



Reopening America: Strategies for Safer Schools

Overview

Schools are the beating heart that allow our communities to flourish by nurturing the next generations of talent, heroes, and leaders. While their primary purpose is to educate, school buildings and campuses provide a number of other community functions. Students, families, and communities depend on schools for food, health services, social-emotional support, creative and physical outlets, protection, and human connectivity. For the 2019–20 school year, elementary and secondary schools in the United States supported nearly **56.5 million students** while employing **3.7 million teachers**.

During the pandemic, more than **130,000 elementary and secondary school buildings** in the US were closed, sending all students home. Innovations like virtual learning enabled educators to continue teaching students. However, barriers to virtual learning exacerbated **socio-economic inequities among students**. Accessibility to virtual classrooms varies depending on technological means, including internet capabilities and computer or tablet availability. In some households, students learn and complete school work on **smartphones that are sometimes shared among siblings**.

Further, the ability to go to school can mean the difference between life and death for some students. Hunger rates for children are **staggering**, the education success gap is **widening**, domestic violence threatens lives, and physical inactivity adds to our nation's obesity challenges. Because schools are safe havens for so many, it is critical that we begin to pave the path to reopening our schools in a safe and measured way.

While virtual learning will likely continue in some form after schools reopen, returning to classrooms—even on a limited basis—is critical to students' emotional and mental well-being. While curriculum plays a significant role in preparing children for success as an adult, relationships and interpersonal experiences are just as crucial to childhood development. Many students are longing to reconnect with **friends and teachers and miss sharing experiences like classroom field trips and graduation ceremonies**.

For the 2020–21 school year, districts face the difficult task of determining if their school facilities will reopen this fall; and if so, how can they accommodate a basic level of operations within an acceptable level of risk? These are difficult and complex decisions that need to be broken down into **manageable pieces**. The steps that we take today in response to the COVID-19 pandemic will lay the groundwork for the proactive, long-term preparedness necessary to ensure our schools are resilient to future shocks and stresses, including potential influenza pandemics.

Architects can utilize problem-solving and thinking skills to provide input to school districts across the nation as they begin to formulate re-occupancy plans, from spatial reconfigurations to ventilation considerations. **The American Institute of Architects (AIA) established a team of architects, public health experts, engineers, and facility managers to assess and prepare the built environment for reopening during outbreak cycles of the pandemic**. The following report summarizes the team's findings specifically related to K-12 schools and provides insights and guidance to education officials on reopening.

Background

K-12 schools are vital social infrastructure within communities. A holistic and proactive approach based on current science and public health information must exist before they can reopen.

Many factors need to be taken into account given that school buildings vary in age, square footage, location, context, condition, spatial constraints, infrastructure, and student populations. Generally, schools include a variety of spaces, including classrooms, labs, administrative offices, wide corridors, outdoor areas, a cafeteria, and a nurse's office. Buildings are designed—and sized—based on code and pedagogical requirements, durability, security, and other best practices for the age and population that also fulfill state and local codes and policies. The needs of students, depending on age groups and grade levels, also need to be considered. For example, children in kindergarten will have very different needs and ability to comply with changing behavior norms, than those students in high school.

Student population sizes and activities will also need to be examined. In 2020, the national average public school population is approximately **526 students**. Over the course of a typical school day, there are several high-risk occasions where students and faculty gather in close proximity, including arrivals, departures, all-school assemblies, lunchtime, and group-based extracurricular activities. Within the context of pandemic recovery, it is important to limit these assembly-type gatherings in order to reduce the likelihood of spreading an infectious disease. It is also important to limit the impact of activities—such as singing, running, and cheering—that can contribute to **super-spreader events**.

This report provides basic building blocks that are flexible enough to be adjusted on a case-by-case basis when working with a team of architects, engineers, public health experts, and facility managers to adapt education facilities to mitigate risk of SARS-CoV-2 transmission.

