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IAQP WHITEPAPER

DECARBONIZING WITH THE ASHRAE STANDARD 62.1-2022 IAQ PROCEDURE

INDOOR AIR QUALITY PROCEDURE (IAQP)

5 KEY THINGS TO WATCH OUT FOR

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FIVE KEY STEPS TO CONSIDER WHEN USING THE IAQ PROCEDURE

1. COMPLY WITH LATEST ASHRAE STANDARD 62.1 REQUIREMENTS
2. ADDRESS ALL REQUIRED DESIGN COMPOUNDS
3. AIR CLEANING TECHNOLOGIES WITH TESTED AND DOCUMENTED EFFICACY VIA 3RD PARTY TESTING
4. MAINTENANCE REQUIREMENTS THAT ALLIGN WITH TYPICAL MAINTENANCE SCHEDULES
5. ACCOUNT FOR VALIDATION OF AIR CLEANING EFFECTIVENESS AFTER INSTALLATION

DECARBONIZING WITH THE IAQP:

As building owners and design professionals seek new ways to improve efficiency, lower cost, and reduce carbon emissions in their buildings, many are considering ventilation optimization through the ASHRAE Standard 62.1 Indoor Air Quality Procedure (IAQP) as a means to enable all of these design goals. Unlike the traditional prescriptive method, the Ventilation Rate Procedure (VRP), which uses occupancy and area to determine an outdoor air ventilation rate, the IAQP allows the design professional to leverage additional methods, such as air cleaning devices, to reduce the need for high rates of outdoor air while still providing clean and comfortable air to the building occupants. The concept of cleaning the air first, then addressing any remaining contaminants via dilution with outdoor air, is one that can both help meet energy and carbon emissions goals, by reducing the load and energy use associated with conditioning outdoor air, and provide lower first cost by reducing the size of HVAC equipment needed. Page 100 of the ASHRAE Standard 62.1 users manual states **"The IAQP may allow for a more cost-effective solution to providing good air quality, as all design strategies may be considered..."**

When applying air cleaning technologies as part of an IAQP-enabled optimized outdoor air strategy, there are some key details for the design professional to consider. While addressing all the details to successfully apply the IAQP is beyond the scope of this article, we will explore 5 key considerations that should not be overlooked when evaluating different air cleaning technology options. It is important to also state that ASHRAE Standard 62.1 and local/national codes are living documents that may be changed over time. While we believe the following to be accurate and true at the time of writing, it is critical that the design professional review and understand all the applicable codes and standards that apply to the project.

KEY CONSIDERATIONS WHEN APPLYING AIR CLEANING TECHNOLOGIES

1 KEEP UP TO DATE ON THE LATEST 62.1 CHANGES

As carbon emissions, energy efficiency, and pandemic building resiliency have driven actions to make HVAC systems better, ASHRAE has made a number of changes to the 62.1 standard over the past few years. In the past, the IAQP method has been less well defined, leaving a number of key considerations up to the design professional. In the 2019 and 2022 standards or addenda, a number of helpful clarifications or guidelines have been added to help clarify how the design professional should leverage the IAQP. In this paper, we will refer to the 2022 version of the standard unless otherwise noted. While many states have not yet formally adopted the latest version, the design professional should consider whether to apply concepts or clarifications from the latest standard (as long as not excluded or prohibited by local codes or standards) so that the design can take advantage of the helpful clarifications and guidelines of the latest version. Below are a few examples of changes to the standard that those applying the IAQP should be aware of:

ADDENDUM AA TO 62.1-2019 (FEB 2022)

Makes the IAQP more prescriptive by defining contaminants of concern, design limits, and post occupancy testing requirements.

ADDENDUM N TO 62.1-2022 (SEPT 2022)

Raises the bar for compliant air cleaning technologies by defining specific, industry standard, test procedures to measure efficacy.

ADDENDUM C TO 62.1-2022 (OCT 2023)

Makes applying the IAQP much easier for engineers by providing an Excel tool to calculate outside air requirements using the IAQP.

