

SEP Proposal Form

Organization Contact Information

Organization Name:

South Coast Air Quality Management District

Contact Name:

Patricia Kwon

Contact Title:

Air Quality Specialist

Mailing Address:

21865 Copley Drive

Diamond Bar

CA

91765

Phone Number:

909-396-3065

E-Mail:

pkwon@aqmd.gov

Organization Description:

SCAQMD is the air pollution control agency responsible for monitoring and regulating air pollution in the South Coast Air Basin (Basin) and the Riverside County portion of the Salton Sea Air Basin (SSAB) and Mojave Desert Air Basin (MDAB). The Basin comprises the Orange County and non-desert portions of Los Angeles, Riverside, and San Bernardino counties. SCAQMD jurisdiction is the second most populous urban area in the United States, and covers approximately 11,000 square miles with about 16 million inhabitants. SCAQMD is also responsible for the development and implementation of the Basin's Air Quality Management Plan (AQMP) for the inclusion in the state implementation plan (SIP) to attain and maintain national ambient air quality standards (NAAQS) for ozone and PM_{2.5}. The topography and climate of Southern California combined with the growing population, increasing vehicle miles traveled (VMT), San Pedro Bay Ports activities, and a segment of manufacturing, chemical, and refining industries make the Basin an area of high air pollution. The impact of air pollution on public health and welfare ranks high among public concerns in California and disproportionately affects the Basin more than the rest of California. Since 2000, the California Air Resources Board (CARB) has linked air pollution, especially diesel exhaust and other toxic air contaminants, to high annual cases of premature deaths, asthma attacks and other lower respiratory symptoms, school truancy, and missed work days. Despite the last two decades of aggressive efforts to reduce air pollution, the Basin still has some of the worst air quality in the U.S. based on the number of days the NAAQS for ozone are exceeded.

Organization Experience

SCAQMD has a long history of successfully collaborating with Basin stakeholders to reduce emissions from variety of mobile and stationary sources through research, development, demonstration, and deployment (RDD&D) of alternative fuel and clean fuels technologies in Southern California. These projects or studies address a diverse mix of advanced technologies, including advanced engine and emission control technologies, fuel cell, electric and hybrid technologies, health impacts, and fuel and emission studies. SCAQMD has installed air filtration systems at 71 schools near the Ports, Boyle Heights, San Bernardino, and the Coachella Valley. It has a decade of experience in air filtration starting with the SCAQMD air filtration pilot study.

SCAQMD has published results from the pilot study in the peer reviewed journal *Indoor Air* (2013) and conducted a national assessment (2010) of air filtration technologies (high performance filters and stand-alone units) at Sunnyslope Elementary School in Riverside, California to identify commercially available technologies meeting the standards in the pilot study.

Staff Expertise, Qualification, Knowledge, and Resources

SCAQMD has the staff resources necessary to meet the goals of the proposed project, and will administer project funds and provide comprehensive project management. The proposed project will be implemented by a program manager, an air quality specialist, an air quality instrument specialist, a financial specialist, a staff assistant, and a deputy district counsel.

Dr. Jason Low is Assistant Deputy Executive Officer of the Monitoring and Analysis Division for Science & Technology Advancement, responsible for ambient monitoring, source testing and laboratory analysis. He oversees the SCAQMD ambient network of over 40 air monitoring stations, the laboratory and numerous special air monitoring projects focusing on air toxics and the local impacts of air pollution. He received his B.S. in Chemistry and Biology, and M.S. and Ph.D. in Chemistry with a focus on atmospheric chemistry, all from the University of California, Irvine.

Dr. Andrea Polidori is Atmospheric Measurements Manager in the Division of Science and Technology Advancement and is responsible for innovative work conducted by AQ-SPEC and the advanced remote measurement programs. He will provide additional technical assistance on air filtration. He received his Ph.D. from Rutgers University in Environmental Sciences and was formerly a research professor at University of Southern California. His areas of specialty are aerosol formation and indoor/outdoor exposure to fine particulate matter.

Patricia Kwon is an air quality specialist in the Technology Demonstration group who will manage the day-to-day activities of the proposed project. She is currently managing several SCAQMD air filtration projects. Other technology areas include electric and hydrogen vehicle infrastructure planning and deployment, as well as solar projects. She has worked for over 14 years in the Technology Demonstration group and in the Socioeconomic Analysis group. She received her M.A. from University of California, Los Angeles in sociology, specializing in statistics and program evaluation, and a B.A. in biology from Johns Hopkins University.

Mary Leonard is the financial analyst whose duties will include managing the grant under the proposed project. She has over 12 years of experience managing administrative and financial aspects of federal and state grants.

As a result of a RFP, IQAir North America (IQAir) was selected and has worked with SCAQMD on the pilot study and an air filtration program for schools near the Ports of Los Angeles and Long Beach. Frank Hammes, president of IQAir, has over 19 years of hands-on and management experience in the design, engineering, and field application of air cleaning technologies for commercial, medical and residential applications. IQAir is one of the leading international providers of high performance indoor air quality engineering solutions.

Project Information

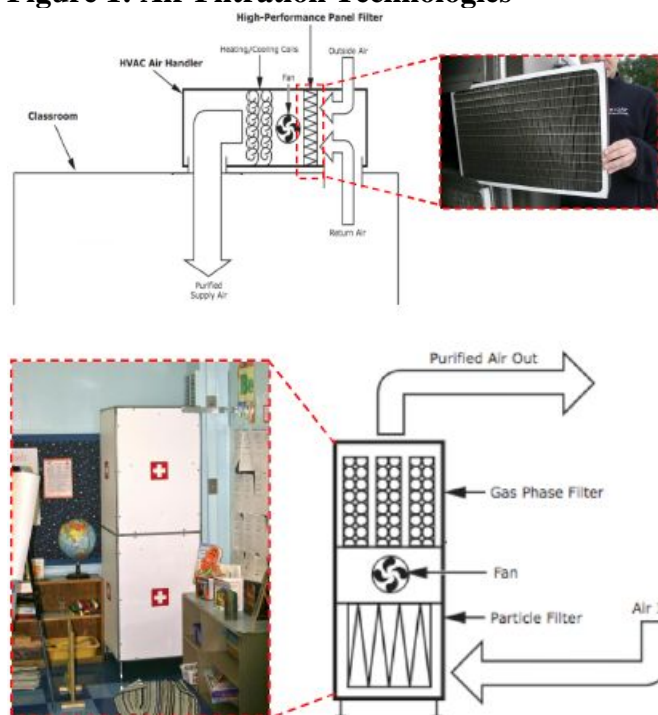
Project Title: Installation of Residential Air Filtration Systems

