty quick," explains Dr. Esper. "We may be able to find some viable virus after a few days, but it's thousands of times less than what was originally deposited by the cough. As soon as the virus hits something that is not alive and certainly not a human, it's not going to do very well."

So just because the virus is detectable on a surface does not necessarily mean that there is enough there to make someone sick. Scientists are still working to figure out what the infectious dose requirement is to actually cause an infection.

## Can coronavirus live on mail?

With online shopping and deliveries now reaching holiday-level busyness, you might be wondering if your mail or packages are carrying the coronavirus. Some people even let their mail or parcels sit for a few days before opening.

"Paper and cardboard are very porous," says Dr. Esper. "The virus doesn't like surfaces like that. It likes smooth, even things."

Coronavirus also does not particularly like to be out in the elements. Certainly, many viruses seem to circulate better in cold weather rather than warm weather, but if the virus is not in another person, it is not going to do well.

"I'm not particularly concerned about catching the virus through the mail," says Dr. Esper. "We're certainly studying it and we'll be able to understand a lot more as time goes on, but the answer is no, I don't think people need to be concerned about getting the virus through the mail." (From Cleveland Clinic, April 24, 2020)



(Photo: James Steinkamp Photography)



(Photo: Ballogg Photography)

## Personal Hygiene

### Teach and reinforce healthy hygiene practices (CDC Guidelines):

- Train staff on healthy hygiene practices so they can teach these to students.
- Ensure handwashing strategies include washing with soap and water for at least 20 seconds, especially after going to the bathroom; before eating; and after blowing your nose, coughing, or sneezing. If soap and water are not available and hands are not visibly dirty, use an alcohol-based hand sanitizer that contains at least 60% alcohol.
- CDC offers several free handwashing resources that include health promotion materials, information on proper handwashing technique, and tips for families to help children develop good handwashing habits.
- Ensure adequate supplies (e.g., soap, paper towels, hand sanitizer, tissue) to support healthy hygiene practices.

### Surfaces: EPA and CDC Guidelines How to Clean:

#### Intensify cleaning and disinfection efforts.

- Routinely clean and disinfect surfaces and objects that are frequently touched. This may include cleaning objects/surfaces not ordinarily cleaned daily (e.g., doorknobs, light switches, classroom sink handles, countertops). Clean with the cleaners typically used. Use all cleaning products according to the directions on the label. For disinfection most common EPA-registered household disinfectants should be effective. A list of products that are EPA-approved for use against the virus that causes COVID-19 is available here external. Follow the manufacturer's instructions for all cleaning and disinfection products (e.g., concentration, application method and contact time, etc.).
- Provide EPA-registered disposable wipes to teachers and staff so that commonly used surfaces (e.g., keyboards, desks, remote controls) can be wiped down before use.
- Ensure adequate supplies to support cleaning and disinfection practices.



(Photo: James Steinkamp Photography)

### How to Clean and Disinfect (CDC Website update May 7, 2020) Hard (Non-porous) Surfaces

- If surfaces are dirty, they should be cleaned using a detergent or soap and water prior to disinfection.
- For disinfection, most common EPA-registered household disinfectants should be effective.
  - (A list of products that are EPA-approved for use against the virus that causes COVID-19 is available from EPA). Follow the manufacturer's instructions for all cleaning and disinfection products for concentration, application method and contact time, etc.
  - Additionally, diluted household bleach solutions (at least 1000ppm sodium hypochlorite) can be used if appropriate for the surface. Follow manufacturer's instructions for application, ensuring a contact time of at least 1 minute, and allowing proper ventilation during and after application. Check to ensure the product is not past its expiration date. Never mix household bleach with ammonia or any other cleanser. Unexpired household bleach will be effective against coronaviruses when properly diluted. Bleach solutions will be effective for disinfection up to 24 hours.
- Prepare a bleach solution by mixing:
  - 5 tablespoons (1/3 cup) bleach per gallon of water or
  - 4 teaspoons bleach per quart of water





(Photo: Ballogg Photography)

### Soft (Porous) Surfaces

- For soft (porous) surfaces such as carpeted floor, rugs, and drapes, remove visible contamination if present and clean with appropriate cleaners indicated for use on these surfaces. After cleaning:
  - If the items can be laundered, launder items in accordance with the manufacturer's instructions using the warmest appropriate water setting for the items and then dry items completely.
  - Otherwise, use products that are EPA-approved for use against the virus that causes COVID-19 and that are suitable for porous surfaces

### Electronics

- For electronics such as tablets, touch screens, keyboards, remote controls, and ATM machines, remove visible contamination if present.
  - Follow the manufacturer's instructions for all cleaning and disinfection products.
  - Consider use of wipeable covers for electronics.
  - If no manufacturer guidance is available, consider the use of alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens. Dry surfaces thoroughly to avoid pooling of liquids.

### Linens, Clothing, and Other Items That Go in the Laundry

- In order to minimize the possibility of dispersing virus through the air, do not shake dirty laundry.
- Wash items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely. Dirty laundry that has been in contact with an ill person can be washed with other people's items.
- Clean and disinfect hampers or other carts for transporting laundry according to guidance above for hard or soft surfaces.



(Photo: James Steinkamp Photography)



(Photo: James Steinkamp Photography)

## **Fogging: Effective against COVID-19? Can I use fumigation or wide-area spraying to help control COVID-19?**

EPA does not recommend use of fumigation or wide-area spraying to control COVID-19. The Centers for Disease Control and Prevention (CDC) recommends that you clean contaminated surfaces with liquid products, such as those provided on List N, to prevent the spread of disease. Read CDC's recommendations. Fumigation and wide-area spraying are not appropriate tools for cleaning contaminated surfaces. (from EPA website, 5/10/2020)

### **(from Aftermath: Specialists in Trauma Cleaning & Biohazard Removal):**

As we are facing the new normal, government organizations like the CDC have come together to give us real-time updates and best practices to continue to be safe. This includes guides focused on cleaning versus disinfecting, targeted to teach people how to best disinfect coronavirus and other common household germs, including cold and flu viruses. As a best practice, the CDC has approved a disinfection process, by utilizing EPA registered and approved chemicals, reducing the risks associated with COVID-19 and limit its spread.

Most of these cleaners require that a surface be cleaned with either a soap and water mixture or detergent. Once dry, the surface should then be sprayed to help combat common germs and viruses on surfaces.

The approved list of cleaners, also known as the EPA "List N" is believed to be the most effective at eradicating the virus that causes COVID-19.

For example, by wiping the surface, the friction caused by the application of the disinfectant with towels ensures maximum contact with the virus, which will lead to the greatest risk reduction.