Consideration for reopening schools

- Follow federal, state, and local laws and regulations, which will determine when schools reopen to the public and provide a legal basis for school and educational activities to resume operations.
- Determine administrative protocols and how to communicate them to stop the transmission of germs before people enter the building. Adopt **policies** requiring symptomatic students and staff—or those who have been in contact with someone known to be ill or who has tested positive—to stay home.
- Develop a district-wide master plan of services and an inventory of available spaces.
- Define the basic spaces and activities within a school building that will be required to operate.
- Establish partnerships with public and private entities, such as museums and community centers, that can provide additional facility resources. These partnerships can decentralize school-based activities, while strengthening community response.
- Consider school functions and activities that can be performed in an alternative setting, including for populations who have dependencies on staff, facilities, or other materials provided by schools. For example, older children are better able to undertake remote learning and individual projects.
- Evaluate the condition of the building and its systems. Buildings with low or no occupancy and that were not maintained during closure may need to operate on a limited schedule and may require recommissioning to be safely re-occupied.
- Promote positive mental and socio-emotional health during the pandemic by providing an inclusive and welcoming environment that allows teachers and staff to integrate back into the school community. Students and staff may demonstrate heightened levels of stress, fear, and confusion returning to classrooms. There may also be social stigma attached to students and staff who contracted COVID-19, recovered, and returned to school settings.

Step-by-step Risk Management Plan for Buildings

When reopening schools, education officials can utilize a seven-step [Risk Management Plan for Buildings](#) to assess hazards, prioritize and apply architectural or engineering strategies (controls), and reduce risk. The primary objective is protecting the health and safety of students, teachers, and staff while promoting a positive and welcoming learning environment that is also secure.

Hazards and strategies in schools

Mitigations for reopening schools should address the following hazards:

- Virus transmission through close personal contact ([being within six feet of another person for more than 15 minutes](#)) among teachers, staff, and students in large assembly gatherings, classrooms, and physical education activities. This is the primary way COVID-19 is transmitted and can be the focus of mitigation strategies..
- Virus transmission through contact of shared surfaces. All contact surfaces should be considered, including, but not limited to, desks, lab and gym equipment, books, water fountains, door handles, and personal possessions (such as sharing pencils, backpacks, and electronic devices).
- [Aerosolized transmission of virus droplets](#) possibly through HVAC systems.
- [Fecal-oral transmission](#) via shared restrooms.

For more detailed information on public health hazards and considerations in schools, see AIA's [COVID-19 emerging research and public health data](#).

Control strategies that can mitigate these hazards in schools include the following. All strategies may or may not be appropriate or desirable.

- Avoiding large group gatherings and pinch-points where individuals come into close proximity with one another.
- Determining school capacity within the context of physical distancing guidelines and maximizing school capacity by assessing appropriateness of converting common spaces (gymnasiums, libraries, cafeterias, and media centers) to academic spaces.
- Breaking down the school into separate zones by grade level and class to reduce personal contact. A cluster of classrooms can be grouped around a common bathroom, hallway, and egress points to reduce the numbers of students and their movements in each area of the school building over the course of the day.
- Posting signage and floor markings in queuing areas to indicate adequate physical distancing.
- Increasing use of outdoor spaces and adding temporary structures, such as canopies, tents, etc., to reduce dense occupancy in the building.

- Implementing increased cleaning and maintenance protocols to reduce virus transmission. Building facility staff should frequently disinfect all high-touch spaces, surfaces, hardware, furnishings, and classroom tools, at a minimum, per CDC guidelines.
- Engaging students in the cleaning and sanitization process as they start and finish activities.
- Posting signage on the exterior and throughout the building describing implemented mitigation strategies and expectations of occupants, including PPE requirements, cleaning/disinfecting policies, behavioral reminders, and scheduling.
- Recommissioning and enhancing ventilation systems. A study from the [University of Nebraska](#) found that 75–80% of 220 K-12 schools in Nebraska and Iowa did not meet the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) minimum standard for ventilation rates ([Standard 62.1-2010](#)). ASHRAE has developed guidance specific to schools that includes, but is not limited to, air flushing of all spaces prior to re-occupancy and on a daily basis as well as new recommendations for temperature (68–78 degrees) and relative humidity in rooms (between 40–60%). Where possible, utilize CO₂ monitors to meet ASHRAE standards and increase air filtration from the typical [MERV 8 to MERV 13](#) filter. Consider UV lighting in air handling systems and/or classrooms where appropriate. Consult with a mechanical engineer or HVAC specialist when considering changes to existing systems to ensure proper function and reduce chances of mold and mildew growth over the long term.
- [Recommissioning building water distribution systems](#), including equipment with water reservoirs (i.e., anything utilizing water, such as water heater storage, ice machines, drinking fountains, decorative fountains, and coffee machines), if the building has remained unoccupied or shutdown.
- Educating students and staff about COVID-19 and how to reduce its spread.
- Adopting PPE policies—in alignment with CDC guidelines—for protecting staff, teachers, and students, especially school nurses who may need to interact with symptomatic individuals