Project Description

SCAQMD proposes a SEP to install and maintain high-performance air filtration systems in residences located in communities impacted by air pollution, especially Environmental Justice (EJ) and/or Disadvantaged (DA) Communities disproportionately impacted by toxic air contaminants. It will partner with IQAir for installation of the air filtration systems, and work with the local community on the mitigating impacts of air filtration. This program takes advantage of SCAQMD's expertise in air filtration technologies used in schools. Residents will provide access to their homes, and will be trained by IQAir staff on how to maintain their air filtration systems. IQAir will be available to handle non-routine maintenance or situations requiring intervention (HVAC replacement, fire, construction, etc.) as needed through a maintenance service contract.

Air filtration technologies such as high-performance air filters and stand-alone units have been successfully demonstrated in classroom environments in schools to significantly reduce exposure to diesel particulate matter in the SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications (2009) and *Indoor Air* journal article (2013). A Program Opportunity Notice (PON) for testing of air filtration technologies was released in May 2010. Testing conducted in August 2010 by UCR CE-CERT of 15 different air filtration technologies showed that high-performance filters and stand-alone units manufactured by IQAir were the only technologies that met the performance specifications in the PON.

Figure 1: Air Filtration Technologies



High-performance panel filters (top) and stand-alone units (below) used in the SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications

Scope of Work: A task-by-task breakdown of the air filtration implementation project follows. The period of performance for this implementation project will continue for six months from the date of grant award for installation, with one additional year for post installation follow-up. The proposed scope of work includes tasks and deliverables to meet the objectives of the implementation project. IQAir shall perform the various tasks designed to complete the implementation project, facilitate cooperation from residents, and continued maintenance of the installed air filtration systems. SCAQMD will provide technical assistance as necessary to ensure smooth implementation based on past air experience in managing similar air filtration programs.

The implementation project will involve: 1) installation of high-performance air filtration systems, 2) collection of air flow and monitoring data after installation to verify the performance, 3) post installation reports, 4) training of residents on maintenance to ensure their proper and efficient operation, 5) five to ten year supply of replacement filters, and 6) maintenance service contract for IQAir to handle non-routine maintenance issues for the life of the project. Figure 1 shows two of the high-performance air filtration technologies (SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications, 2009).

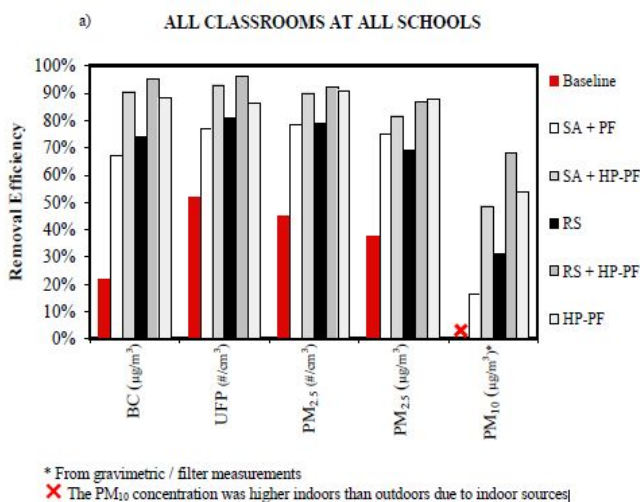
Project Location(s)

Residences in EJ and/or DA communities impacted by air pollution. Selection of homes within target communities will be based on exposure to relevant pollutants and/or toxics, affected geographical locations, environmental health data, and other pertinent selection criteria.

Emission Benefits

Air filtration systems in residences target fine and ultrafine particulate matter and black carbon found in railroad locomotives and trucks associated with goods movement activities in the region, and other toxic air contaminants. Results from the SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications (2009) show reductions of in-classroom exposure to harmful particulate species by up to 90%. Testing results from the PON indicate that the Nanomax S-220 panel filter manufactured by IQAir had removal efficiencies between 89%-92% for ultrafine particulate matter and between 88%-91% for black carbon. The CleanZone SL stand-alone unit manufactured by IQAir showed removal efficiencies between 94% - 100% for ultrafine particulate matter and 83% - 94% for black carbon, and was the only stand-alone unit that did not exceed the noise threshold of 45 decibels set by school districts for new in-classroom equipment. The specific air pollutants addressed by the air filtration systems are fine and ultra-fine particulates, and diesel particulates from combustion sources such as automobiles, trucks, locomotives, ships, industry and wildfires. In addition, these air filtration solutions are suitable to remove coarser particles such as fine dust, pollen, mold spores, and tire debris.

SCAQMD Air Filtration Pilot Study Results



The combination of a register system and a high-performance panel filter (RS + HP-PF) was the most effective solution for reducing the indoor concentrations of black carbon, ultrafine PM, and PM_{2.5} (both mass and particle count), with average removal efficiencies from 87 to 96%. Replacing a conventional HVAC-based panel filter (PF) with a HP-PF resulted in a substantial reduction in the indoor levels of all particulate pollutants inside classrooms. When the HP-PF alone, the study average removal efficiencies were close to 90% (88, 86, 91, and 88%, for black carbon, ultrafine PM, PM_{2.5} count, and PM_{2.5} mass, respectively). This is significantly higher than baseline (pre-existing) removal efficiencies of 20-50%.

Source: SCAQMD Pilot Study of High Performance Air Filtration for Classroom Applications (2009)

Health studies have determined that fine and ultra-fine particulates, including potent air toxic diesel soot and other toxic air contaminants, present the greatest air pollution health risk to Southern California communities. Continued evaluation of air filtration technologies will provide data to support the commercialization of more cost effective filters and stand-alone units.