Simply "fogging" an area with a disinfectant does not meet EPA-registered label requirements without proper pre-cleaning and may be a violation of federal law. More importantly, improper application of the disinfectant can lead to a false sense of security, an increase in health hazards and not be effective at reducing the risk of the spread of COVID-19.

However, the CDC has not deemed the "fogging" method as the most effective way to combat COVID-19, as it does not clean the affected surface.

### **Inside the Building**

Steps for completing a full building assessment (Can pull from the PASS checklist tool – policies and procedures, people roles and training, communication, architectural, access control, video surveillance, detection, and alarms)

- Re-evaluating unfinished projects
- Best practices for cleaning and sterilizing/disinfecting
- Intensify cleaning and disinfection efforts using EPA and CDC Guidelines
- Enforce social distancing / spacing and "hands free" environment
- Expect and respond to an uptick in vandalism
- Adjust and adapt mechanical systems
- Have buildings been repurposed during closures (for example as childcare facilities)? Do modifications need to be made to be ready for students
- Are there building design considerations to account for to help support social distancing while schools are open? (Table layouts in cafeterias, considerations for entry points, etc.)
- Working with budget constraints



(Photo: Ballogg Photography)



## Distancing and Social Spacing:

As schools reopen we need to consider how do we keep students and staff safe and how is social distancing enacted in school environments.

Classrooms in existing school buildings generally range from 700 to 1200 square feet for a class size of 20 to 35 students. These ranges depend on age of building, school district populations, and grade level of students. Current social distancing metrics call for a 6-foot minimum separation from other people. This reduces the number of students that can occupy current classrooms. The potential for furniture design and technology may allow these metrics to adjust. Appropriate distancing, combined with other school procedures, can allow students and staff to return to the classroom.

We reviewed several classroom layouts for a typical 30 x 30 classroom.

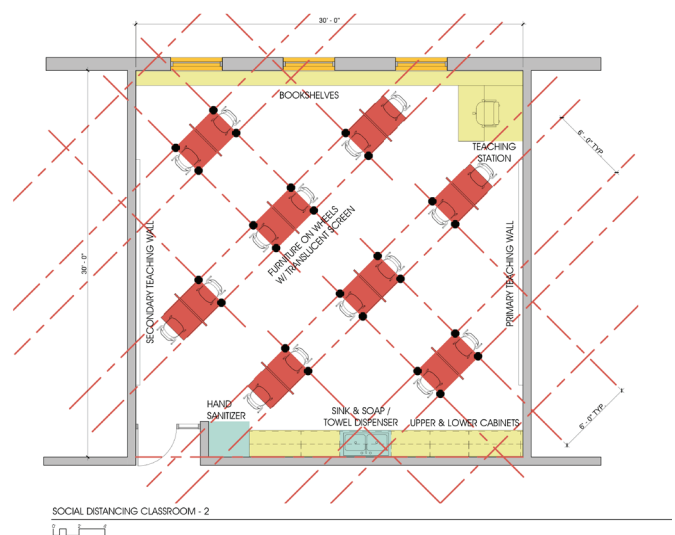
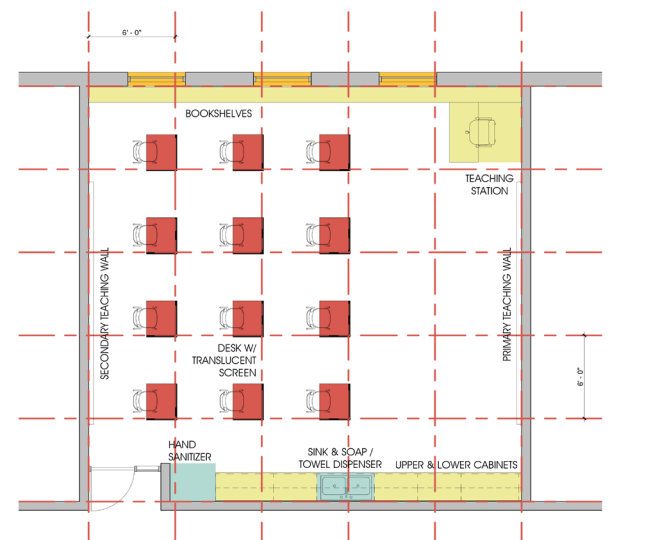
These diagrams provide potential solutions for returning students and allow for face to face group learning to take place. Combined with other technology, and procedures for student movement through the building, education can be delivered, and risk minimized.

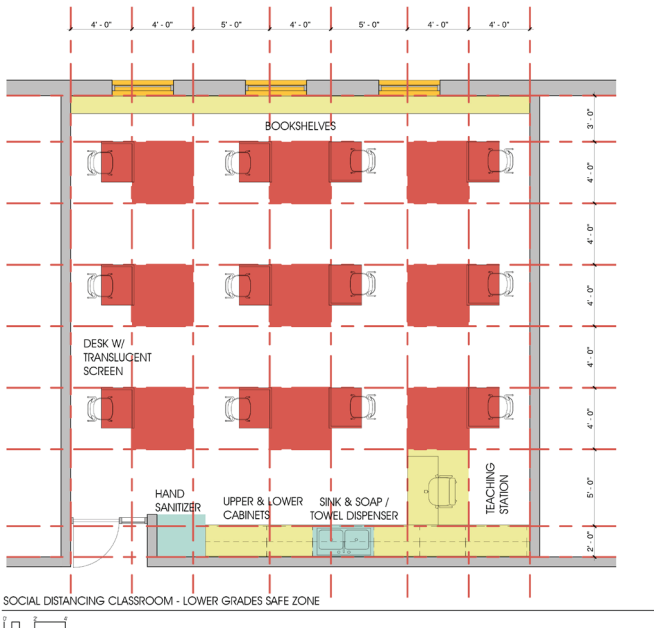
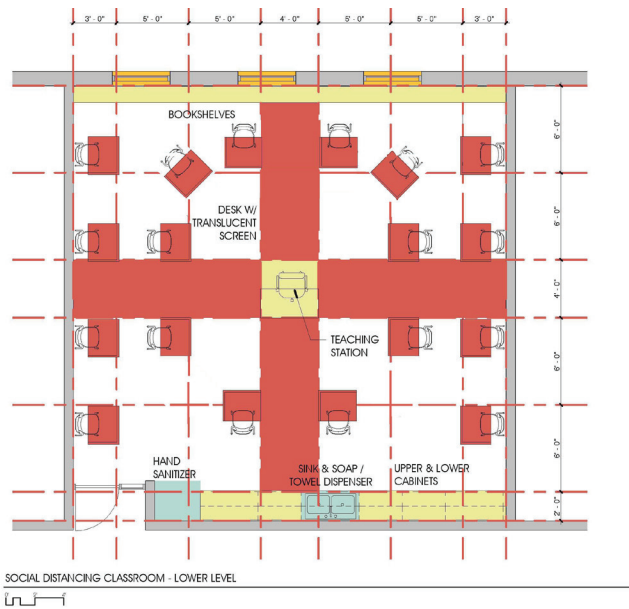
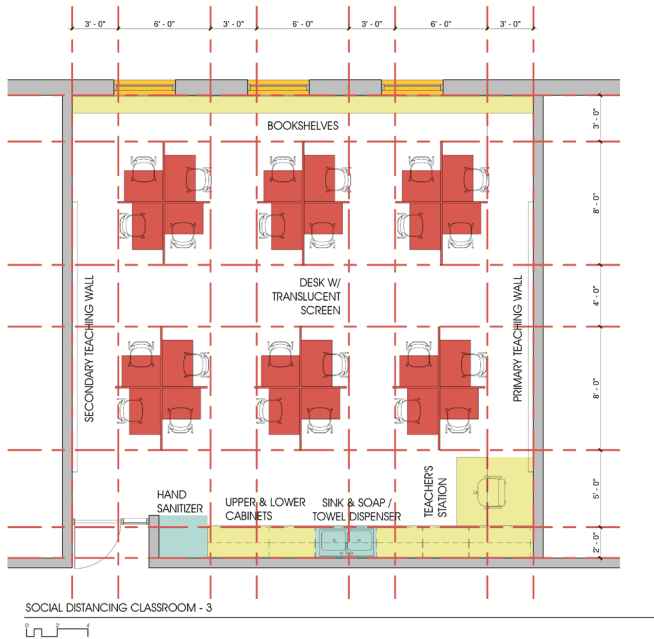
- The first of these diagrams illustrates a conceptual classroom layout based on a 6' x 6' grid within the room. It demonstrates that applying social distancing metrics means that classrooms are limited to about half the number of students that would typically be accommodated: 12 students compared to 24 students. Accepting this as a new limit will require schools to adjust schedules to allow for face to face classroom learning.

