



MCSD Air Quality and Ventilation Management

Executive Summary

This communication is to maintain transparent and open communications as per the recommendations and community concerns expressed towards ventilation and air quality. Rest assured, 100% of MCSD facilities are safe for your students and our staff. We are seeking alternative measures to make air quality or ventilation system improvements as a means to go above and beyond the minimum requirements. The information presented to district administrators regarding two specific sections within our COVID-19 Prevention Plan (CPP), published on January 26, 2021, with revisions on July 5, 2021. The two sections addressed in this communication are Engineering Controls (CPP, page 7), and Buildings or Structure with Mechanical Ventilation (CPP, page 13). MCSD is actively engaged in steps required within the CPP to provide the highest quality of air filtration, maximum air ventilation, and that all optimal practices are exercised for clean air within our classrooms and workspaces. The steps outlined within this document are strictly used to identify, monitor, and evaluate our current HVAC systems.

MCSD Air Quality and Ventilation Management Plan

MCSD developed a formal plan to evaluate the effectiveness of our present HVAC systems and the potential for air quality or ventilation management. The plan encompasses four phases, as outlined below:

Phase I - Research, Planning, Initial Baseline Testing of Air Change Rates

Phase I, most recently completed, focused primarily on researching several opportunities for equipment improvements and assessing initial air pressure and air changes per hour (ACH) within our classrooms, as provided by our current HVAC systems. During this phase, MCSD distributed 607 individual air purifiers of varying sizes and coverages. We also tested more than 75 separate locations throughout the district for ACH data. The final reporting of this data is pending from our third party contractor, anticipated by August 30, 2021. This phase also outlines the requirement to create a concept of systemic layers for air and ventilation management improvements.

Phase II - Air Quality Testing, System Capability Assessments, MERV Filter Comparison Tests

Phase II, is now actively underway. Within this phase MCSD will conduct a pilot study for detailed assessments of current indoor air quality, outdoor air quality comparisons, and collect appropriate particulate sampling at select classroom locations. These tests will be conducted at a minimum of 15 locations and for a minimum of six intervals, including the baseline establishment data. The interval testing will aid the district in the proper determination of maximum filtration feasibility and optimal capacity of our current HVAC systems. Third party contractors are working with MCSD to conduct these assessments and ensure all testing and reporting is compliant or exceeds acceptable industry standards, as applicable.

The selected contractors and assigned scope are as follows:

- a. HVAC System assessments, performance, and recommendations - TRANE (a globally recognized HVAC manufacturer and servicing corporation).
- b. Entek Consulting Group (certified industrial hygienist and air quality experts).

Pilot Study Concept

MCSD conducts pilot study tests for HVAC system capabilities, which include various measurements of air changes per hour and indoor versus outdoor air quality readings. The tests will be conducted between September 1, 2021 through November 1, 2021. The conclusion of this testing period with full data collection will enable MCSD to make the best decisions to improve air quality and ventilation; while simultaneously managing optimal lifespan, functions, and filtration for our HVAC systems. The expected improvements may also aid the prevention of COVID-19 or other airborne respiratory aggravations.

The following consideration potentials may be included within the pilot study:

- a. Particulate mass (PM) concentrations for PM 1, PM 2.5, PM 7, PM 10 and Total Suspended Particulate (TSP). Sampling conducted using a total suspension index (TSI) DustTrak.
- b. Carbon dioxide will be assessed using a TSI Q-Trak.
- c. Development of a project sampling form, specific to the district.
- d. Classroom and campus verification report(s).
- e. Comparison and variation reporting for MERV filtration levels selected for testing (MERV 8, MERV 11, and MERV 13).
- f. Periodic sampling from select locations and time frame intervals.
- g. Noise levels from HVAC and/or air purifiers.

- h. ACH (air changes per hour) sampling in collaboration with air quality sampling during pilot study.
- i. Assessment of UV-C and/or Ionization effectiveness.

