Air Quality & Ventilation at Schools

August 25, 2021
Dr. Mary Ann Dewan
County Superintendent of Schools

Submit your questions through this url: https://sccoe.to/AirQualityQs
Welcome

Dr. Mary Ann Dewan - County Superintendent of Schools
Stephanie Gomez - Santa Clara County Office of Education Chief Business Officer
Ted Pierce - Santa Clara County Office of Education
Roger Silveira - East Side Union High School District
Michael Vallez - Santa Clara County Office of Education

Submit your questions through this url: https://sccoe.to/AirQualityQs
Goals for Today’s Meeting

- Air Quality Index: Defining AQI, resources, and recommendations
- Components of your HVAC systems, ventilation and filtration
- Understanding how outdoor air exchange is critical to maintain and improve indoor air quality
- Addressing poor air quality during COVID-19
- COVID-19 funding sources
- Additional AQI and ventilation resources
Air Quality Index (AQI):

- Defining AQI
- Resources
- Recommendations
Defining Air Quality, AQI

- The U.S. EPA developed the Air Quality Index, (AQI), scale to make public health impacts of air pollution concentrations easily understandable.

- Translates daily air pollution concentrations into a number scale (0-500) with color-coded ranges.

- Identifies specific amounts of pollution in the air, based on federal air quality standards.
Air Quality Index (AQI)
Six Categories

<table>
<thead>
<tr>
<th>Daily AQI Color</th>
<th>Levels of Concern</th>
<th>Values of Index</th>
<th>Description of Air Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Good</td>
<td>0 to 50</td>
<td>Air quality is satisfactory, and air pollution poses little or no risk.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Moderate</td>
<td>51 to 100</td>
<td>Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.</td>
</tr>
<tr>
<td>Orange</td>
<td>Unhealthy for Sensitive Groups</td>
<td>101 to 150</td>
<td>Members of sensitive groups may experience health effects. The general public is less likely to be affected.</td>
</tr>
<tr>
<td>Red</td>
<td>Unhealthy</td>
<td>151 to 200</td>
<td>Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.</td>
</tr>
<tr>
<td>Purple</td>
<td>Very Unhealthy</td>
<td>201 to 300</td>
<td>Health alert: The risk of health effects is increased for everyone.</td>
</tr>
<tr>
<td>Maroon</td>
<td>Hazardous</td>
<td>301 and higher</td>
<td>Health warning of emergency conditions: everyone is more likely to be affected.</td>
</tr>
</tbody>
</table>
Recommended Reliable Resources to Get Air Quality Index (AQI) Information for Your Area

Submit your questions through this url: https://sccoe.to/AirQualityQs

Sign-up for air quality notifications!

BAAQMD
Recommended Reliable Resources to Get Air Quality Index (AQI) Information for Your Area

Sign-up for air quality notifications!

AirNow.gov
### School Air Quality Activity Recommendations (CDE)

