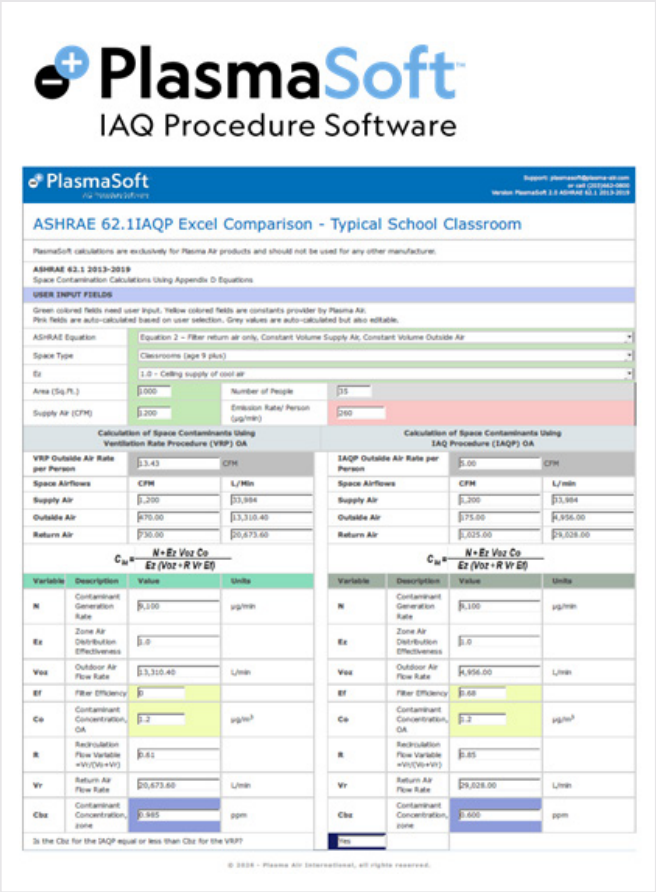
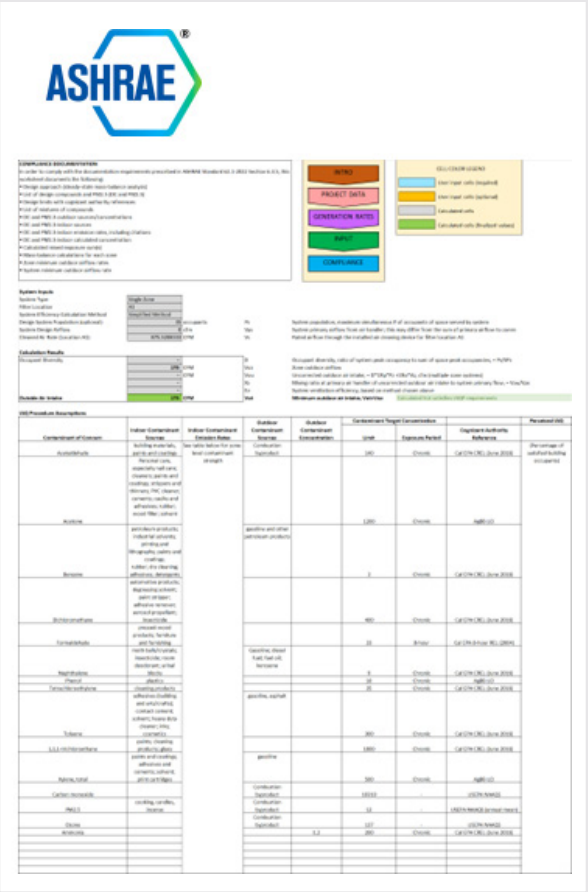
Engineering Confidence in IAQP Calculations

PlasmaSoft™: Proven ASHRAE Methodology. Simplified Engineering Workflow.

Verification of PlasmaSoft against the official ASHRAE Standard 62.1 IAQP Calculator





The Challenge

ASHRAE Standard 62.1 introduced the Indoor Air Quality Procedure (IAQP) to enable performance-based ventilation design that can reduce outdoor air requirements while maintaining equivalent or better indoor air quality than the Ventilation Rate Procedure (VRP).