Phase III - HVAC System Enhancements, Classroom and Campus Verification, Reporting

Phase III, begins with modifying HVAC systems for the highest quality filtration and other equipment additions for UV-C and/or Ionization enhancements. This phase is planned to begin as soon as capable with adequate data to make formal district level decisions for HVAC systems. This phase by design may begin prior to the formal completion of the preceding phase, phase II. The completion of this phase is upon receipt of classroom and campus verification throughout this district. This requires all HVAC system modifications associated with this plan to be completed according to MCSD established and approved standards for air quality and ventilation management in a layered approach.

- A. Layer 1** - Staff and students wear masks indoors (respiratory controls)
- B. Layer 2** - Maximized filtration within HVAC systems (mechanical ventilation)
- C. Layer 3** - UV & Ionization devices (electronic measure)
- D. Layer 4** - Air purifiers (electronic ventilation)
- E. Layer 5** - Future air quality testing, efficiency management, and annual reporting (program management)

Phase IV - Reports and Verification, Program Sustainment, Communication

Phase IV, begins with HVAC system modification completion and the formal completion of the preceding phase, phase III. This phase will work with third party contractors and/or other certified parties involved within this plan to ensure the proper and adequate reporting and records are produced for public information. The completion of this phase is upon receipt of air testing, sampling, and verification that all District buildings' air quality meets or exceeds MCSD standards. The final action within this phase is the completion notification communication and publishing of future actions for program sustainment and management.

Additional Information

This reference document provides an updated status of progress and is placed on our webpage as a "living" document. It is subject to frequent changes or revisions without prior notice. Final reports will be published for all plan completions, as described above. Anticipated costs for fully implementing this air quality and ventilation management plan of action will exceed \$1.5M in this fiscal year. Additionally, this plan is expected to impact future budget years by approximately \$800K or more annually. The

objectives created within this management plan are considered for the overall long-term health benefits of our students, staff, and community.

Primary References: San Joaquin Valley Air District, www.valleyair.org, California Department of Public Health, www.cdph.ca.gov, ANSI/ASHRAE 62.1, 62.2, 52.1, and UL 2998

****All future decisions of additional work, plans, upgrades, or contracting will be at the discretion of MCSD staff and the MCSD Board of Education.*

MCSD AIR QUALITY AND VENTILATION MANAGEMENT (PILOT TEST)

Summary

MCSD developed a pilot test for HVAC system capabilities, which include various measurements of air changes per hour and indoor versus outdoor air quality readings. The tests commence September 1, 2021 and run through November 30, 2021. MCSD voluntarily determined to conduct testing based on internal desires to drive continuous improvements for safety and other factors supporting student achievements. All classrooms are safe learning spaces but the district understands improvement opportunities may exist to increase safety, reduce absences, and to establish clear district standards understood by all concerned / interested parties.

Purpose of Pilot Testing

The purpose of this testing period enables MCSD to make the best possible decisions to improve air quality and ventilation; while simultaneously managing optimal lifespan, controls, functions, and optimal filtration for our present HVAC systems. The potential improvements may also aid the prevention of COVID-19 or other airborne respiratory aggravations.

Objectives of Testing

MCSD expects to learn details regarding the introduction of outside air quality within classrooms and its effects on the indoor air quality. In addition, how to improve conditions and/or mitigate varying factors affecting student learning due to absences, or illness may decrease through increased filtration, improved air controls, and other air quality devices or systems, when applied properly. In the end, the district plans to drive aggressive improvements for air quality, ventilation, controls, optimal effectiveness of filtration, operational effectiveness, cost effectiveness, and COVID-19 preventive measures through a proper and effective use of HVAC systems.

Pilot Testing Explained

Where are we testing?