The following school activity recommendations are based on consultation with health researchers and several important principles drawn from recent studies. Modify these levels to correspond with the AQI, emissions concentration, or other air district recommended method for your region.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recess (15min)</td>
<td>No restrictions</td>
<td>Ensure that sensitive individuals are medically managing their condition.*</td>
<td>Sensitive individuals should exercise indoors or avoid vigorous outdoor activities.*</td>
<td>Exercise indoors or avoid vigorous outdoor activities. Sensitive individuals should remain indoors.*</td>
<td>No outdoor activity. All activities should be moved indoors.</td>
</tr>
<tr>
<td>P.E. (1hr)</td>
<td>No restrictions</td>
<td>Ensure that sensitive individuals are medically managing their condition.*</td>
<td>Sensitive individuals should exercise indoors or avoid vigorous outdoor activities.*</td>
<td>Exercise indoors or limit vigorous outdoor activities to a maximum of 15 minutes Sensitive individuals should remain indoors.*</td>
<td>No outdoor activity. All activities should be moved indoors.</td>
</tr>
<tr>
<td>Athletic Practice &amp; Training (2-4hrs)</td>
<td>No restrictions</td>
<td>Ensure that sensitive individuals are medically managing their condition.*</td>
<td>Reduce vigorous exercise to 30 minutes per hour of practice time with increased rest breaks and substitutions. Ensure that sensitive individuals are medically managing their condition.*</td>
<td>Exercise indoors or reduce vigorous exercise to 30 minutes of practice time with increased rest breaks and substitutions. Sensitive individuals should remain indoors.*</td>
<td>No outdoor activity. All activities should be moved indoors.</td>
</tr>
<tr>
<td>Scheduled Sporting Events</td>
<td>No restrictions</td>
<td>Ensure that sensitive individuals are medically managing their condition.*</td>
<td>Increase rest breaks and substitutions per CIF guidelines for extreme heat.**</td>
<td>Increase rest breaks and substitutions per CIF guidelines for extreme heat.**</td>
<td>Event must be rescheduled or relocated.</td>
</tr>
</tbody>
</table>
Components of Indoor Air Quality
Outdoor Air Exchange is Critical in Increasing Indoor Air Quality
How Outdoor Air Enters Buildings

Source: UC Davis

Submit your questions through this url: https://sccoe.to/AirQualityQs
Outdoor Air Exchange

- Increase outdoor air circulation by opening doors and windows when safe to do so (below 101 AQI).
- If your building has a mechanical ventilation system, evaluate the impact of open windows/doors.
- Typical classroom has 6-8 air exchanges per hour.
Recommendations For Your HVAC

- Run air handling systems for longer hours, including before and after the space is occupied.
- Seal edges of the filter to limit bypass.
- Adjust thermostat from ‘Auto’ to ‘On’
Verification of Ventilation & Filtration Performance

- Verify through commissioning and testing.
- Work with an expert to evaluate building systems, ventilation, filtration, and air cleaning.
- Measure carbon dioxide (CO2) as a proxy for ventilation
- Monitor the effectiveness of the system by measuring ventilation directly, when possible.
  - Building owners/operators can review specific components such as air flow rates (outdoor air vs. recirculated air) and the pressure differences between higher risk areas (e.g., bathrooms and dining areas) and other areas.
CDPH - Ventilation Recommendations

Airborne Diseases (ca.gov)

- For indoor spaces, ventilation should be optimized
  - Follow CDPH Guidance on Ventilation of Indoor Environments and Ventilation and Filtration to Reduce Long-Range Airborne Transmission of COVID-19 and Other Respiratory Infections: Considerations for Reopened Schools
Practical Implications

Multiple protective strategies can help to substantially reduce the risk of long-range airborne transmission of SARS-CoV-2 in classrooms. These include:

- **Mask wearing**: All individuals (teachers, students, staff, etc.) should wear masks—under all ventilation rate or air filtration conditions in the classroom, this practice reduces both short-range and long-range airborne transmission risk comparing to not wearing mask.

- **Outdoor air ventilation**: The system should provide at least the code-required minimum ventilation rate (per California Title 24). In classrooms with no ventilation and no filtration, the risk of long-range airborne infection would be over six times as high as that for classrooms with code-required ventilation and a MERV 8 filter.
Practical Implications (cont.)

- **Filtration**: Ventilation system filters should be MERV-rated at MERV 13 or better. They should also be properly installed (i.e., no gaps that would allow air to bypass the filter) and properly maintained (i.e., replaced as often as recommended). MERV-rated filters can provide substantial protection from long-range airborne infection, especially if ventilation is poor.