2 ADDRESS ALL CONTAMINANTS OF CONCERN

A key clarification first introduced in the 2019 version of ASHRAE Standard 62.1 is that to ensure air quality is suitable, there are 14 specific design compounds or 'contaminants of concern' that must be evaluated and addressed. Past versions left this undefined and up to the design professional to determine what contaminant(s) to address. Addendum aa, Sections 6.3.1 and 6.3.2, state:

> THE SYSTEM DESIGN SHALL BE BASED ON THE DESIGN COMPOUNDS (DCS) AND PM2.5 SPECIFIED IN TABLE 6-5", "THE CONCENTRATION LIMITS, REFERRED TO AS DESIGN LIMITS, SHALL BE AS SPECIFIED IN TABLE 6-5", AND "DESIGN VENTILATION SHALL BE SUCH THAT THE CALCULATED CONCENTRATION OF EACH DC, MIXTURE OF DCS, AND PM2.5 DOES NOT EXCEED ITS LIMIT.

Now that we have better definition of what contaminants to evaluate, we can leverage the IAQP to ensure that all of these contaminants are addressed. If using air cleaning technologies, it is critical to ensure that the specific technology or technologies used can address all of these contaminants. It is also important to consider that some elective building rating systems, such as LEED, may require more stringent targets than ASHRAE Standard 62.1, so be sure to check whether those standards apply to the project in question. For example, the LEED pilot credit (EQpc165) for an IAQP Compliance Path has an option to earn an additional LEED point by using a limit of 20 g/m3 for formaldehyde instead of the limit of 33 g/m3 in ASHRAE Standard 62.1-2022.

DESIGN COMPOUNDS & LIMITS (ASHRAE STANDARD 62.1-2022)

COMPOUND	COGNIZANT AUTHORITY	DESIGN TARGET
Acetaldehyde	Cal EPA CREL (June 2016)	140 ug/m^3
Acetone	AgBB LCI	1200 ug/m^3
Benzene	Cal EPA CREL (June 2016)	3 ug/m^3
Dichloromethane	Cal EPA CREL (June 2016)	400 ug/m^3
Formaldehyde	Cal EPA 8-hour REL (2004)	33 ug/m^3
Naphthalene	Cal EPA CREL (June 2016)	9 ug/m^3
Phenol	AgBB LCI	10 ug/m^3
Tetrachloroethylene	Cal EPA CREL (June 2016)	35 ug/m^3
Toluene	Cal EPA CREL (June 2016)	300 ug/m^3
1,1,1-trichloroethane	Cal EPA CREL (June 2016)	1000 ug/m^3
Xylene, total	AgBB LCI	500 ug/m^3
Carbon Monoxide	USEPA NAAQS	9 ppm
PM2.5	USEPA NAAQS (annual mean)	12 ug/m^3
Ozone	USEPA NAAQS	70 ppb

3 PROOF OF EFFECTIVENESS

With air quality being critical to the health and comfort of occupants, it is critical that air cleaning technologies not only advertise effectiveness on addressing all contaminants of concern, but can also demonstrate it through independent lab testing, along with demonstrating that no harmful byproducts are produced. For an air cleaning technology to comply with the updated IAQP, the technology must have third-party cleaning efficiencies for the applicable design compounds (DCs) and PM2.5 (see table above for applicable design compounds). Efficiencies for each DC and PM2.5 must be determined by third-party testing performed according to defined test methods (e.g., ASHRAE 145.2 for gas-phase air cleaners or ASHRAE 52.2 for particulate filters), other "national consensus standards" approved by the authority having jurisdiction, or "custom efficiency tests" that comply with ASHRAE defined requirements (see Addendum n to Standard 62.1-2022, Section 6.3.4(e)) and are approved by the authority having jurisdiction. Efficiency testing must be performed for all 14 DCs and PM2.5.

For devices that use adsorbent media, it is important to design around the removal efficiency of the filter at the end of life (i.e. the time when the sorbent filter is considered depleted and must be replaced), rather than when new. In the graphic below, we can see the projected ending efficiency (after 2 years) of enVerid's sorbent filters.

It is recommended that the design professional obtain copies of testing for all design compounds as part of the approval of submittals for the project. An example of this kind of documentation for enVerid Sorbent Ventilation Technology® can be obtained here. Additionally, they offer a helpful IAQP compliance check list here.