MCSD selected five school campuses for the conduct of our scheduled pilot testing of Air Quality and Ventilation Management. The sites selected are as follows: Ada Givens Elementary School, Peterson Elementary School, Rivera Middle School, Stefani Elementary School, and Stowell Elementary School. The campuses represent various factors within the district and the community. Some deciding factors of campuses selected are as follows: Social-Economic, Geographical, HVAC Lifespan, Brand / Model of HVAC Units, Access to HVAC, Mitigation for Learning Disruption, Grade Levels, Staff Participation, and Service Status for HVAC. The pilot test is an audit of three pre-selected classrooms and does not include every classroom at the named campuses.

Who is conducting tests?

Third-party vendors under contracts will conduct all testing to collect data and compile official data reports with measures and recommendations for the district. MCSD staff will assist with testing and escort evaluators throughout the campus and/or classroom access as required in the conduct of these pilot tests. The vendors selected are as follows: TRANE Technologies, TRANE Commercial HVAC of Americas, and Entek Consulting, LLC. The contracted companies may sub-contract other parties to assist with the pilot testing based on the agreement between the district and the contracted vendors.

Why are we testing?

MCSD classrooms and workspaces are 100% safe and no indication or facts state otherwise. The district had recent opportunities to hear parent and community concerns regarding air quality within our classrooms. These actions come in response to communications received, resurgence of COVID-19 variants, recent assessments of our ventilation systems, and the school district's unwavering desire for continuous improvements for all areas of safety standards. MCSD decided to address these concerns with an aggressive approach to manage air quality and ventilation through a sound program that reviews the entire system for mechanical and electronic ventilation and filtration.

What do we expect to learn?

MCSD anticipates learning more about the HVAC engineering of our facilities and the overall design and capabilities for our existing HVAC systems. Additionally, we expect to learn the maximum filtration applicable to our present HVAC systems, effectiveness of select filtrations, MERV ratings of specific filters or brands, and the best achievable air quality and ventilation averages to expect within each classroom or workspace. The additional desire is to measure and evaluate the effectiveness of our air purifiers, ultra-violet lights, and ionization devices when working in conjunction with our existing HVAC systems.

How long does the testing take to complete?

The selected parameters of this pilot test commences early September and completes late November 2021. The actual tested variables evaluated require approximately 30-45 operational classroom days, in order to collect accurate samples for air quality and airflow. This detailed information is required to make timely and accurate decisions for the long-term management of improved and safer HVAC system operations. Upon conclusion of all sampling, analysis, and compiling of relevant data collected the district will publish public reports applicable to the conduct of this pilot test.

Are there any risks to students or staff during the testing?

There are no additional risks associated with this testing and all employees or contractors will be wearing masks and following the strict guidance of this district and/or the local department of public health. All adult persons entering classrooms will be recently tested negative and/or had received the vaccine, as required by recent state directives. Lastly, no students or staff (outside of M&O or administrators) are required or expected to have any direct or close contact with the individuals involved within the pilot test protocols. The sample collection within each classroom lasts no longer than 30 minutes. The sampling process repeats approximately one time every other week throughout the entire pilot testing period.

What happens at the end of the testing?

Upon conclusion of all testing results and any required modifications of the HVAC systems, each classroom will be verified based on the established standards of MCSD. A notice prominently displayed within each classroom and/or workspace provides confirmation that the area meets the rigorous standards set by this school district. The notice will outline that all air quality and ventilation systems meet or exceed the requirements for safety and quality.

What were Initial Testing Completed by MCSD and what are the Results?

Air Control and Balancing Services, under contract for TRANE Technologies performed air change per hourly rate (ACH) evaluations throughout MCSD classrooms and office spaces. The testing conducted August 9 - August 13, 2021 and concluded with a certified report from our third-party contractors, dated August 24, 2021. The results of the ACH evaluations were that MCSD learning and workspaces experience between 8-10 ACH. MCSD is compliant and far exceeds the building code standards for classrooms of 2.9 ACH. It is also important to understand that MCSD classrooms are meeting COVID-19 prevention standards of 6-10 ACH, as recommended by CDC and Merced County Department of Public Health.