Although technically robust, IAQP has historically seen relatively low industry adoption. Prior to the release of the official ASHRAE spreadsheet, engineers either performed complex manual calculations or used specialist software – typically provided by IAQ vendors – such as PlasmaSoft to implement the ASHRAE mass-balance equations.

When ASHRAE later released its own IAQP spreadsheet calculator, some engineers questioned whether vendor-developed software could introduce bias toward selling air-cleaning equipment, despite implementing the same methodology. This perception has caused some consulting engineers to adopt the ASHRAE spreadsheet, even though many acknowledge that it is complex, time-consuming, easy to make an error and thus not well suited to occasional IAQP users. As a result, many projects continue to default to the simpler Ventilation Rate Procedure, missing a range of opportunities to optimize HVAC design, thereby reducing large capital equipment expenses, delivering significant annual energy savings, whilst also improving overall occupant and building performance.

This technical brief aims to remove the concern of "vendor bias" by highlighting the results of a direct, reproducible test between PlasmaSoft and the official ASHRAE Standard 62.1 IAQP spreadsheet calculator (62.1IAQP_2022, purchased from the ASHRAE store).

The Reproducible Test

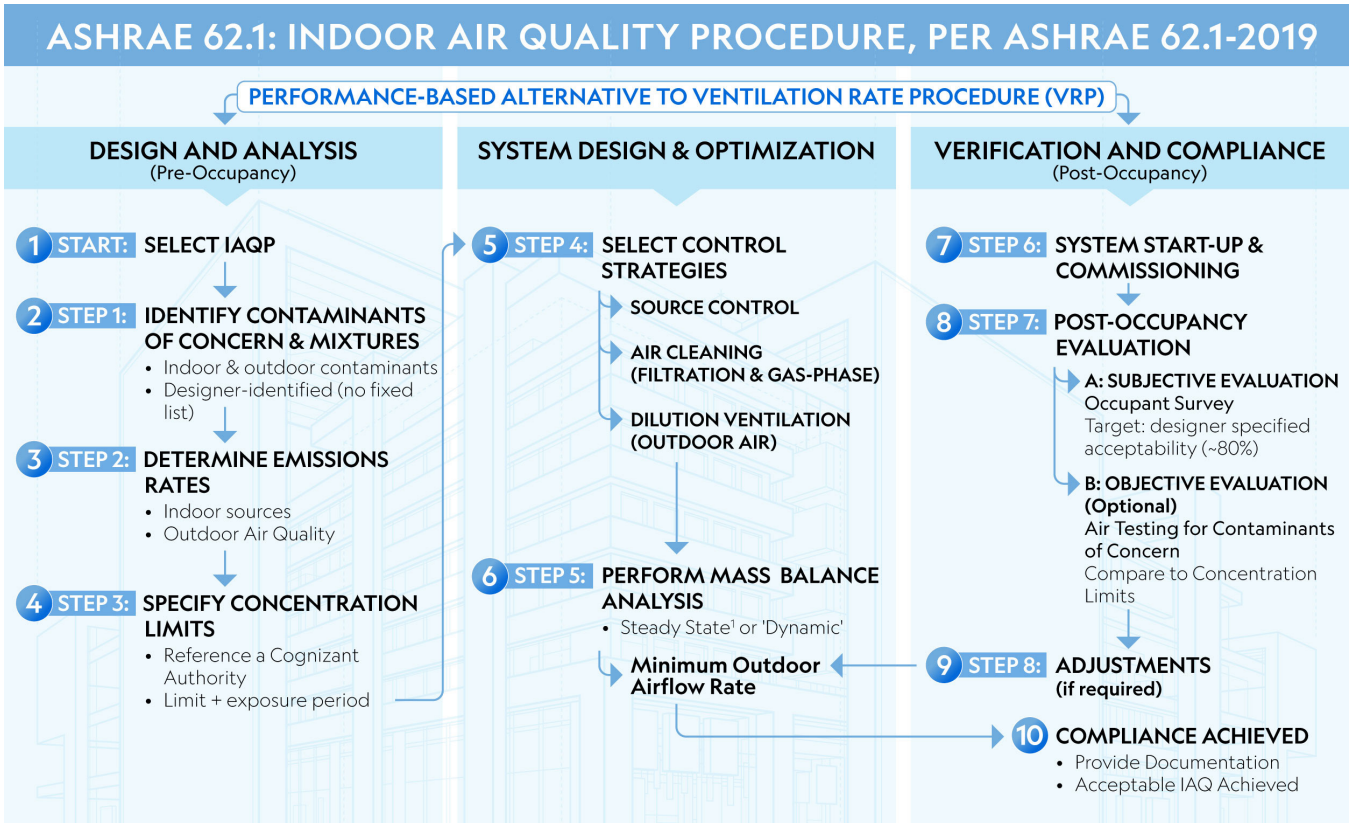
Scope:

PlasmaSoft was compared against the official ASHRAE IAQP spreadsheet using identical Office and Classroom design examples, as follows:

Input	Typical Office	Typical Classroom	Source
Space type (Table 6-1)	Office space	Classrooms (age 9+)	ASHRAE 62.1
Floor area (ft^2)	10,000	1,000	Example design
Occupants (default density)	50	35	ASHRAE 62.1 Table 6-1
Supply air (CFM)	10,000	1,200	Example design
Ammonia emission (µg/min per person)	260	260	PlasmaSoft constant
Cleaning efficiency Ef (ammonia)	0.68	0.68	Third-party test, Plasma Air ionization
Outdoor concentration Co ($\mu g/m^3$)	1.2	1.2	PlasmaSoft constant
Zone air distribution effectiveness Ez	1.0	1.0	Ceiling supply of cool air

Process:

For the comparison test ASHRAE 62.1:2019 methodology was used.



Mass Balance Equation:

The IAQP is built on the steady-state mass balance equations in the standard's appendix (Informative Appendix E, Table E-1 in 62.1-2019). PlasmaSoft implements those equations for eight system configurations.

For the comparison test, the mass balance equation used is the most common one — air cleaner in the recirculated airstream, constant-volume supply and outdoor air (Table E-1 "Location A, constant/constant"):

$$Cbz = (N + Ez \cdot Voz \cdot Co) / [Ez \cdot (Voz + R \cdot Vr \cdot Ef)]$$

where

- N is the contaminant generation rate
- Voz the outdoor airflow
- R·Vr the recirculated airflow through the air cleaner
- Ef the cleaning efficiency
- Co the outdoor concentration.

Input Assumptions:

The equations in the two tools are the same; the tools differ only in their default input assumptions. To make the comparison one-to-one, the ASHRAE spreadsheet inputs were set as follows:

- Design compound: ammonia only, the compound PlasmaSoft is scoped around, entered at PlasmaSoft's occupant emission rate (260 µg/min per person).
- Air cleaner: PlasmaSoft's third-party-tested ammonia efficiency (Ef = 0.68) and cleaned airflow (the recirculated air through the ionization equipment, R·Vr).
- Outdoor air: the same IAQP outdoor-air rate selected by PlasmaSoft, so both tools evaluate the identical design point.
- Compliance target: PlasmaSoft (per 62.1-2019) accepts a design when the IAQP concentration does not exceed the VRP concentration; the spreadsheet's 62.1-2022 ammonia limit cell was pointed at that same target.

Why input assumptions can legitimately differ between tools

The IAQP is performance-based by design: ASHRAE 62.1 requires the designer to select the contaminants of concern, their emission rates, target limits and cleaning efficiencies, and it does not prescribe a single data set (the 2019 edition has no fixed compound list at all; the ASHRAE spreadsheet reflects the later 2022 defaults).

Two correct IAQP tools will therefore ship with different defaults while computing with the same equations.