- The second diagram explores a non-typical layout for a classroom to achieve a slightly larger classroom capacity. It relies on a screen device (furnishing) to separate the paired students from one another.

- The third diagram achieves a larger classroom capacity, 24 students. It relies on the use of separation screens (furnishing) to maintain a 6' social distance. Ideally these screens would be of a clear material to allow for surveillance and supervision.

The first several diagrams are more appropriate for upper grade levels. At lower grade levels students are more “hands on” and active learners. The challenge is to maintain distance learning metrics and discourage contact and close interaction. The third and fourth diagrams illustrate arrangements that help create healthy independent (safe) zones within classrooms. Through use of tape, colored floor tile, or even mats, classrooms can be laid out to promote individual safe zones. Use of Safe Zone quadrants within a classroom can help promote smaller groups and individual “safe space.” The Safe Zone concept helps reinforce social distancing among younger students.





## Mechanical Ventilation:

Air born viruses provide a unique challenge to existing mechanical ventilation systems with-in a building. The following are low cost adjustments that can be implemented to an existing mechanical system based on ASHRAE's Position document on Infectious Aerosols dated April 14, 2020:

- Increase the outdoor air ventilation to the building by increasing the outdoor air dampers. Staff should slowly increase the position of the outside air damper to 100% and disable demand-controlled ventilation. The adjustments should be limited to increasing the damper position by 5% every hour. Staff shall monitor the buildings temperature and humidity levels and adjust the outside air damper position to meet the temperature and humidity setpoints. Typical mechanical systems are designed based on peak outside air conditions and therefore have additional capacity during part load days.
- Adjust the mechanical system's occupancy schedule to 24/7 operation. This will keep the system in occupied mode and continually bring in outside air.
- Increase the performance of filtration to a minimum of MERV-13 (ASHRAE 2017b) or the highest achievable level.
- Engage a professional engineer to determine if the filtration performance can safely be increased on the existing equipment.
- If the mechanical system utilizes an energy recovery wheel, evaluate if the energy wheel can be bypassed to avoid recirculation of contaminated exhaust. If the energy wheel has been bypassed, staff should monitor the buildings temperature and humidity levels.

Additional measures that can be implemented to an existing building include:

- Installing portable room air cleaners with HEPA filters and Ultraviolet germicidal irradiation (UVGI) devices. These systems are designed to capture and kill the contaminant and can be selected to provide 6 to 8 air changes per hour. UVGI light has been proven to kill off a large percent of mold, viruses, and bacteria from air streams. UVGI light can be retrofitted into existing mechanical equipment, however finding the correct location to install the lights can be challenging.



- Increasing the amount of outside ventilation air and the level of filtration will help dilute COVID-19 in the buildings. These are low cost adjustments that can be made by staff with the assistance of a professional engineer. Existing conditions should be documented prior to adjusting the mechanical systems for reference. The reference material can be used to return the system back to its original design.

*CDC Interim Guidance for Administrators of US K-12 Schools and Child Care Programs: Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19):*

**When there is no community transmission (preparedness phase)** The most important thing to do now is **plan and prepare**. Administrators should reinforce healthy practices among their students and staff. As the global outbreak evolves, schools should prepare for the possibility of community-level outbreaks. Schools need to **be ready** if COVID-19 does appear in their communities. Here are some strategies:

**Review, update, and implement emergency operations plans (EOPs).** This should be done in collaboration with local health departments external icon and other relevant partners. Focus on the components, or annexes, of the plans that address infectious disease outbreaks.

- Ensure the plan includes strategies to reduce the spread of a wide variety of infectious diseases (e.g., seasonal influenza). This includes strategies for social distancing and school dismissal that may be used to stop or slow the spread of infectious disease. The plan should also include strategies for continuing education, meal programs, and other related services in the event of school dismissal.

- Ensure the plan emphasizes everyday preventive actions for students and staff. For example, emphasize actions such as staying home when sick; appropriately covering coughs and sneezes; cleaning frequently touched surfaces; and washing hands often.

- o CDC has workplace resources such as posters with messages for staff about stay-

ing home when sick and how to avoid spreading germs at work.

- o Other health and education professional organizations may also have helpful resources your childcare facility or school can use or share. For example, the American Academy of Pediatrics provides information on germ prevention strategies and reducing the spread of illness in child care setting.

- Reference key resources while reviewing, updating, and implementing the EOP:

- o Multiple federal agencies have developed resources on school planning principles and a 6-step process for creating plans to build and continually foster safe and healthy school communities before, during, and after possible emergencies. Key resources include guidance on developing high-quality school emergency operations plans, and a companion guide on the role of school districts in developing high-quality school emergency operations plans.