- **In-room (portable) air cleaners**: Air cleaners used to reduce the risk of long-range airborne transmission should provide high-efficiency filtration and a sufficient “clean air delivery rate” (CADR) (i.e., at least 2/3 of the floor area). Such air cleaners can provide substantial additional protection, especially in naturally ventilated classrooms (in which air is supplied only through open windows or doors) or in classrooms with non-functioning or poorly functioning ventilation systems. Multiple devices per classroom may be necessary for sufficient total air cleaning.
Submit your questions through this URL: https://sccoe.to/AirQualityQs

- **MERV 6**
  - MPR 300
  - FPR N/A
  - LINT, HOUSEHOLD DUST & POLLEN

- **MERV 8**
  - MPR 600
  - FPR 5
  - MERV 6 + DUST MITES & MOLD SPORES

- **MERV 11**
  - MPR 1000 TO 1200
  - FPR 7
  - MERV 8 + PET DANDER, SMOKE, SMOG
  - COUGH/SNEEZE

- **MERV 13**
  - MPR 1500 TO 1900
  - FPR 10
  - MERV 11 + BACTERIA & VIRUS CARRIERS

![Air Filter Diagram](image-url)
<table>
<thead>
<tr>
<th>MERV Rating</th>
<th>Average Particle Size Efficiency (PSE), microns – % Removal</th>
<th>Typical Controlled Contaminant or Material Sources (ASHRAE 52.2)</th>
<th>Typical Building Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>0.3-1.0: &lt;20% 1.0-3.0: 20-35 3.0-10.0: &gt;70</td>
<td>&gt; 10 Microns Textile Fibers Dust Mites, Dust, Pollen</td>
<td>Window AC units Common Residential Minimal Filtration</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>3.0 to 10.0 Microns Cement Dust, Mold Spores, Dusting Aids</td>
<td>Industrial Workplace Better Residential Commercial</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>&gt;70</td>
<td>Superior Commercial Superior Residential</td>
</tr>
<tr>
<td>9</td>
<td>&lt;50</td>
<td>1.0 to 3.0 Microns Legionella, Some Auto Emissions, Humidifier Dust</td>
<td>Hospital Laboratories Better Commercial</td>
</tr>
<tr>
<td>12</td>
<td>&gt;80</td>
<td>0.3 to 1.0 Microns Bacteria, Droplet Nuclei (sneeze), Most Tobacco Smoke, Insecticide Dust</td>
<td>Superior Commercial Smoking Lounge Hospital Care General Surgery</td>
</tr>
<tr>
<td>13</td>
<td>&lt;75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>&gt;95</td>
<td>&lt;0.3 Microns (HEPA/ULPA filters) Viruses, Carbon Dust, Fine Combustion Smoke</td>
<td>Clean Rooms Carcinogenic &amp; Radioactive Matls., Orthopedic Surgery</td>
</tr>
<tr>
<td>17**</td>
<td>&gt;99.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18**</td>
<td>&gt;99.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19, 20**</td>
<td>&gt;99.999</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Adapted from EPA 2009; originally from ANSI/ASHRAE Standard 52.2-2007. Not all levels are shown.

** Not part of the official ASHRAE Standard 52.2 test, but added by ASHRAE for comparison purposes.
Concerns over equipment damage or inability to handle the MERV 13 filters

<table>
<thead>
<tr>
<th>Brand</th>
<th>Depth</th>
<th>MERV</th>
<th>ΔP at 295 ft/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordic Pure</td>
<td>2”</td>
<td>13</td>
<td>0.25</td>
</tr>
<tr>
<td>FilterBuy</td>
<td>2”</td>
<td>13</td>
<td>0.13</td>
</tr>
<tr>
<td>Flanders</td>
<td>2”</td>
<td>13</td>
<td>0.17</td>
</tr>
<tr>
<td>3M</td>
<td>1”</td>
<td>13</td>
<td>0.18</td>
</tr>
<tr>
<td>Nordic Pure</td>
<td>1”</td>
<td>13</td>
<td>0.37</td>
</tr>
<tr>
<td>FilterBuy</td>
<td>1”</td>
<td>13</td>
<td>0.22</td>
</tr>
<tr>
<td>Flanders</td>
<td>1”</td>
<td>13</td>
<td>0.30</td>
</tr>
<tr>
<td>3M</td>
<td>1”</td>
<td>7</td>
<td>0.22</td>
</tr>
<tr>
<td>Nordic Pure</td>
<td>1”</td>
<td>7</td>
<td>0.23</td>
</tr>
<tr>
<td>Flanders</td>
<td>1”</td>
<td>7</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Source: California Energy Commission