Performance Measures: Air filtration technologies need to meet the minimum performance requirements as specified in the SCAQMD Pilot Study of High Performance Air Filtration for Classroom Applications and thus provide a significant improvement in air quality conditions with respect to Baseline Conditions.

- Ultrafine Particulates – Particles roughly defined by an aerodynamic diameter less than 0.1 μm , estimated by measuring the total number concentration of all airborne particles down to at least 10 nm in diameter)
- Fine Particulate Matter (PM_{2.5}) – Particles with an aerodynamic diameter less than 2.5 μm , estimated with an established continuous or filter-based PM measurement method
- Black Carbon – Component of PM indicative of diesel emissions measured with established light absorption methods. Elemental Carbon measurements using established methods could substitute for BC measurements.
- Baseline Conditions – Percentage reduction in the indoor concentration of a particular air pollutant relative to its concurrent outdoor level before installation of any air filtration device.
- Minimum Average Removal Performance – Minimum percentage reduction in the indoor concentration of a particular pollutant relative to its concurrent outdoor level after installation of one or more air filtration devices, averaged over all time periods.
- Potential Average Removal Performance – Potential percentage reduction in the indoor concentration of a particular pollutant relative to its concurrent outdoor level after installation of one or more air filtration devices, demonstrated for several indicative time periods.

Demonstrated Effectiveness Inside Schools/Classrooms or Equivalent Environments: In the South Coast Air Basin, many residences and schools are in close proximity to important sources of air pollution, including stationary sources such as refineries and mobile sources, especially heavily trafficked roadways. IQAir has previous experience with installation of particulate filtration devices in residences and schools located in close proximity to major sources of PM (e.g. major roadways with high percentages of diesel truck traffic) through its work on the pilot study and implementation program in schools near the Ports of LA and Long Beach. PM filtration (Life Shield Return (LSR), Perfect 16 and HealthPro units and use of MERV 16 and HyperHEPA filters) is also highly effective for toxics such as hexavalent chromium+6. Furthermore, gas phase technology in its stand-alone units has been approved by CARB for removal of mercaptans for Porter Ranch residents in the Aliso Canyon gas leak.

A similar project was conducted in 2013 to install air filtration systems in 90 homes in Mira Loma Village as part of a settlement of a CEQA lawsuit for a warehouse distribution center. In addition, as part of a UC Davis asthma study (in progress), lower cost LSR air filtration systems were installed in homes in Riverside and Fresno. The LSR is a more cost effective alternative to the Perfect 16 for homes with central HVAC. For homes without central HVAC, a compact or regular Health Pro system is a cost effective solution.

Minimal Impact on Air Flow: Work on the pilot study and implementation programs demonstrate that IQAir’s air filtration devices do not significantly reduce the existing airflow rates through the HVAC system and/or do not require higher power consumption to achieve similar flow rates.

Project Timeline

The program is divided into several phases: project administration, selection of homes and communities, agreements with residents, installation, training of residents, air flow and monitoring to verify performance of the systems, maintenance service contract with IQAir to handle non-routine service issues, and reporting (site assessments, post installation reports, annual O&M reports). Once funds are received, a contract is executed with IQAir. Air filtration installation can be scheduled after working hours or whenever convenient to residents.

Itemized Budget

Site assessments for each residence for installation and a 5-10 year supply of replacement filters will include a budget. Installations will be done to maximize the number of residences served. Average costs for equipment, replacement filters, site assessment, setup/training, and delivery are outlined below based on the type of system deployed. Costs for HyperHepa and MERV 16 systems are slightly higher and any required HVAC modifications would be an additional cost.

System Type	Equipment	Replacement Filters	Replacement Interval	Site Assessment ¹	Setup, Training	Delivery (ground)
Life Shield Return (LSR)	\$680	\$80 (average price, varies by size)	6 months	\$150	\$60	\$50
Perfect 16 (3 ton)	\$2,695 ²	\$345 Nanomax ⁴	3 years	\$150	\$60	Included
Perfect 16 (5 ton)	\$3,195 ²	\$395 Nanomax	3 years	\$150	\$60	Included
Compact Health Pro	\$799 ³	\$199 HyperHEPA ⁵ \$69 Pre-filter ⁶	3-4 years HEPA 6-18 months Pre-filter ⁴	\$150	\$60	\$30
Health Pro	\$849 ³	\$199 HyperHEPA \$69 Pre-filter	3-4 years HEPA 6-18 months Pre-filter	\$150	\$60	\$30

¹Bulk pricing for site assessments (10 per day in same geographical area) would be \$60 per assessment

²Price includes installation

³No installation required for Health Pro systems

⁴Replacement interval for NanoMax filter from 8-12 months depending on use

⁵Replacement interval on pre-filter ranges from 6-18 months

⁶Replacement interval on HyperHEPA filter estimated at 4 years

Acknowledgment: By checking this box, you verify that you have read and understand the ARB SEP Policy and verify that all information given to ARB about your organization and your proposed project is factual.



Air Resources Board



Matthew Rodriguez
Secretary for
Environmental Protection

Mary D. Nichols, Chair
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Edmund G. Brown Jr.
Governor

June 23, 2017

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 17-BSTD-01
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: Air Resources Board Staff Comments on Proposed 2019 Residential Standards

Thank you for providing an opportunity to comment on the Commission staff's proposed revisions for the 2019 Title 24, Part 6, Building Energy Efficiency Standards presented at the June 6, 2017 workshop, which focused on ventilation and indoor air quality for both residential and non-residential buildings.

We fully support your efforts to maintain and improve indoor air quality while pursuing increased energy efficiency in California buildings. We especially support the proposal to require higher efficiency air filters for all new and renovated buildings statewide, and the proposal for verification of kitchen range hood performance certification. We also support provisions for multi-family dwellings that will provide the same level of protection from outdoor air pollution as for single family homes. Our specific comments are attached.

If you have any questions regarding our comments, please contact me at (916) 323-4519, or bart.croes@arb.ca.gov. You may also contact Peggy Jenkins at (916) 323-1504 or peggy.jenkins@arb.ca.gov.

Sincerely,

Bart E. Croes, P.E.
Chief, Research Division

Attachment

cc: Peggy Jenkins
Manager, Indoor Exposure Assessment Section
Research Division

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>.