Entrances and circulation spaces

In order to promote school security, students typically funnel through a single point of entry that is closely monitored by teachers and/or security staff. Perimeter doors are typically out of sight and designed for emergency egress only. Entrances and circulation areas present pinch points that can limit the ability to properly physically distance. This can create longer queues at entrances, extending the amount of time it takes to enter a building, and cause congestion in corridors. [If feasible, schools may consider screening students and staff for COVID-19 symptoms as they enter schools.](#)

Control strategies that can reduce risk at entrances and in circulation spaces, include:

- Staggering schedules, including opening and closing times, to reduce traffic at entrances at any one time.

- Creating queuing zones at a building entrance with signage and ground markings indicating minimum six-foot distancing.
- Constructing temporary infrastructure, such as canopies, to support queuing during inclement weather.
- Setting up a supervised quarantine area for symptomatic students.
- Utilizing multiple points of entry during arrivals and departures while maintaining a secure perimeter.
- Identifying separate staff and student entry points.
- Implementing hands-free door openers and hardware to limit touching of surfaces.
- Limiting access to only essential staff and visitors. During the school day, consider having visitors and deliveries come through the main or other typical entry and continue to follow security procedures.
- Providing physical distancing signage and floor markings within the front office.
- Providing additional protection for reception staff, such as a vertical plexiglass sneeze guards.
- Creating one-way circulation in hallways to maintain physical distancing and reduce face-to-face contact while maintaining access to emergency routes and exits.
- Removing or relocating obstacles (e.g., corridor lockers) to create more space and support physical distancing.
- Blocking off water fountains or replacing with touchless bottle filling stations.

Classrooms

The average classroom occupancy is [20 students in a typical US public school](#). Classrooms can range from 700–1,300 square feet depending on state standards and student age groups. Typically, students sit at desks that are in close proximity to one another and for periods longer than 15 minutes, which is the current exposure threshold for “[contact](#).” Students also typically work together in small groups while facing each other and move around the classroom for learning activities. Additionally, science and other interactive programs promote group activities and may require shared equipment. Students frequently touch shared surfaces, such as desks, chairs, books, and equipment, which can increase the spread of germs, including SARS-CoV-2.

Control strategies to reduce the risk in classrooms and accommodate square footage needs could include:

- Repurposing cafeterias, gymnasiums, and libraries as larger classroom spaces.

- Considering remote learning for upper grades (6–12) and using a majority of in-person teaching spaces for children with special needs and students for whom remote learning is less effective and a greater challenge if district enrollment exceeds new system capacity.
- Reducing occupancy in classrooms and the number of desks and worktables.
- Enlarging space for students by removing nonessential furniture components.
- Turning desks to face the same direction and fixing casters to limit furniture mobility.
- Mapping floors to delineate one-way walking paths and furniture locations.
- Relocating materials and storage to clean rooms more easily.
- Lockable storage for hazardous cleaning and disinfection products for staff use only.
- Where physical separation is not possible, securely installing cleanable dividers between worktables or office systems can reduce risk but be sure they do not pose a tripping hazard nor disrupt ventilation or fire systems. Plexiglass and other transparent materials can further help to maintain visual connections
- Using cubbies, shelf units, and other classroom furniture as low barriers adjacent to student desks or teaching areas, etc.
- Limiting the number of students in an area to two or three, if the classroom is divided into activity zones (center-based learning) where students rotate in small groups to interact with the teacher.
- Creating a handwashing station in or adjacent to the classroom or sanitizing station(s).
- Adding a touchless water bottle filling station in classrooms.
- Enhancing acoustic treatment so that teachers and students can be heard when speaking through masks.
- Providing video conferencing and projection equipment for remote learning that allows viewing of the teacher and white board. Include microphone and speakers for teachers in large classrooms
- Opening windows as much as possible for fresh air.

