GTAA
PARTNERS IN PROJECT GREEN
A PEARSON ECO-BUSINESS ZONE

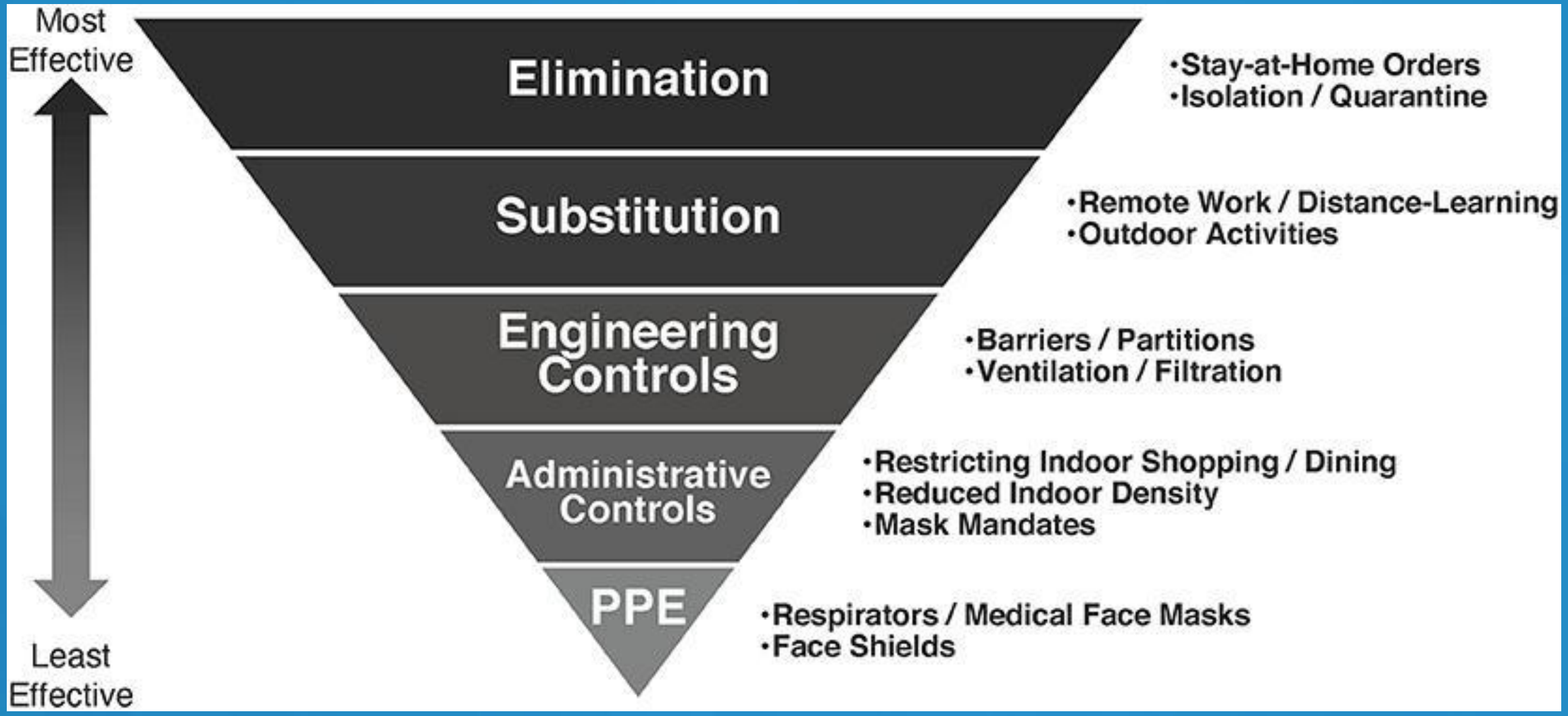
COVID-19 Ventilation Upgrades

Strategies to increase ventilation, eliminate energy waste, & reduce GHG emissions

March 15th, 2022

NERVA ENERGY

Josh Lewis, CEM, CMVP
VP Energy Engineering
josh@nervaenergy.com


Most Effective
Elimination
•Stay-at-Home Orders
•Isolation / Quarantine
Substitution
•Remote Work / Distance-Learning
•Outdoor Activities
Engineering Controls
•Barriers / Partitions
•Ventilation / Filtration
Administrative Controls
•Restricting Indoor Shopping / Dining
•Reduced Indoor Density
•Mask Mandates
PPE
•Respirators / Medical Face Masks
•Face Shields
Least Effective

Common Indoor Air Pollutants

Airborne particles
from diesel exhaust, dust, smoke and other sources

Indoor formaldehyde
from building materials, furniture, cooking, and smoking

Household odors & gases
from activities such as painting, cooking, and smoking

Ozone
from outdoor air (ground level ozone is harmful to breathe)

O_3

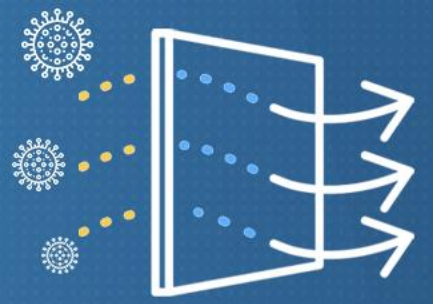
Carbon Dioxide
from people exhaling and cooking


90%


WORK
LIVE
LEARN

WHAT DO THE EXPERTS RECOMMEND?