California Environmental Protection Agency

CALIFORNIA AIR RESOURCES BOARD COMMENTS
Title 24, Energy, California Code of Regulations
Part 6, California Building Energy Efficiency Standards

June 23, 2017

The California Air Resources Board (CARB) staff fully supports the efforts of the California Energy Commission (CEC) staff to maintain and improve indoor air quality while improving the energy efficiency of California's buildings. At the June 6 workshop, CARB staff appreciated CEC staff's highlighting of the sections of the California Public Resources Code and Health and Safety Code that directly require the CEC to protect indoor air quality and public health while pursuing its energy efficiency mandates. CARB staff's specific comments on CEC's proposed changes to ventilation standards for nonresidential and residential buildings are provided below.

1. CARB staff agrees with CEC that higher air filter efficiency, at least a Minimum Efficiency Rating Value (MERV) of 13, and a 2-inch depth filter grille should be required for all new/renovated residential and non-residential buildings statewide.

1.1 Higher air filter efficiency requirements for residential and non-residential buildings will reduce Californians' exposures to small particles, such as PM_{2.5}, which have been associated with the greatest health risks in California.¹ It is estimated that there are about 9,200 premature deaths per year due to PM_{2.5} exposure. According to the MERV rating chart attached (see Appendix A), filters meeting current requirements for air filter efficiency in Title 24 – MERV 6 for residential buildings and MERV 8 for non-residential buildings – provide minimal protection against PM_{2.5}. MERV 13 filters can remove substantially more PM_{2.5}, and will have a clear benefit to protect Californians from exposures to PM_{2.5}, especially considering that Californians spend, on average, about 90% of their time indoors.

1.2 CARB staff prefers a requirement for MERV 16 filters over MERV 13 filters for most applications, because MERV 16 filters have a higher removal efficiency for particles larger than 0.3 μm, as seen in the attached MERV rating chart. Additionally, MERV 16 filters capture more of the particles smaller than 0.3 μm as well. In a recent study funded by CARB, Brett Singer of Lawrence Berkeley National Laboratory found that MERV 16 filtration on a supply ventilation system reduced PM_{2.5} by 96-97% and ultrafine particles (UFP) by 97-99% relative to outdoors, compared to 63-67% for PM_{2.5} and for 77-82% for UFP from supply MERV 13 filtration.² However, CARB staff agrees that ease of implementation

¹ California Air Resources Board, 2010. Estimate of Premature Deaths Associated with Fine Particle Pollution (PM_{2.5}) in California Using a U.S. Environmental Protection Agency Methodology. Available at https://www.arb.ca.gov/research/health/pm-mort/pm-report_2010.pdf.

² Singer B.C., Delp W.W., Black D.R., and Walker I.S. 2016. Measured performance of filtration and ventilation systems for fine and ultrafine particles and ozone in an unoccupied modern California house. Indoor Air. doi:10.1111/ina.12359. Available at <http://onlinelibrary.wiley.com/doi/10.1111/ina.12359/full>.

and enforceability are important criteria to consider as well, and agree that moving from MERV 6 and MERV 8 to MERV 13 will provide a substantial improvement in protection of indoor air quality and occupant health. Accordingly, CARB staff supports a move to MERV 13 on a statewide basis at this time, but recommends that CEC pursue a higher MERV requirement in future code revision cycles.

1.3 CARB staff also agrees that MERV 13 should be required in all ducted buildings statewide, rather than just in PM_{2.5} non-attainment areas, because that would provide equal protection to all areas and population groups of concern and would be a much easier requirement to implement and enforce. Despite many regulations to reduce ambient PM concentrations in California, the time needed for full implementation of these regulations means that our State will continue to have non-attainment areas for many years. Even within attainment areas, homes and buildings may have PM levels that exceed the California Ambient Air Quality Standards due to their close proximity to local sources, such as busy roadways, rail yards, ports, airports, and stationary sources. Studies have shown that the impacts of traffic emissions from freeways can extend 300 meters from the roadway during the day time and up to 2600 meters before sunrise.³ One study showed that the emissions from aircraft arrivals and departures at LAX airport may increase the concentrations of UFPs over an area of 60 km² by 2 times.⁴ Statistically significant higher concentrations of PM_{2.5} were also measured on the downwind sites of rail yards compared to the upwind side.⁵ People living close to these sources have higher risks of adverse health outcomes, such as asthma and cardiovascular diseases.⁶ This is especially true for environmental justice communities, where the population often experiences higher exposures than others. In addition, implementation of the Sustainable Communities and Climate Protection Act (Senate Bill 375) promotes the siting of new developments in infill areas. While most infill areas will be located in non-attainment areas or near busy roadways, some will not. Therefore, having a statewide requirement for higher MERV-rated filters would assure equal protection for everyone in possible high-exposure areas of concern.

³ Choi, W., et al., 2012. Prevalence of wide area impacts downwind of freeways under pre-sunrise stable atmospheric conditions. *Atmospheric Environment*, 62: p. 318-327. Available at <http://www.sciencedirect.com/science/article/pii/S1352231012007753>.

⁴ Hudda, et al., 2014. Emissions from an International Airport Increase Particle Number Concentrations 4-fold at 10 km Downwind. *Environmental Science & Technology*, 48(12): 6628-6635. Available at <http://pubs.acs.org/doi/abs/10.1021/es5001566>.

⁵ Placer County Air Pollution Control District, 2008. Summary of Data Analysis on the Roseville Rail Yard Air Monitoring Project – 2007. Available at <https://www.placer.ca.gov/~media/apc/documents/up/2008/august/rrampboardmemo081408.pdf?la=en>.

⁶ Health Effects Institute, 2010. Traffic-related air pollution: A critical review of the literature on emissions, exposure, and health effects. Available at <https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health>.

1.4 Requiring a 2-inch depth filter grille will facilitate the adoption of MERV 13 filters now and higher MERV filters in future code cycles. A commonly raised concern regarding higher MERV filters is that they may have higher airflow resistance, and therefore trigger a need for bigger fans and larger ducts, which may increase the first costs and energy use. However, in a recent study conducted for CARB, Brett Singer at the Lawrence Berkeley National Laboratory found that a deep pleat MERV 16 filter reduced airflow by just 2.7%, and a 1-inch MERV 13 filter reduced airflow by 4.9%.⁷ A deeper filter grille will enable the installation of a deeper pleated filter with larger surface area and accordingly lower air resistance, and address the concerns regarding airflow resistance.