AIR CLEANING EFFICIENCY FOR enVerid HLR MODULES
(Based on ASHRAE 145.2 and 52.2 test methods)

CONTAMINANT	EFFICIENCY (derated for 2 year End-Of-Life)	THIRD PARTY LAB	TEST METHOD
Acetaldehyde	72%	RTI International	ASHRAE 145.2
Acetone	72%	RTI International	ASHRAE 145.2
Benzene	87%	RTI International	ASHRAE 145.2
Naphthalene	54%	LMS Technologies	ASHRAE 145.2
Formaldehyde	72%	LMS Technologies	ASHRAE 145.2
Naphthalene	87%	RTI International	ASHRAE 145.2
Phenol	60%	RTI International	ASHRAE 145.2
Tetrachloroethylene	54%	LMS Technologies	ASHRAE 145.2
Toluene	52%	RTI International	ASHRAE 145.2
1,1,1-trichloroethane	54%	LMS Technologies	ASHRAE 145.2
Xylene, total	60%	RTI International	ASHRAE 145.2
PM2.5	MERV11	RTI International	ASHRAE 52.2
Ozone	70%	RTI International	ASHRAE 145.2

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MAINTENANCE CONSIDERATIONS

How long an air cleaning device remains effective without maintenance can be a critical factor in the overall outcome. Many facilities have routine maintenance schedules, but if a device requires maintenance more frequently than established schedules, that required maintenance risks being overlooked. For some air cleaning technologies, 1 to 2 years of operation before substantial maintenance (excluding simple particulate filter swaps that most facilities plan for) may be feasible and inline with typical annual maintenance schedules, but some air cleaning technologies may begin to lose effectiveness quickly, in days or months, especially for some compounds such as formaldehyde. Formaldehyde is of particular importance because it is often the design compound that drives the highest ventilation requirement due to the relatively low allowable limit combined with the number of building materials that emit it.

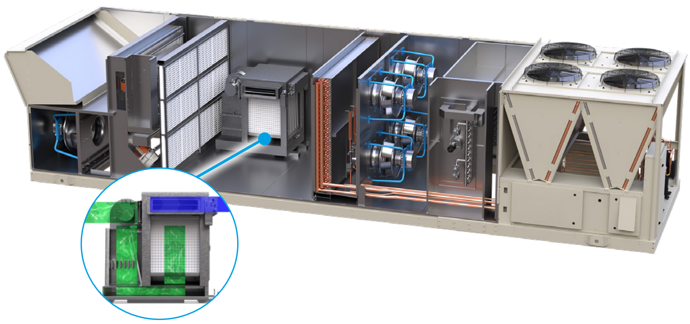
5

VALIDATION

ASHRAE Standard 62.1-2022 (and 2019) requires IAQP designs to be validated for efficacy as part of the commissioning process. This requirement ensures that designs on paper translate into performance in the real world, delivering clean and comfortable air to occupants. Both an objective evaluation, which measures if design compounds are within allowable limits, and a subjective evaluation "to demonstrate the occupants' level of acceptability of 80% or more within each zone served by the system" are required, however "substantially similar zones" don't each need their own survey. Refer to Section 7.3.2 Informative Note for further details. These validation requirement make it all the more important for the design professional to have confidence in the air cleaning solution. Choosing devices that are tested to an accepted industry standard, effective against all listed Design Compounds, and have good longevity all become increasingly important to give the designer, owner and occupants confidence that the design will perform as designed during the commissioning, without requiring unplanned redesign or modification, and continue to perform throughout the life of the HVAC system.

MOVING FORWARD

With the understanding that leveraging air cleaning can allow designers to meet both decarbonization/energy savings goals, and deliver clean and comfortable air to the occupants, ASHRAE Standard 62.1 and the IAQP are more important than ever before. Becoming familiar with the requirements of 62.1, along with the afore-mentioned considerations around air cleaning device testing, effectiveness and maintenance give the design professional a critical set of tools in evaluating air cleaning solutions for the building.



To learn more about how Daikin and enVerid air cleaning solutions can enable your design goals, you can visit Daikin's IAQ page and enVerid's learning portal or find your local Daikin Sales Representative here.