This baseline testing was critical for MCSD to understand as it moves forward in efforts for continuous improvements of our indoor air quality and ventilation management. The information collected during this part of the initial testing is an instrumental component to understand the effects and necessary steps to implement optimal filtration levels for our HVAC systems. Our goal is to improve indoor filtration from the present MERV-8 to MERV-13 for all MCSD facilities. Increased filtration levels creates room pressure drops, may unbalance air, and reduce the current baseline for ACH when applied. The completion of this unique pilot study is crucial for MCSD to make the proper decisions for optimal filtration, lifespan management, and overall costs for required improvements to the district budget.

General Considerations within Pilot Test Planning

Refer to the “HVAC Supplemental Information and Considerations” sheet.

Primary References

ANSI/ASHRAE 62.1, 62.2, 52.1
ASHRAE checklist for schools
ASHRAE COVID and MERV filtration guidance
UL-2998 (Electronic Ventilation Ozone)
CDC Guidelines for Schools
CDC Guidelines for COVID
San Joaquin Valley Air District Guidelines
Department of Public Health Directives and Guidance
Professional Consultation from selected vendors
MCSD COVID-19 Prevention Plan (Revised July 2021)
MCSD Air Quality and Ventilation Management (August 2021)
Community Input and Recommendations for Air Quality and Safety Improvements in Classrooms

*****All future decisions of additional work, plans, testing, upgrades, or contracting will be at the discretion of MCSD staff and the MCSD Board of Education.**

MCSD HVAC Supplemental Information and Considerations

Areas or Items Considered for Review and/or Testing

The list below provides a detailed listing of items or areas discussed and considered within the development of the MCSD Air Quality and Ventilation Management plans and testing. Some or all of the items listed below may be a part of the ongoing program and standard establishment. The items indicated below are not in any particular order or priority.

- a. Thermostat controls
- b. Fan Run Times
- c. Coil Age
- d. Age of HVAC System
- e. Airflow Patterns
- f. Air Register and Vent Locations
- g. Student Seating and/or Teacher Seating
- h. Total Occupancy in Room (Includes evaluators at time of testing)
- i. Drawing a Map of Airflow Directions within Rooms
- j. Complete Servicing of the HVAC Units in Pilot Test
- k. Anticipated Pilot Test and Total Program Timeline
- l. Weather Conditions
- m. Outdoor Air Quality Comparison to Indoor Air Quality Samples
- n. Transparent Communication Plans
- o. Requisitions of HVAC Service, Filters, Devices, and Controls
- p. Campus, Staff Participation Requests
- q. Noise Level Readings
- r. UV-C Spectrum (Optimal Levels @ 265nm)
- s. Rise and Fall of Aerosol Plumes
- t. Wind Direction, Temp, or Velocity, Relative to HVAC System Placement
- u. HVAC System, UV / Ionization Device, or Filtration Lifespan
- v. Future Budget / Cost Impacts (Service, Parts, Filters, Electric)
- w. Air Purifier w/ HEPA Run Time in Pilot Test Rooms
- x. Total HVAC System Run Time (Min 10hr per day)
- y. Air Quality Testing Parameters (PM2.5 and PM10)
- z. HVAC System, Built-in Sensors and Type of Measures
- aa. Economizer settings (@20%) and Automation of Control Units
- ab. Ozone Conditions and Mitigation (Zero Ozone Emmissions)
- ac. Humidity Levels (Over Circulation of Non-Conditioned Air)
- ad. Age of Present MERV-8 Filters for Initial Baseline Samples
- ae. Compressor / Blower Strain from Increased Resistance and/or Amps
- af. Bearing Bleed Out from HVAC Excessive Temperatures
- ag. Mitigation for Outside Air (Poor Air Quality or Excessive Temps)