1.5 CARB staff believes that the estimate of \$117 for incremental costs associated with the higher MERV requirement is reasonable. Because using a 2-inch depth filter can largely reduce the air pressure drop across the filter, there should not be a need to increase duct size or power to compensate higher airflow resistance that may be observed for a 1-inch depth, higher MERV filter. Therefore, there should be no cost for larger size ducts. The incremental costs should mainly result from the higher unit price of MERV 13 filters, which is small, and extra materials related to a deeper filter grille.

2. CARB staff supports the proposal to update kitchen range hood performance requirements to meet the slightly refined ASHRAE 62.2-2016 requirements and to have Home Energy Savings System (HERS) Program raters verify that kitchen range hoods are certified by the Home Ventilating Institute (HVI) to meet the 100 cfm minimum airflow and 3 sone maximum sound requirements. Hundreds of chemicals, many of which are toxic, have been identified in the emissions from cooking activities. Range hoods are commonly used to remove air pollutants and moisture generated during cooking activities.⁸ To achieve air pollutant and moisture removal and encourage their usage, kitchen range hoods should be operated at a sufficient air flow rate and a reasonable noise level, and vented to the outdoors. Accordingly, the current code requires use of kitchen range hoods certified by HVI to provide at least 100 cfm airflow at no more than 3 sones. However, the required HVI certification is often not enforced. The proposed requirement for HERS verification of HVI certification would help ensure that appropriate kitchen range hoods will be installed to mitigate air pollutant emissions from cooking activities. Therefore, CARB staff fully supports the proposed requirement. In addition, CARB staff acknowledges that air flow rate is not the ideal metric to determine the performance of kitchen range hoods for air pollutant removal. Therefore, CARB staff recommends that once the ASTM testing method for kitchen range hood capture efficiency becomes

⁷ Singer et al., 2016. Reducing in-home exposure to air pollution. Available at https://www.arb.ca.gov/research/single-project.php?row_id=65080.

⁸ A list of references about air pollutants generated by cooking activities and the effectiveness of kitchen range hood can be found at https://www.arb.ca.gov/research/indoor/cooking/cooking_range_hoods.htm.

available, the code should be updated to require a minimum removal efficiency for kitchen range hoods.

3. CARB staff supports CEC staff's efforts to require the same level of protection against outdoor air pollution for multi-family dwellings as for single-family homes. Requiring MERV 13 or higher filters on any supply air system used in multi-family dwellings will largely reduce particle concentrations in the air brought into the indoor environment, and provide protection for people living in these buildings equal to that of people living in single-family homes.

**APPENDIX A
MERV Rating Chart**

Table 1. Filter Data Comparison: MERV Ratings*					
MERV Rating	Average Particle Size Efficiency (PSE), microns – Removal			Typical Controlled Contaminant or Material Sources (ASHRAE 52.2)	Typical Building Applications
	0.3-1.0	1.0-3.0	3.0-10.0		
1-4			<20	> 10 Microns Textile Fibers Carpet Fibers, Dust Mites, Spray Paint Dust, Sanding Dust, Pollen	Window AC units Residential Minimal Filtration
5			20-35	3.0 to 10.0 Microns Cement Dust, Pudding Mix, Mold Spores, Hair Spray, Dusting Aids, Snuff	Paint Booth Inlet Industrial Workplace Better Residential Commercial
6			35-50		
7			50-70		
8			>70		
9		<50	>85	1.0 to 3.0 Microns Welding Fumes, Legionella, Some Auto Emissions, Milled Flour, Humidifier Dust	Hospital Laboratories Better Commercial Superior Residential
10		50-65	>85		
11		65-80	>85		
12		>80	>90		
13	<75	>90	>90	0.3 to 1.0 Microns Bacteria, Droplet Nuclei (sneeze), Most Tobacco Smoke, Copier Toner, Insecticide Dust, Most Paint Pigments	Superior Commercial Smoking Lounge Hospital Care General Surgery
14	75-85	>90	>90		
15	85-95	>90	>90		
16	>95	>95	>90		
The following classes are determined by a different methodology**					
17	≥ 99.97		<0.3 Microns (HEPA/ULPA filters)** Viruses, Carbon Dust, Sea Salt, Fine Combustion Smoke, Radon Progeny	Clean Rooms Carcinogenic & Radioactive Materials, Pharmaceutical Manufacturing, Orthopedic Surgery	
18	≥ 99.99				
19, 20	≥ 99.999				

* Adapted from EPA 2009; originally from ANSI/ASHRAE Standard 52.2-2007.

** Not part of the official ASHRAE Standard 52.2 test, but added by ASHRAE for comparison purposes.

Villa, Victoria@ARB

From: Jenkins, Peggy@ARB
Sent: Tuesday, October 10, 2017 8:30 AM
To: Villa, Victoria@ARB
Cc: Osornio, Juan@ARB
Subject: RE: Evaluation of Air Filtration SEPs

Hi Victoria,

Sorry for the delay in getting back to you. I have a disabled brother who lives with me and was recently in the hospital, so my schedule has been tight with taking care of him.

Overall I think that both of the SEP proposals you sent me are good and I would strongly support approval, with a few clarifications. Such projects can greatly reduce the occupants exposures to both indoor and outdoor pollutants. I'll give some quick comments below and will send more later today (I am tied up today from 9-3). We can also talk by phone today after 3, if you are available.

I have been involved in much of the SCAQMD filtration activities as a reviewer and advisor, and we have used IQAir for two of our filtration studies, and both are top-notch in this area, and are very well qualified to do the work proposed. In the first study in which our contractor used IQAir, IQAir made custom high efficiency filters to replace the typical low efficiency filters used to filter vehicle passenger cabin air. Those filters were very successful. To avoid airflow resistance, IQAir also developed a newer type filter with smaller diameter fibers, which let more air through while still removing nearly all of the fine and ultrafine particles. Their filters really are top of the line...extremely effective.