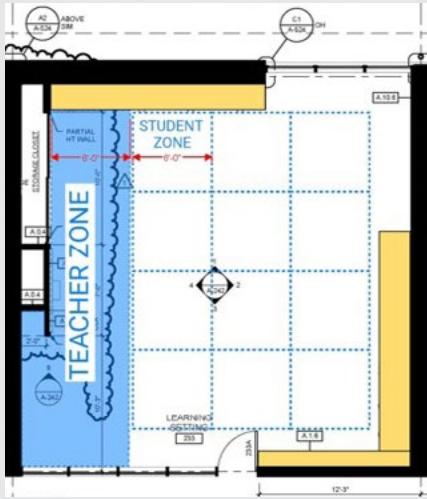
Administrative strategies for classrooms to reduce risk include:

- Requiring students to wear masks in school, as appropriate for their age and ability, except when eating.
- Teaching some students in class and others remotely.

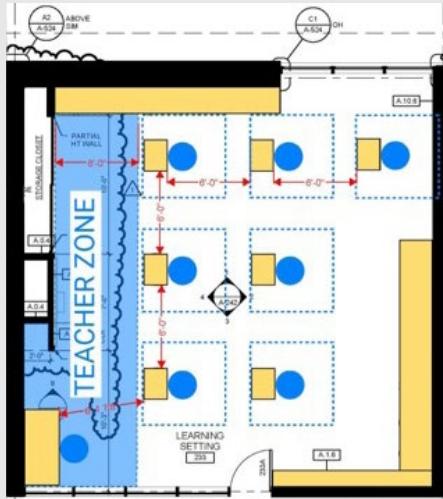
- Scheduling students for half-day in-class instruction five days per week or for full days two to three days per week (e.g., Monday, Wednesday, and every other Friday and Tuesday, Thursday, and every other Friday).
- Rotating teachers rather than students between classrooms for specialized programs like art class.
- Ensuring staff clean and disinfect shared supplies or bring new supplies to each class.
- Establish day-to day cleaning and disinfection protocols as well as extensive cleaning and disinfection protocols throughout the school week.
- Conducting classes outdoors to increase natural air flow and connections with the natural environment, which can reshape the learning landscape into a laboratory.

Analysis of physical distancing in classroom application

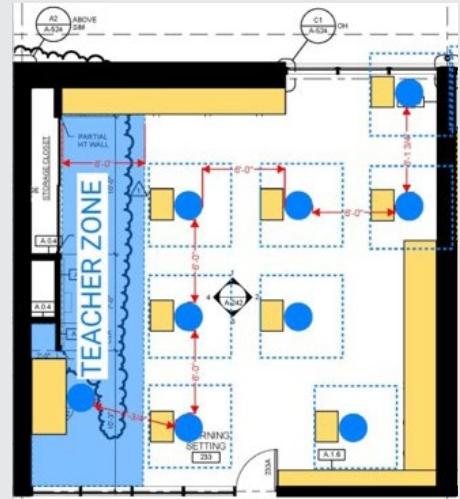
6' student space



6' between desks



6' between students



Single classroom (800 sq. ft.)

Pre-pandemic capacity: 24 desks (33 sf/student)
Pandemic capacity: 12 desks (66 sf/student)

The numbered strategies below reference the [AIA Re-occupancy Assessment Tool](#) framework.

3.2.2 Remove non-essential furniture, equipment, and instructional materials to increase floor area and ease of cleaning

3.9.8 Enhance acoustic treatment so students can hear and be heard through masks (ceiling application in this example)



Double classroom (1,600 sq. ft.)