- o The Readiness and Emergency Management for Schools (REMS) Technical Assistance (TA) Center's website external icon contains free resources, trainings, and TA to schools and their community partners, including many tools and resources on emergency planning and response to infectious disease outbreaks.

**Develop information-sharing systems with partners.**

- Information-sharing systems can be used for day-to-day reporting (on information such as changes in absenteeism) and disease surveillance efforts to detect and respond to an outbreak.

- Local health officials should be a key partner in information sharing.

**When there is minimal to moderate community transmission.**

If local health officials report that there are multiple cases of COVID-19 in the community, schools may need to implement additional strategies in response to prevent spread in the school, but they should continue using the strategies they implemented when there was no community transmission. These additional strategies include:

**Coordinate with local health officials.** This should be a first step in making decisions about responses to the presence of COVID-19 in the community. Health officials can help a school determine which set of strategies might be most appropriate for their specific community's situation.

**Implement multiple social distancing strategies.** Select strategies based on feasibility given the unique space and needs of the school. Not all strategies will be feasible for all schools. For example, limiting hall movement options can be particularly challenging in secondary schools. Many strategies that are feasible in primary or secondary schools may be less feasible in childcare settings. Administrators are encouraged to think creatively about all opportunities to increase the physical space between students and limit interactions in large group settings. Schools may consider strategies such as:

- **Cancel field trips, assemblies, and other large gatherings.** Cancel activities and events such as field trips, student assemblies, athletic events or practices, special performances, school-wide parent meetings, or spirit nights.
- **Cancel or modify classes where students are likely to be in very close contact.** For example, in physical education or choir classes, consider having teachers come to classrooms to prevent classes mixing with others in the gymnasium or music room).
- **Increase the space between desks.** Rearrange student desks to maximize the space between students. Turn desks to face in the same direction (rather than facing each other) to reduce transmission caused from virus-containing droplets (e.g., from talking, coughing, sneezing).
- **Avoid mixing students in common areas.** For example, allow students to eat lunch and breakfast in their classrooms rather than mixing in the cafeteria. If it is not possible to suspend use of common areas, try to limit the extent to which students mix with each other, and particularly with students from other classes (e.g., stagger lunch by class, segregate lunch and recess area by class, send a few students into the library to pick out books rather than going as a class, suspend the use of lockers). Restrict hallway use through homeroom stays or staggered release of classes. Try to avoid taking multiple classes to bathrooms at once (e.g.,

avoid having all classes use the bathroom right after lunch or recess). In childcare or elementary school settings, consider staggering playground use rather than allowing multiple classes to play together, and limit other activities where multiple classes interact.

- **Reduce congestion in the health office.**

For example, use the health office for children with flu-like symptoms and a satellite location for first aid or medication distribution.

- **Teach staff, students, and their families to maintain distance from each other in the school.** Educate staff, students, and their families at the same time and explain why this is important.

### Healthy Meals

- Have there been any disruptions to distribution channels? How do we Handle this?
- Kitchen cleaning recommendations
- Cafeteria cleaning recommendations
- Food sanitation guidance
- Social distancing for food service – staff and students – serving and eating (may be part of emergency mgt)
- Re-evaluating plans to prepare for a possible school closure in the future.
- Consider ways to distribute food to students.

If there is community spread of COVID-19, design strategies to avoid distribution in settings where people might gather in a group or crowd. Consider options such as “grab-and-go” bagged lunches or meal delivery. (CDC Guidelines)



(Image: Wiki Commons, edited)



## Getting to and From School

Schools should prepare for increased parent drop-offs, pick-ups traffic at school buildings. This may also entail distancing standing vehicles, reconfiguring access, and parking areas, and adjusting signage.

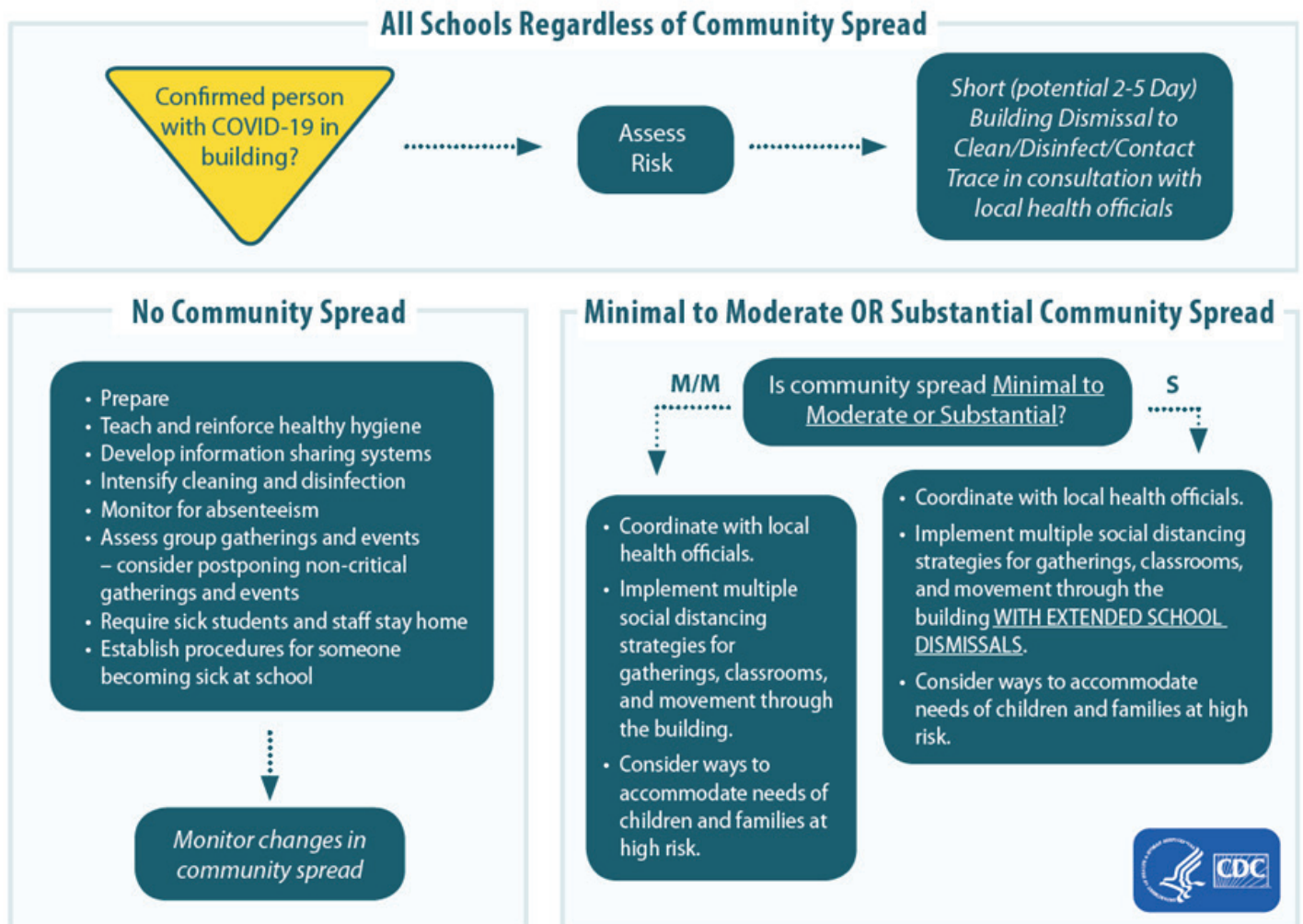
- Policies and procedures for drivers
- Training for drivers on new procedures
- Were buses repurposed for food delivery, mobile hotspots, etc.? What work needs to be done so they are ready for student transportation?
- What are best practices for cleaning and sterilizing/disinfecting buses
- Has regular maintenance been occurring? If not, what are best practices to ensure the fleet is ready for student transportation?
- Re-evaluation of travel routes. Has the outbreak caused any foreseen issues to travel routes that