The second study that used their HVAC and portable filters was a study of filtration effectiveness and in homes of children with asthma, which has completed field work. They were very successful, but there are a few caveats. Even though IQAir has some of the quietest portable air cleaners of all companies, when placed in small bedrooms or smaller homes and run on high they can be too noisy for the occupants. So, for our asthma kids study IQAir developed quieter models...and my understanding is that they have incorporated those measures into their newer models, so that their newer models are now even quieter than the models SCAQMD tested and used in the past. So, for both proposed SEP projects, I would recommend that we make sure the newer, quieter models are planned for use.

The second thing we learned from our asthma kids study is that IQAir greatly underestimated how often the filters would need to be changed, and I believe this will be a concern in the proposed SEPs as well. The chart provided by SCAQMD shows change intervals that I believe will be much too long for the SCAB...those filters will fill up much faster than estimated. In our study, problems with bad odors and excess accumulated dust on the filters developed within 4-6 months. Some of the lower income homes especially were pretty dusty, so the filters will fill sooner. And in LA factors such as the occasional Santa Ana winds will make that worse. Also, Lawrence Berkeley National Lab and others have found that filters over time will release contaminants back into the airstream, so changing at the correct frequency is very important.

I have a few other areas where we should request changes or clarifications, and also want to review info on the Perfect 16 and Life Shield products, but must get going. I'll give you a call this afternoon once my meetings are done.

Regards,
Peggy

Peggy L. Jenkins
Manager, Indoor Exposure Assessment Section
Research Division
CA Air Resources Board
PO Box 2815
1001 I Street, 5th floor
Sacramento, CA 95814
916-323-1504

From: Villa, Victoria@ARB
Sent: Monday, October 09, 2017 6:30 AM
To: Jenkins, Peggy@ARB
Cc: Osornio, Juan@ARB
Subject: RE: Evaluation of Air Filtration SEPs

Good morning Peggy,

I wanted to follow-up with you and see if you had a chance to review the SEP Proposals.

Thank you!

With regards,

Victoria Villa

Air Pollution Specialist

California Air Resources Board – Enforcement Division
9480 Telstar Ave. | El Monte, CA 91731 | (626) 575-6772



1001 I Street • P.O. Box 2815 • Sacramento, California 95812

From: Jenkins, Peggy@ARB
Sent: Thursday, September 28, 2017 1:47 PM
To: Villa, Victoria@ARB
Cc: Osornio, Juan@ARB
Subject: RE: Evaluation of Air Filtration SEPs

I'll be in later today and will respond soon.

Peggy L. Jenkins
Manager, Indoor Exposure Assessment Section

Research Division
CA Air Resources Board
PO Box 2815
1001 I Street, 5th floor
Sacramento, CA 95814
916-323-1504

From: Villa, Victoria@ARB
Sent: Wednesday, September 27, 2017 4:32 PM
To: Jenkins, Peggy@ARB
Cc: Osornio, Juan@ARB
Subject: Evaluation of Air Filtration SEPs

Hi Penny,

I work with Todd as part of the SEP Team, and he directed me to you for your assistance.

While in the past we have approved SEPs that utilize funds for the installation of air filtration systems in schools, we have yet to be presented a SEP that request funds for residential purposes. As a result, Todd is requesting your help evaluating the attached SEPs for a feasibility analysis, and opinion on whether the systems would provide a sufficient emissions benefit.

We appreciate any feedback you may have on the matter. Thanks Penny!

With regards,

Victoria Villa

Air Pollution Specialist

California Air Resources Board – Enforcement Division
9480 Telstar Ave. | El Monte, CA 91731 | (626) 575-6772



1001 I Street • P.O. Box 2815 • Sacramento, California 95812

Villa, Victoria@ARB

From: Patricia Kwon <pkwon@aqmd.gov>
Sent: Friday, August 25, 2017 12:10 PM
To: Villa, Victoria@ARB
Subject: RE: residential air filtration proposal

Hi Victoria,
In answer to your questions, see my responses below.

1. We have established criteria to determine which areas are Environmental Justice (EJ) communities which includes at least 10% of the population below the federal poverty line and top 15% PM_{2.5} concentration or top 15% cancer risk. We would install air filtration systems in homes in EJ communities, including single- family and multi-family residential units and mobile homes. In most instances this should correspond to criteria under CalEnviroScreen 3.0 for Disadvantaged Communities (DAC). If possible, depending on the nature and source of the violation, we would like to target San Bernardino in an early residential air filtration project. In some cases, CalEnviroScreen 3.0 excludes certain portions of western San Bernardino since they fall outside the cutoff for DACs. Some of these areas are in very close proximity to the BNSF railyard and other known sources of PM_{2.5} and toxics, so we would not wish to exclude these areas from consideration, and would like some flexibility in these instances. Our intent would be to select homes in closest proximity to the source of the violation, and expand the target radius as funding permits. A potential exception would be to include the entire set of homes within a neighborhood with defined, agreed upon geographical boundaries, before proceeding to the next neighborhood. We would consult local government and community based organizations and the funding agency to best determine the selection of homes and geographical boundaries of local neighborhoods.
2. Project cost per home would vary but in general, it would be the sum of costs for equipment, replacement filters, site assessment, setup and delivery. The actual cost would depend on the type of equipment and replacement interval for the filters.
3. Homes will need to be assessed to identify the options the home will be able to integrate into their existing infrastructure. The HVAC system and allowable space would be the primary focus to determine the type of system to be installed. If a home does not have a central HVA system, then the stand-alone air purification systems are the best solution.

Let me know if there are any further questions. Thanks for your consideration of our residential air filtration proposal.

Patricia

Patricia Kwon
Technology Demonstration
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-3065 work
(909) 396-3252 fax

From: Villa, Victoria@ARB [<mailto:Victoria.Villa@arb.ca.gov>]
Sent: Thursday, August 24, 2017 7:32 PM
To: Patricia Kwon <pkwon@aqmd.gov>
Subject: RE: residential air filtration proposal

Hi Patricia,

The residential air filtration filter underwent review, and there were a few questions.