Pre-pandemic capacity: 48 desks (33 sf/student)
Pandemic capacity: 24 desks (66 sf/student)

The numbered strategies below reference the [AIA Re-occupancy Assessment Tool](#) framework.

3.2.2 Increase floor area by opening movable partition

3.1.3 Provide outdoor programming spaces

3.3.5 Utilize natural daylight where possible

3.6.1 Utilize operable windows for outside air intake if possible



3.9.8 Enhance acoustics by equipping teacher with personal headset microphone and speakers, particularly in large spaces when masks are being worn

3.2.2 Remove/relocate corridor lockers to provide a wider path for common travel direction

3.2.1 Stagger desks where possible and position to face the same direction

3.4.5 Map the floor surface to delineate circulation and/or furniture location

3.2.1 Provide or retrofit locking casters to limit furniture mobility where mobility could pose an issue for physical distancing

4.3.5 Provide disposable towels and disinfectants for students to clean desks prior to and after use

3.2.1 Stagger use of cubbies for student belongings

Cafeterias and food service

Cafeterias and food service areas can present risk due to the high number of transactional activities that can spread pathogens. Additionally, cafeterias are typically intended for large groups, which is problematic for physical distancing and could require extensive queueing for food selection. Closing cafeterias for dining and repurposing them as instructional spaces is an opportunity to meet educational spatial needs. Strategies for food service while cafeterias are closed include:

- Asking staff and students to bring water bottles and brown bag lunches.
- Providing boxed meals or food vendor delivery to students in classrooms or for outdoor dining on staggered schedules; including accommodating nutritional needs of underserved students who rely on school lunch as the main meal of their day.
- Providing handwashing or hand sanitizing stations in classrooms with adequate and touchless recycling and trash receptacles.
- Eliminate the use of vending machines, devices, or salad bar areas with communal surfaces to acquire food or snacks.

When the number of COVID-19 disease cases are significantly reduced in the local community area, schools may consider the following strategies when resuming food service and dining in cafeterias:

- Providing physical distancing markers for lunch queuing.
- Using contactless point of sale.
- Selling grab-and-go packaged meals.
- Eliminating shared serving utensils or bins of cutlery; provide individually wrapped disposable utensils.
- Providing ample cleaning supplies and hand sanitizing stations.
- Encouraging occupants to pre-clean and clean up after themselves.

Gymnasiums and assembly spaces

Congregating in large groups can increase transmission risk. Additionally, activities such as exercising, cheering, and singing can increase the airborne droplet transmission spread. As a result, increased physical distancing and airflow would need to occur for such activities in gymnasiums, music and choir rooms, and other areas of assembly.

Control strategies to mitigate risk in gymnasium and assembly spaces include:

- Prohibiting all contact sports temporarily.
- Taking physical activities outdoors or exploring alternative options for group activities (i.e. sports for individuals like golf).
- Incorporating forms of physical activity that students can participate in that will support social-emotional well-being and minimize droplet production (e.g., yoga and meditation as opposed to volleyball).

- Eliminating or limiting shared equipment.
- Disinfecting any shared equipment between each user.

Nurse's office/clinic areas

Nurse's offices will be presented with new challenges as a result of COVID-19. Clinical areas are often tight quarters that may not allow for adequately distancing patient beds.

Control strategies to reduce the risk of virus transmission in nurse's offices and clinic areas, include:

- Identifying a space to temporarily and comfortably isolate a symptomatic student or staff member that is separated from non-symptomatic occupants, including students who need to obtain other medical care.
- Creating a self-contained medical room just outside the main school facility.
- Establishing a “nurse’s zone” treatment area and integrating minimum social distancing between resting cots and using privacy curtains between beds.
- Developing cleaning and disinfecting protocols for both entering and leaving nursing care areas.
- Establishing one way traffic flow into and out of the nursing care area.
- Creating access to a nearby exit that is not the main entry or exit.