would require modifications to be made?

- Social distancing considerations for kids riding busses?
- **Stagger arrival and/or dismissal times.** These approaches can limit the amount of close contact between students in high-traffic situations and times.
- **Limit cross-school transfer for special programs.** For example, if students are brought from multiple schools for special programs (e.g., music, robotics, academic clubs), consider using distance learning to deliver the instruction or temporarily offering duplicate programs in the participating schools.

CDC Interim Guidance for Administrators of US K-12 Schools and Child Care Programs: Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19)

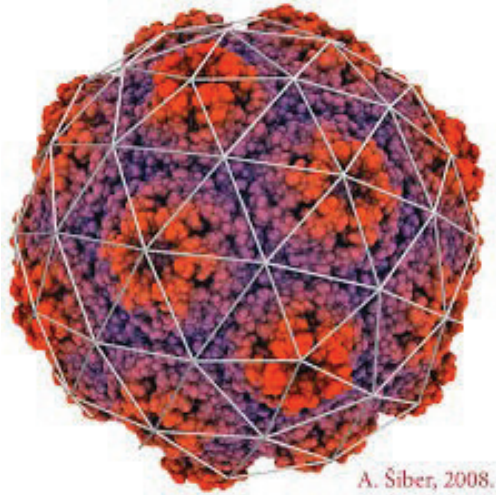
## School Decision Tree



## VIRUS FOR YOUNG LEARNERS: TRIANGLE STRUCTURE AND DESIGN FOR EFFICIENCY (AN EDUCATIONAL SIDEBAR FOR STUDENTS):

Is it any comfort that the virus structure is geodesic? No, but like all nature's design, it is very interesting.

**Geodesic virus structure (too small to see without a powerful microscope):**

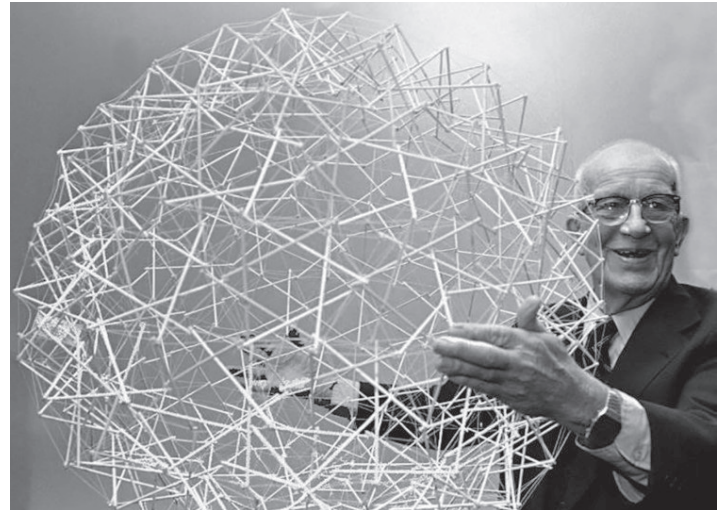


**Geodesic Building Structure:**



In 1962, Donald Caspar and Aaron Klug formulated their theory of virus structure. They were inspired by the first book on Fuller's work, including his geodesic domes, which gave the virologists the insight that stimulated the development of the Caspar-Klug theory of quasi-equivalence, describing the near-identical way in which large numbers of identical protein units form capsids through a

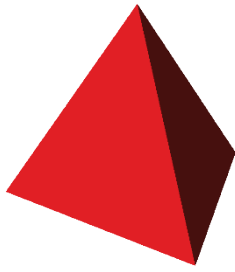
self-assembly process of triangulation. They were so excited about this they called Buckminster Fuller in Carbondale, Illinois, (where he lived in a Geodesic dome and taught at Southern Illinois University), to tell him. It turns out nature was working with the same forms Fuller was, and for the same reasons: for economy and efficiency of material.



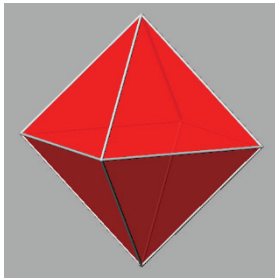
Fuller of course knew that nature loves triangles, which is why he used these forms when developing his designs derived from nature. Fuller was concerned with doing "more with less." He liked lean efficient structures and was fond of asking people how much their buildings weigh.

A virus particle consists of two chemical components: a core composed of nucleic acid and a shell, known as a capsid, which is made from a network of individual proteins. Crick and Watson (the scientists who determined the DNA molecule is a spiral helix) had reasoned earlier that the virus protein shell was composed of identical subunits and, presuming specific bonding between subunits, they must be packed together in a symmetrically regular manner. They predicted that spherical viruses might have tetrahedral, octahedral, or icosahedral symmetry. The frequent occurrence of icosahedral symmetry in nature is due to the principle of economy as the structure provides the most efficient packing of subunits.