1. The proposal mentions installing the systems in homes in environmental justice areas. What methodologies would be used for selecting the residences?
2. Could you please clarify the project cost per home? It would be the sum of the equipment, replacement filters, replacement intervals, site assessment, setup and delivery, correct?
3. What determines the type of system that gets installed in a home?

Thanks Patricia!

Victoria Villa

Air Pollution Specialist

California Air Resources Board – Enforcement Division

From: Patricia Kwon [pkwon@aqmd.gov]
Sent: Thursday, June 01, 2017 1:01 PM
To: Osornio, Juan@ARB; Klossing, Debbi@ARB; Villa, Victoria@ARB
Cc: Matt Miyasato; Naveen Berry
Subject: residential air filtration proposal

Hi,

Attached is a proposal to CARB for residential air filtration. The air filtration technologies proposed for residences can be used for filtration of ultrafine PM and chromium-6. Based on the actual SEP, costs and selection of residences in target communities can be further refined. SCAQMD would be requesting a 5% administration fee to cover costs as the SEP implementing agency. I'm happy to provide additional details and answer any questions you might have regarding this proposal.

Please note that I will be on vacation until June 27, 2017. I will be in a remote location and unable to access email until this time. If there are urgent questions, please contact Naveen Berry, Technology Demonstration Manager, in the interim. Thanks for your interest and consideration of our residential air filtration proposal.

Patricia

Patricia Kwon
Technology Demonstration
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-3065 work
(909) 396-3252 fax

Villa, Victoria@ARB

From: Patricia Kwon <pkwon@aqmd.gov>
Sent: Wednesday, September 20, 2017 1:33 PM
To: Villa, Victoria@ARB
Cc: Osornio, Juan@ARB
Subject: RE: residential air filtration

Victoria,

Thanks for the update on the residential air filtration proposal. Ideally we would like to start residential air filtration in one of our CCP communities such as San Bernardino. Based on household data from the CA Department of Finance, the City of San Bernardino has about 65,676 housing units of which 41,354 are single family residential units and 24,322 are multi-family residential units.

I asked IQAir about their ability to install air filtration systems based on their existing staffing. These numbers are below. If there is a need for a greater number of installations, IQAir could adjust their staffing if needed.

Perfect 16 (x1) installations: 1000 households per year
HealthPro Plus (2x) per households: 12,000 households per year
Perfect Home (1x) per HH: 6,000 households per year

Patricia

Patricia Kwon
Technology Demonstration
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-3065 work
(909) 396-3252 fax

From: Villa, Victoria@ARB [<mailto:Victoria.Villa@arb.ca.gov>]
Sent: Friday, September 15, 2017 8:02 AM
To: Patricia Kwon <pkwon@aqmd.gov>
Cc: Osornio, Juan@ARB <juan.osornio@arb.ca.gov>
Subject: RE: residential air filtration

Hi Patricia,

The Residential Air Filtration Systems SEP has buy off from management, and is being directed to other divisions for further review.

However, management did pose one additional question:

1. Feasibly, how many residences could potentially be selected on an annual basis?

As far as a timeline for the completion of the review and approval process, my best estimate would be about a month and half to two months. After division review, it goes to upper management, at which point a recommendation gets presented to the executive office. They have the final say as which projects get approved/denied.

Thanks!

With regards,

Victoria Villa

Air Pollution Specialist

California Air Resources Board – Enforcement Division
9480 Telstar Ave. | El Monte, CA 91731 | (626) 575-6772



1001 J Street • P.O. Box 2815 • Sacramento, California 95812

From: Patricia Kwon [<mailto:pkwon@aqmd.gov>]
Sent: Thursday, September 14, 2017 3:12 PM
To: Villa, Victoria@ARB
Subject: residential air filtration

Victoria,

I'm presenting the Wal-Mart and Murillo's Trucking SEPs to Tech Committee tomorrow and one of the Board members on this committee will ask about the status of the residential air filtration proposal we submitted in May. Has this proposal been approved or is there a timeline as to when we will know if it will be approved? Thanks.

Patricia

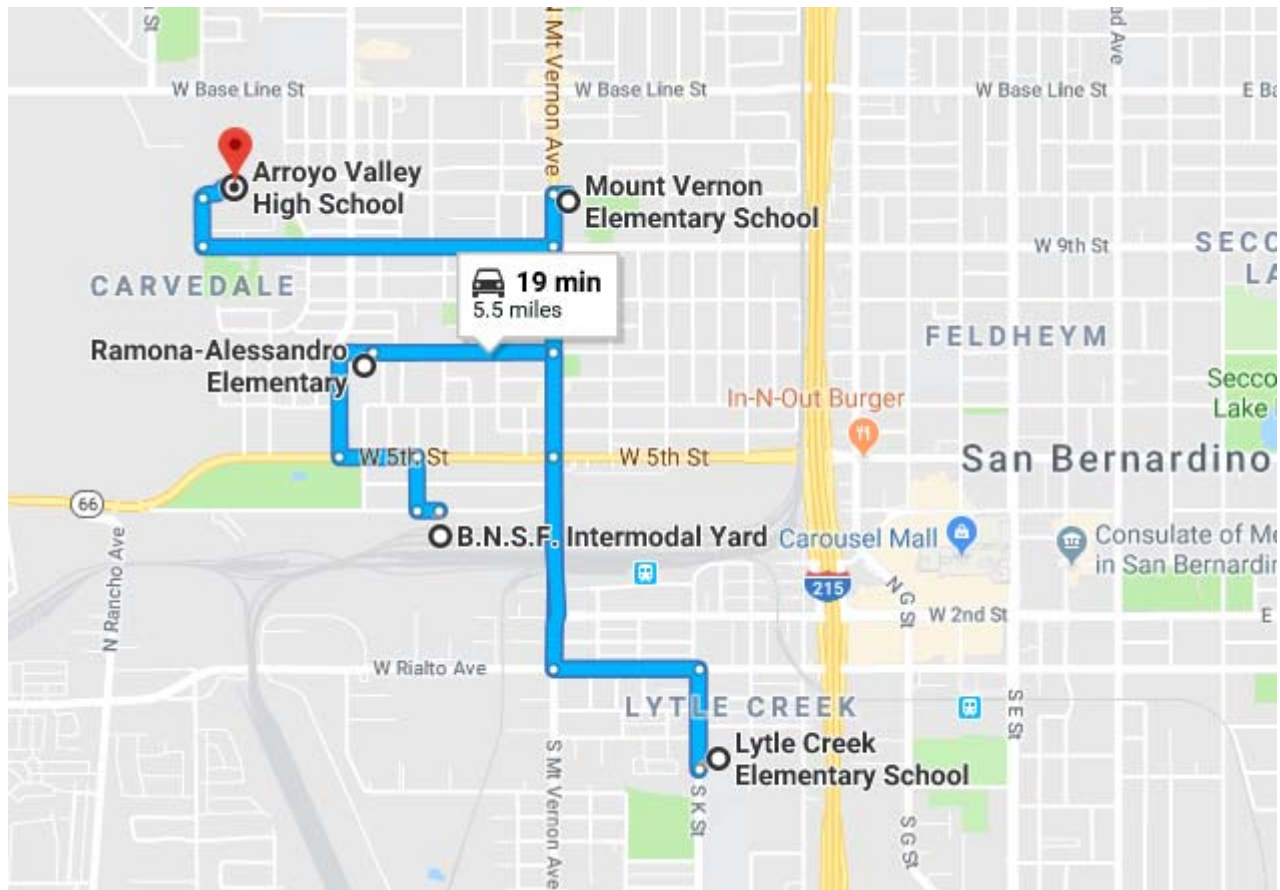
Patricia Kwon
Technology Demonstration
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-3065 work
(909) 396-3252 fax