Submit your questions through this url: https://sccoe.to/AirQualityQs
Swiss Cheese Approach

Doors & Windows  MERV 13 Filter  Face Masks  Portable Filters

Submit your questions through this url: https://sccoe.to/AirQualityQs
Wear a Face Covering

- The best protection is a N95 or KN95 respirator which requires a professional fitting and training.
- A surgical and/or cloth mask provides an additional 15% to 30% particles blocked.
- Double Masking* - wearing a cloth mask atop a disposable surgical mask

* CDC correlated different types of masks with efficiencies in blocking particles small enough to be considered “most important for transmitting SARS-CoV-2.”
  - 42 percent of particles blocked: Unknotted surgical mask
  - 44.3-percent of particles blocked: Cloth face mask
  - 92.5-percent of particles blocked: Double mask
Portable Air Cleaners

- Commonly called HEPA filters

- Consider using these filters where there is **no or poor outdoor ventilation, no HVAC system, or when upgrades to the HVAC system are not feasible**

- Recommended to purchase units which are **certified for ozone emissions and electrical safety** by the California Air Resources Board (CARB)

- **Avoid ozone-producing air cleaners**
Addressing Poor Air Quality During COVID-19

● Continue to wear a mask / face cover
● Monitor AQI
  ○ Sign up for AQI notifications
  ○ Have a plan when AQI becomes unsafe
  ○ Close doors and windows when AQI is unsafe
● HVAC Systems
  ○ Ensure HVAC systems are functioning properly
  ○ Install MERV 13 or better
● Provide portable air filters for areas with poor ventilation
COVID-19 Funding Sources

- In-Person Instruction Grant
- ESSER Funds (I, II, III)
- Allowable Uses:
  - Inspection, testing, maintenance, repair, replacement and school site upgrades to improve indoor air quality and ventilation in school facilities
  - Capital projects over $5,000 require preapproval from CDE:
    - [https://www.cde.ca.gov/fg/cr/documents/fedfundscapitalexp.pdf](https://www.cde.ca.gov/fg/cr/documents/fedfundscapitalexp.pdf)
Examples of Allowable Uses

- Portable air cleaners and air cleaner filters
- HVAC system maintenance, repairs, upgrades or replacement
- MERV 13 filters
- HVAC system air quality inspection or testing
- Replacing windows for increased air quality
- Replacing or fixing roof for air quality
Additional AQI & Ventilation Resources

● Video: UC Davis (Western Cooling Efficiency Center)
  ○ “The Importance of Filtration in Schools” (8:12)
  ○ https://youtu.be/ycgLBUfIM_c

● Video: UC Davis (Western Cooling Efficiency Center)
  ○ “Ventilation in Schools” (6:31)
  ○ https://youtu.be/F9hB9BgonHs
Additional AQI & Ventilation Resources

- Air Quality Template for Schools - California Dept. of Ed.
  - School Air Quality Activity Recommendations - Air Quality (CA Dept of Education)

- EPA Tools for Schools
  - Indoor Air Quality Design Tools for Schools | US EPA

- MERV 13 Installation
  - https://www.youtube.com/watch?v=ZO-LE5_pJbw
Additional AQI & Ventilation Resources

● Santa Clara County Office of Education - Advisory Page
  ○ [https://www.sccoe.org/resources/emergencyadvisory/Pages/default.aspx](https://www.sccoe.org/resources/emergencyadvisory/Pages/default.aspx)
Submit your questions through this url:
https://sccoe.to/AirQualityQs
Connect with SCCOE

• Social Media
  📱  📡  🎨

• Ed Bulletin (e-newsletter)

• www.sccoe.org