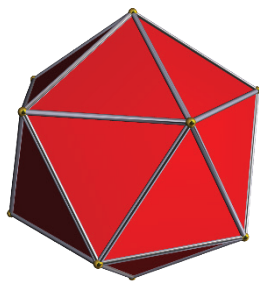




**Tetrahedron**



**Octahedron**



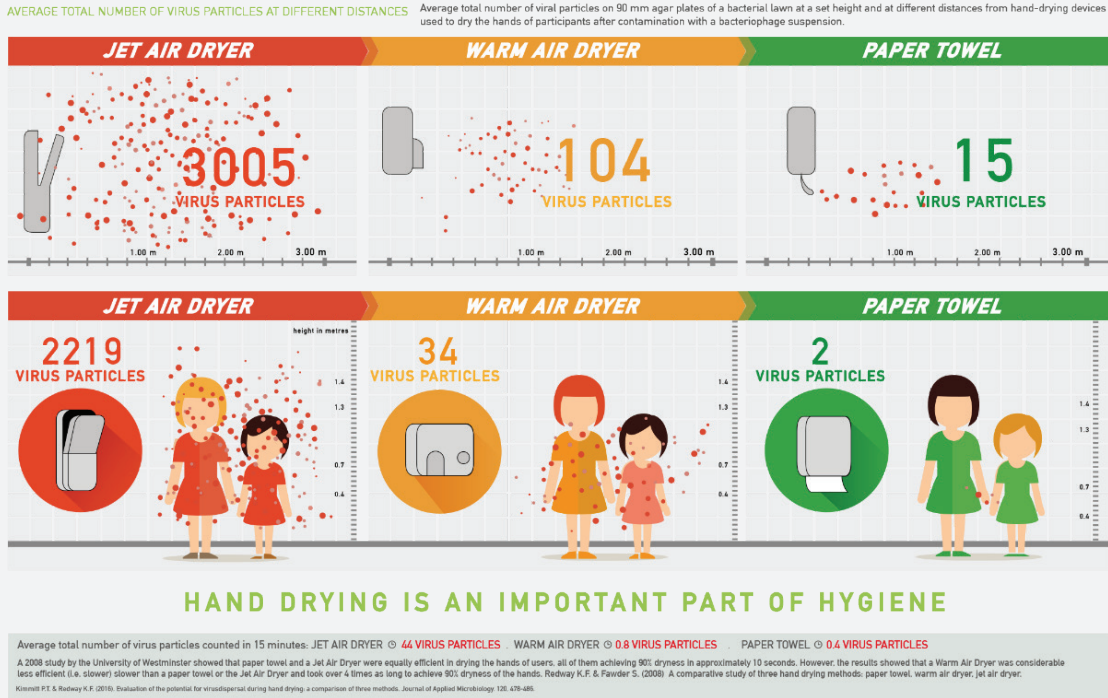
**Icosahedron**

Fortunately, though virus structure is very efficient and even has a certain natural beauty owing to this efficiency, proteins are not a stable material to build with: Viruses don't last forever unless they find a living host and produce more virus, which is why we want to wash them off, avoid breathing them, and hide from them. They are subject to decay if they are outside a human body, where bleach or soap can destroy them fairly effectively.

# PAPER TOWELS BETTER THAN AIR DRYERS TO STOP VIRUS SPREAD

by George Citroner on April 17, 2020, for Healthline.com

## Potential for virus dispersal in the washroom after hand washing



Graphic: Nuwkem Hygiene **The use of a jet air dryer can expose you to approximately 800 times more harmful bacteria**

- The ongoing COVID-19 pandemic has brought a laser focus on handwashing and hygiene.
- A new study finds using paper towels is more effective than conventional jet air dryers for removing microbes when drying poorly washed hands.
- The research team discovered there was much more environmental contamination after jet air dryer use.

*All data and statistics are based on publicly available data at the time of publication. Some information may be out of date. Visit our coronavirus hub and follow our live updates page for the most recent information on the COVID-19 outbreak.*

A study recently published by U.K.-based researchers, and to be presented at the 2019 European Congress on Clinical Microbiology and Infectious Diseases, finds using paper towels is more effective than conventional jet air dryers for removing microbes when drying poorly washed

hands. “The problem starts because some people do not wash their hands properly,” study author Mark Wilcox, a University of Leeds microbiologist, said in a statement. “When people use a jet-air dryer, the microbes get blown off and spread around the toilet room.”

### Poorly washed hands

The U.K.-based scientists simulated hand contamination in four volunteers using a “Bacteriophage Trusted Source”: A virus that infects bacteria yet is harmless to humans.

The participant’s hands were not washed after contamination to simulate poorly washed hands. They were then dried using either paper towels or a jet air dryer.

“We often say that handwashing is the key to preventing the spread of illness. But wet hands increase the risk of transmitting bacteria, so drying is an equally important step in prevention,” urgent care specialist Dr. Theresa Lash-Ritter told Cleveland Clinic’s Health Essentials series.



Each volunteer wore an apron so the degree of body or clothing contamination during hand-drying could be measured. Drying was done in a hospital public toilet. Samples were collected from public areas after the participants exited. Virus samples were collected from areas that included doors, chairs, phones, and clothing worn by the study participants.

### **Jet air dryers do not just blow hot air**

Although both paper towels and the jet air dryer removed significant amounts of virus contamination from hands, the research team discovered there was much more environmental contamination after jet air dryer use. The findings indicate there was fivefold more virus dispersed to clothing. Surface contamination was more than 10 times higher after jet air dryer use compared with hand-drying by paper towel.

According to researchers, this means microbes cannot only be transferred directly from hands that are still contaminated after hand-drying, but also indirectly from that person's body, which was contaminated by viruses blown by the jet air dryer blast.

“Crucially, these differences in contamination translate into significantly greater levels of microbe contamination after jet air drying versus paper towel use from hands and body beyond the toilet/washroom,” the study authors wrote. “As public toilets are used by patients, visitors and staff, the hand drying method chosen has the potential to increase (using jet dryers) or reduce (using paper towels) pathogen transmission in hospital settings.”

They also believe these findings are relevant to controlling the SARS-CoV-2 virus that's spreading worldwide, and that “paper towels should be the preferred way to dry hands after washing and so reduce the risk of virus contamination and spread.” Although it can be argued that this study was too small to firmly establish whether paper towels beat using a jet air dryer, this is only the latest study to discover the same thing.

### **European study finds jet air dryers contaminate surfaces**

Scientists in the United Kingdom, France, and Italy teamed up for a study to settle the question of whether hand dryers or paper towels are best at preventing the spread of germs.

For multiple 4-week periods, the scientists tracked how several bacteria known to cause disease in hospitals spread (like antibiotic-susceptible and resistant *Staphylococcus aureus* Trusted Source) in multiple public bathrooms of several hospitals. Each of the bathrooms in the study had both paper towels and a jet air dryer installed. However, only one hand-drying method was allowed per bathroom. This allowed them to compare how each method performed within the same hospital.