Villa, Victoria@ARB

From: Patricia Kwon <pkwon@aqmd.gov>
Sent: Wednesday, February 21, 2018 12:05 PM
To: Villa, Victoria@ARB
Cc: Osornio, Juan@ARB; Stover, Mark@ARB; Stacy, Ann@ARB; ARB SEP; Naveen Berry
Subject: RE: SEP Agreement for Murillo's Trucking, C.J.J. Farming, Inc. and Western Power Sports, Inc.

Victoria,
In answer to your questions.

1. Residences would be selected in EJ or Disadvantaged Communities where at least 10% of the population were below the federal poverty level and in the top 15% for PM2.5 or cancer risk. This is our standard EJ criteria which we would continue to use.
2. The City of San Bernardino would be the first EJ community we would like to focus on, specifically those parts of San Bernardino that meet our standard EJ criteria. As an example, this could include residences near the BNSF railyard, which would take advantage of air filtration systems that have already been installed at four nearby schools, and provide a combined benefit of air filtration in schools and homes. However other areas could be considered, particularly after additional data is collected to verify that high performance panel filters and stand alone units work effectively in older, less energy efficient homes (pre 2006) which may be more typical for EJ communities. An alternative focus would be to collect monitoring data for an existing deployment of stand alone units in 90 homes in Mira Loma as part of a Mira Loma warehouse settlement with the California Attorney General's office in 2013.
<https://oag.ca.gov/news/press-releases/attorney-general-kamala-d-harris-announces-settlement-protect-public-health>
3. SCAQMD is considering a pilot deployment for residential air filtration that could be combined with air filtration in schools in San Bernardino or employ monitoring efforts for homes in Mira Loma. Staff is assessing viable alternatives.



Let me know if you have further questions, etc. Thanks for revisiting this with your Division Chief and Executive Officer. We appreciate the consideration given to our residential air filtration proposal.

Patricia

Patricia Kwon
Technology Demonstration
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-3065 work
(909) 396-3252 fax

From: Villa, Victoria@ARB [mailto:Victoria.Villa@arb.ca.gov]
Sent: Wednesday, February 21, 2018 11:10 AM
To: Patricia Kwon <pkwon@aqmd.gov>
Cc: Osornio, Juan@ARB <juan.osornio@arb.ca.gov>; Stover, Mark@ARB <mark.stover@arb.ca.gov>; Stacy, Ann@ARB <ann.stacy@arb.ca.gov>; ARB SEP <SEP@arb.ca.gov>
Subject: RE: SEP Agreement for Murillo's Trucking, C.J.J. Farming, Inc. and Western Power Sports, Inc.

Patricia,

Thank you for the update.

We will present your questions regarding school selection and aggregating smaller settlements to our Division Chief during our meeting with him on Monday, 2/26/18.

To provide you with an update on the residential air filtration proposal, we will be revisiting this with our Division Chief, and Executive Officer on 3/1/18. That being said, I have a follow-up question to past conversations regarding this proposal.

1. You had mentioned that residences would be selected based on an established criteria consisting of communities in which at least 10% of the population fell below the federal poverty line, and where in the top 15% PM2.5 concentration, or top 15% cancer risk. Is this still accurate?
2. I also recall mention that San Bernardino would be an area of focus. Is this San Bernardino County, or City? What are other areas of focus?
3. Additionally, prior to SCAQMD having submitted the Installation of AFS in Schools SEP, South Coast was already implementing a similar program on their own. That being said, does South Coast currently have a similar program, but for the installation of residential AFS?

With regards,

Victoria Villa

Air Pollution Specialist

California Air Resources Board – Enforcement Division
9480 Telstar Ave. | El Monte, CA 91731 | (626) 575-6772



1001 I Street • P.O. Box 2015 • Sacramento, California 95812

From: Patricia Kwon [<mailto:pkwon@aqmd.gov>]

Sent: Tuesday, February 20, 2018 2:33 PM

To: Villa, Victoria@ARB <Victoria.Villa@arb.ca.gov>

Subject: FW: SEP Agreement for Murillo's Trucking, C.J.J. Farming, Inc. and Western Power Sports, Inc.

Victoria,

We are taking four CARB air filtration SEPs to March Tech Committee and April Board meeting—Western Power Sports, C.J.J. Farming, JEGS Foundation, and Tesoro Companies. In terms of the geographical target areas for these SEPs should we focus on schools by the Ports of LA and Long Beach, or are there other target areas CARB would prefer to focus on? Since some of the SEPS are for smaller amounts, could we combine the funding in one or more of these SEPs to cover several schools in their entirety?

Patricia

Patricia Kwon
Technology Demonstration
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-3065 work
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