PlasmaSoft's assumptions — an occupant-generated design compound, a conservative tested cleaning efficiency, and acceptance only when the result is at least as clean as the VRP design — are inputs any engineer can inspect and reproduce, as this comparison demonstrates.

The Result:

Same ASHRAE Equations. Same Engineering Results.

Once the assumptions are aligned, both tools calculate identical results in both example spaces.

Result: OFFICE	PlasmaSoft	ASHRAE calc.	Comparison
VRP outdoor air (CFM)	850	850	**Identical**
IAQP outdoor air (CFM)	283.3	283.3	**Identical**
Ammonia Cbz at VRP OA (ppm)	0.778	0.778	**Identical**
Ammonia Cbz at IAQP OA (ppm)	0.099	0.099	**Identical**
Outdoor-air reduction	67%	67%	**Identical**

Result: CLASSROOM	PlasmaSoft	ASHRAE calc.	Comparison
VRP outdoor air (CFM)	470	470	**Identical**
IAQP outdoor air (CFM)	175.0	175.0	**Identical**
Ammonia Cbz at VRP OA (ppm)	0.985	0.985	**Identical**
Ammonia Cbz at IAQP OA (ppm)	0.600	0.600	**Identical**
Outdoor-air reduction	63%	63%	**Identical**

The results are identical to within display rounding (ie. below 0.001 ppm and 0.01 CFM). In both spaces the indoor concentration at the reduced IAQP outdoor-air rate is well below the concentration the VRP itself would produce, which is the IAQP acceptance test PlasmaSoft applies. This proves PlasmaSoft does not use a proprietary calculation method — it implements the same mass-balance equations published in ASHRAE Standard 62.1.

This allows engineers to use PlasmaSoft with confidence, knowing that they are applying the published ASHRAE methodology through software specifically designed for consulting engineering practice.

If the Results are Identical... Why Choose PlasmaSoft?

ASHRAE Science. Engineering Simplicity. Better Project Delivery.

PlasmaSoft transforms the ASHRAE IAQP calculation process into an intuitive engineering workflow while preserving complete compliance with the underlying ASHRAE methodology.

Rather than requiring engineers to navigate numerous spreadsheet worksheets, formulas and manual data entry, PlasmaSoft guides users through a logical project design process.

By reducing the complexity of IAQP calculations while maintaining complete alignment with ASHRAE methodology, PlasmaSoft is simpler to use and faster to complete a project which enables consulting engineers to evaluate more projects, optimize more designs and deliver better-performing buildings.

Built on Published ASHRAE Equations

- Implements the published ASHRAE Standard 62.1 IAQP methodology and uses the published ASHRAE Standard 62.1 mass balance equations
- Produces identical engineering results to the official ASHRAE spreadsheet when identical project assumptions are used.

Designed as a Productivity Tool for Engineers

- Designed specifically to simplify the IAQP process and calculations for practicing engineers.
- Reduces engineering time while improving consistency
- Resides in the cloud so users can access their projects at anytime, from anywhere
- Attained AHR innovation award

This award-winning free software calculates the outside air reduction available when using the IAQP versus the traditional Ventilation Rate Procedure (VRP) in ASHRAE 62.1.

Recipient of AHR Expo Innovation Award

Proven Compliance and Savings

- Utilized on thousands of mechanical code projects over 10+ years
- Examples of energy savings across different indoor environments:

HOSPITAL
Annual Savings: $435,000
University of Pittsburgh Medical Center: 1.5 million ft²



UNIVERSITY
Annual Savings: $290,000
Average university size: 1 million ft²



HIGH SCHOOL
Annual Savings: $58,000
Average high school size: 200,000 ft²



HOTEL
Annual Savings: $31,320
Hilton Philadelphia size: 108,000 ft²



Supporting Documents

- Modified ASHRAE workbooks (Office and Classroom) with a built-in comparison sheet,
- the PlasmaSoft PDF reports, and a change log — folder "PlasmaSoft\03 IAQP Calculator\ASHRAE mod". PlasmaSoft runs of 6 July 2026 (v3.1.71)
- ASHRAE 62.1IAQP_2022 spreadsheet.

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