Although there were differences between the hospitals, a consistent pattern did emerge. The bathrooms using jet air dryers were covered with more germs than those where only paper towel was used. “In effect, the dryer creates an aerosol that contaminates the toilet room, including the dryer itself and potentially the sinks, floor and other surfaces, depending on the dryer design and where it is sited,” said Wilcox, who supervised this study, in a statement.

### **How to properly wash hands**

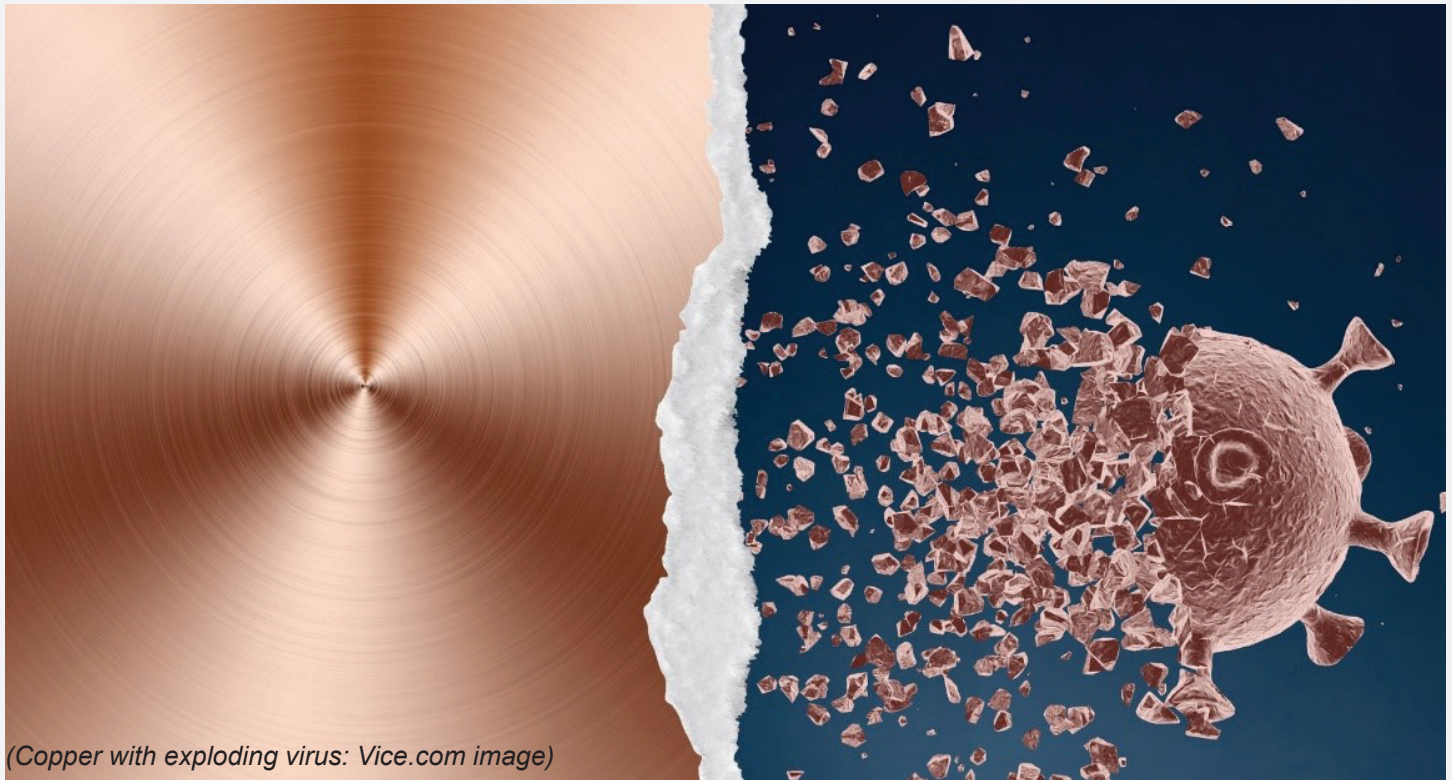
According to Dr. Nikhil Bhayani, FIDSA, an infectious disease physician with Texas Health Resources, following these five steps will help you clean germs (like the virus that causes COVID-19) from your hands — which means it won't matter which hand-drying method you use:

1. Wet your hands with clean, running water (warm or cold). Turn off the tap and apply soap.
2. Lather your hands by rubbing them together with the soap. Lather the backs of your hands, between your fingers, and under your nails.
3. Scrub your hands for at least 20 seconds. “Need a timer?” Bhayani asked. “Hum the ‘Happy Birthday’ song from beginning to end twice.”
4. Rinse your hands well under clean, running water.
5. Dry your hands using a clean towel or air-dry them.

## COPPER'S VIRUS-KILLING POWERS WERE KNOWN EVEN TO THE ANCIENTS

The SARS-CoV-2 virus endures for days on plastic or metal but disintegrates soon after landing on copper surfaces. Here is why:

By Jim Morrison,  
SMITHSONIANMAG.COM, April 14, 2020



*(Copper with exploding virus: Vice.com image)*

When researchers reported last month that the novel coronavirus causing the COVID-19 pandemic survives for days on glass and stainless steel but dies within hours after landing on copper, the only thing that surprised Bill Keevil was that the pathogen lasted so long on copper.

Keevil, a microbiology researcher at the University of Southampton (U.K.), has studied the antimicrobial effects of copper for more than two decades. He has watched in his laboratory as the simple metal slew one bad bug after another. He began with the bacteria that causes Legionnaire's Disease and then turned to drug-resistant killer infections like Methicillin-resistant *Staphylococcus aureus* (MRSA). He tested viruses that caused worldwide health scares such as Middle East Respiratory Syndrome (MERS) and the Swine Flu (H1N1) pandemic of 2009. In each case, copper contact killed the pathogen within minutes. "It just blew it apart," he says.

In 2015, Keevil turned his attention to Coronavirus 229E, a relative of the COVID-19 virus that causes the common cold and pneumonia. Once again, copper zapped the virus within minutes while it remained infectious for five days on surfaces such as stainless steel or glass.

"One of the ironies is, people [install] stainless steel because it seems clean and, in a way, it is," he says, noting the material's ubiquity in public places. "But then the argument is how often do you clean? We don't clean often enough." Copper, by contrast, disinfects merely by being there.