Public restrooms and staff spaces

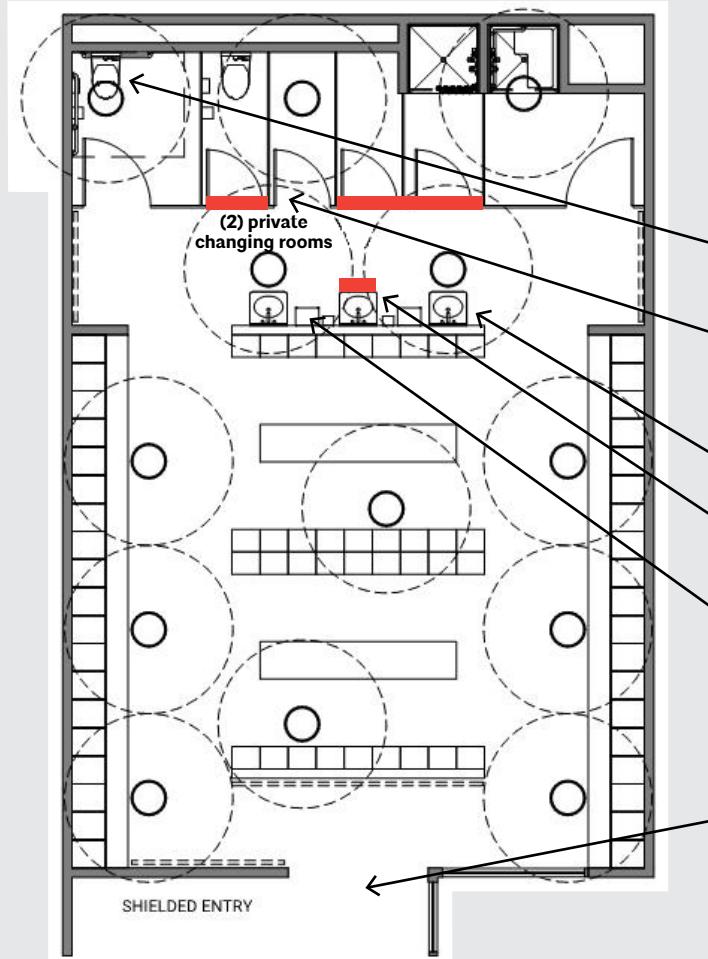
Hazards associated with restrooms and staff office spaces are common across multiple building types. Risk mitigation strategies for both of these spaces can be reviewed in the AIA report [Reopening buildings: Strategies for safer offices](#).

School locker rooms will have hazards and strategies similar to restrooms.

Locker room (900 sq. ft.)

Recommended (8–12) occupants

The numbered strategies below reference the [AIA Re-occupancy Assessment Tool](#) framework.



3.4.8 and 3.5.6 Install toilet lids and signs directing that lids must be closed before flushing

3.2.3 or 3.9.2 Lock every other restroom stall door to restrict access and ensure minimum six-foot fixture spacing or replace or modify height of restroom stall enclosures

3.5.3 Replace flush valves and faucets with touchless devices

3.2.3 Restrict access to lavatories as makes sense to ensure minimum six-foot fixture spacing

3.9.5 and 4.2.10 Provide touchless hand soap, paper towel dispensers, and hand dryers

4.3.1 After class transition, allow for increased cleaning and waste removal (assume 3 student rotations per class)

3.3.4 If possible, configure locker room entry to have no door

In addition to the strategies noted above, a more extensive list of controls for re-occupying schools and other buildings is available in [AIA's Re-occupancy Assessment Tool](#).

Long-term considerations

Over the past few decades, school design has developed to support the varying needs of students and has moved away from traditional modes of learning. Schools are now inherently places of transformation—cultivating new knowledge, awe-inspiring stories, and visions of children allowing transformation into young adults. How can we still cultivate this established educational process in the midst of a pandemic, while replanning and redesigning the educational buildings without failing the needs of an entire generation of learners? This moment in time is a great opportunity for our society to proactively improve our education system for generations to come by refocusing on accessibility, equity, and the innate needs of learners.

At a localized level, architects, educators, and students must work together to establish innovative solutions that will provide places—virtual or in-person—where collaborative, problem-solving, agency-driven, and project-based learning can happen. Digital learning should not replace our classrooms longterm. As conditions evolve, our learning environments must also evolve in response to community interdependencies and student needs.

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