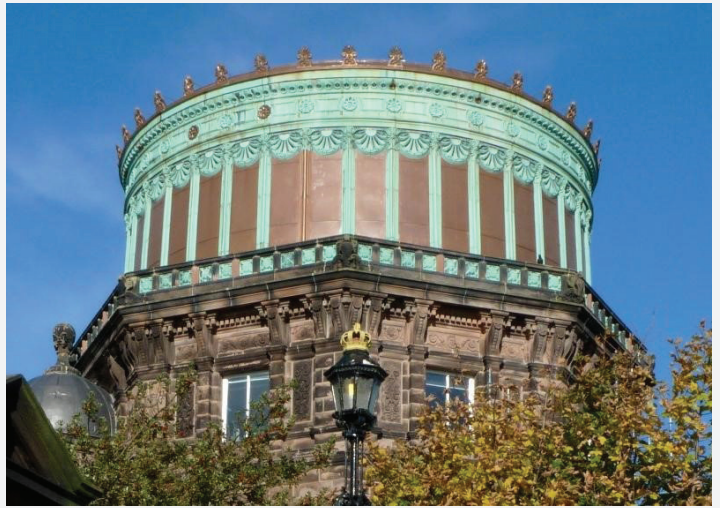
## Ancient Knowledge

Keevil's work is a modern confirmation of an ancient remedy. For thousands of years, long before they knew about germs or viruses, people have known of copper's disinfectant powers. "Copper is truly a gift from Mother Nature in that the human race has been using it for over eight millennia," says Michael G. Schmidt, a professor of microbiology and immunology at the Medical University of South Carolina who researches copper in health-care settings.

The first recorded use of copper as an infection-killing agent comes from Smith's Papyrus, the oldest-known medical document in history. The information therein has been ascribed to an Egyptian doctor circa 1700 B.C. but is based on information that dates back as far as 3200 B.C. Egyptians designated the ankh symbol, representing eternal life, to denote copper in hieroglyphs.

As far back as 1,600 B.C., the Chinese used copper coins as medication to treat heart and stomach pain as well as bladder diseases. The sea-faring Phoenicians inserted shavings from their bronze swords into battle wounds to prevent infection. For thousands of years, women have known that their children did not get diarrhea as frequently when they drank from copper vessels and passed on this knowledge to subsequent generations. "You don't need a medical degree to diagnose diarrhea," Schmidt says.

And copper's power lasts. Keevil's team checked the old railings at New York City's Grand Central Terminal a few years ago. "The copper is still working just like it did the day it was put in over 100 years ago," he says. "This stuff is durable, and the anti-microbial effect doesn't go away."



The East Tower of the Royal Observatory, Edinburgh. The contrast between the refurbished copper installed in 2010 and the green color of the original 1894 copper is clearly seen. (Wiki Commons)

## Long-Lasting Power

What the ancients knew, modern scientists and organizations such as the Environmental Protection Agency have confirmed. The EPA has registered about 400 copper surfaces as antimicrobial. But how exactly does it work?

Heavy metals including gold and silver are antibacterial, but copper's specific atomic makeup gives it extra killing power, Keevil says. Copper has a free electron in its outer orbital shell of electrons that easily takes part in oxidation-reduction reactions (which also makes the metal a good conductor). As a result, Schmidt says, it becomes a "molecular oxygen grenade." Silver and gold do not have the free electron, so they are less reactive.

Copper kills in other ways as well, according to Keevil, who has published papers on the effect. When a microbe lands on copper, ions blast the pathogen like an onslaught of missiles, preventing cell respiration and punching holes in the cell membrane or viral coating and creating free radicals that accelerate the kill, especially on dry surfaces. Most importantly, the ions seek and destroy the DNA and RNA inside a bacteria or virus, preventing the mutations that create drug-resistant superbugs. "The properties never wear off, even if it tarnishes," Schmidt says.



(Photo: Ballogg Photography)

Schmidt has focused his research on the question of whether using copper alloys in often-touched surfaces reduces hospital infections. On any given day, about one in 31 hospital patients has at least one healthcare-associated infection, according to the Centers for Disease Control, costing as much as \$50,000 per patient. Schmidt's landmark study, funded by the Department of Defense, looked at copper alloys on surfaces including bedside rails, tray tables, intravenous poles, and chair armrests at three hospitals around the country. That 43-month investigation revealed a 58 percent infection reduction compared to routine infection protocols.

Further research stalled when the DOD focused on the Zika epidemic, so Schmidt turned his attention to working with a manufacturer that created a copper hospital bed. A two-year study published earlier this year compared beds in an intensive care unit with plastic surfaces and those with copper. Bed rails on the plastic surfaces exceeded the accepted risk standards in nearly 90 percent of the samples, while the rails on the copper bed exceeded those standards on only 9 percent. "We again demonstrated in spades that copper can keep the built environment clean from microorganisms," he says.

Schmidt is also a co-author of an 18-month study led by Shannon Hinsaleasure, an environmental microbiologist at Grinnell College, that compared the bacterial abundance in occupied and unoccupied rooms at Grinnell Regional Medical Center's 49-bed rural hospital. Again, copper reduced bacterial numbers. "If you're using a copper alloy that's always working," Hinsaleasure says, "you still need to clean the environment, but you have something in place that's working all the time (to disinfect) as well."

### **Harnessing Copper**

Keevil and Schmidt have found that installing copper on just 10 percent of surfaces would prevent infections and save \$1,176 a day (comparing the reduced cost of treating infections to the cost of installing copper). Yet hospitals have been slow to respond. "I've been surprised how slow it has been to be taken up by hospitals," Hinsaleasure adds. "A lot of it has to do with our healthcare system and funding to hospitals, which is very tight.

When our hospital redid our emergency room, we installed copper alloys in key places. So, it makes a lot of sense when you're doing a renovation or building something that's new. It's more expensive if you're just changing something that you already have."

The Sentara Hospital system in North Carolina and Virginia made copper-impregnated surfaces the standard across 13 hospitals in 2017 for over-bed tables and bed rails after a 2016 clinical trial at a Virginia Beach hospital reported a 78 percent reduction in drug-resistant organisms. Using technology pioneered in Israel, the hospital has also moved to copper-infused bedding. Keevil says France and Poland are beginning to put copper alloys in hospitals. In Peru and Chile, which produce copper, it is being used in hospitals and the public transit systems. "So it's going around the world, but it still hasn't taken off," he says.

If copper kills COVID-19, should you periodically roll a few pennies and nickels around in your hands? Stick with water, soap, and sanitizer. "You never know how many viruses are affiliated with the hand, so it may not completely get them all," Schmidt says. "It will only be a guess if copper will completely protect."



(Photo: Ballogg Photography)



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*“Copper’s Virus-Killing Powers Were Known Even to the Ancients,” By Jim Morrison, SMITHSONIANMAG.COM, April 14, 2020*

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