INCREASE VENTILATION



IMPROVE FILTRATION

**The American Society of Heating, Refrigerating and Air-Conditioning Engineers

COVID-19

INDOOR AIR QUALITY SPECIALISTS

MAXIMIZE AIRFLOW & INCREASE AIR EXCHANGE RATES

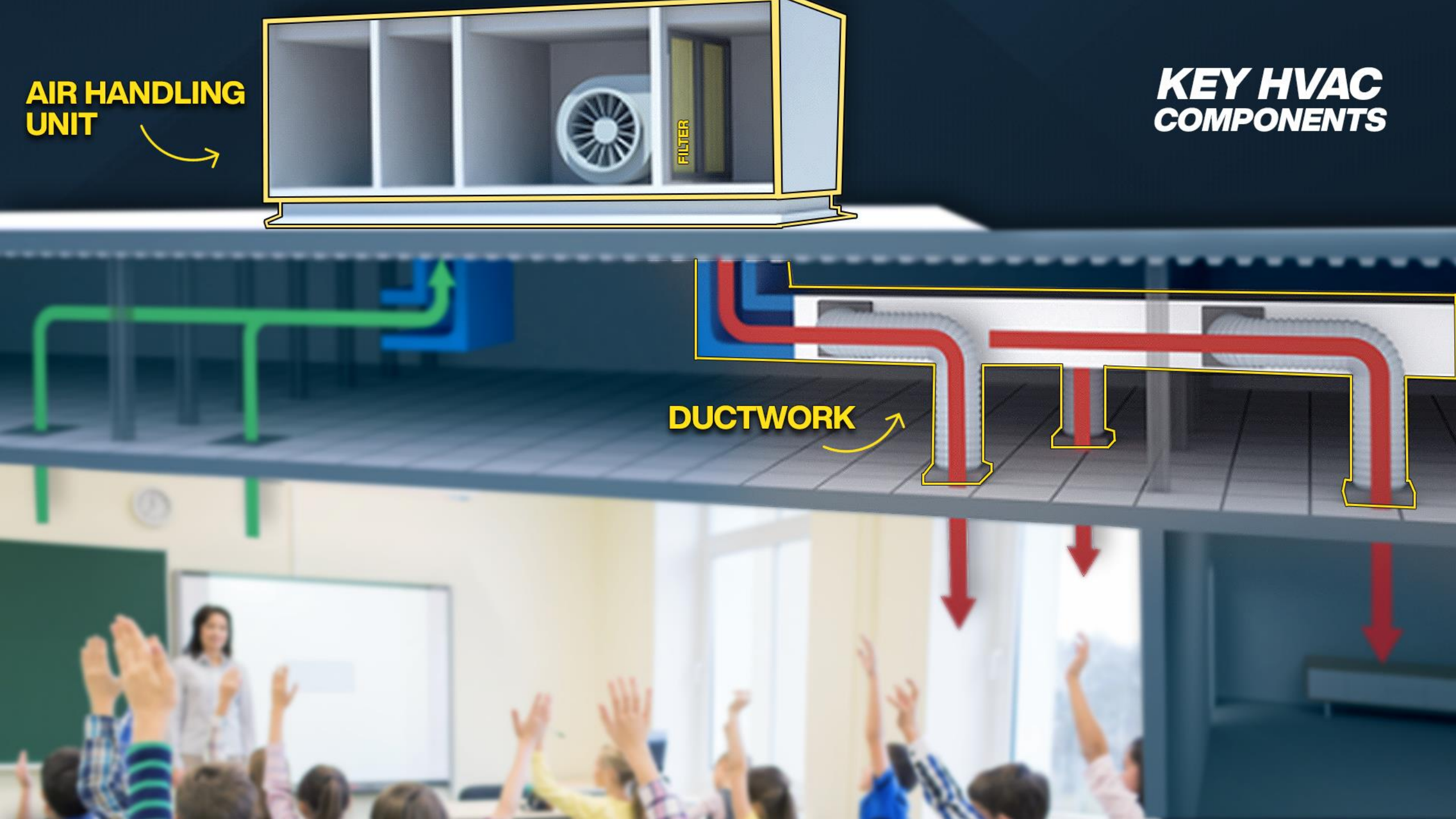
USE AIR TREATMENT TECHNOLOGIES TO PURIFY THE AIR AND SURFACES

Increase Airflow with:

DUCT SEALING

Purify the air and surfaces with:

REME TECHNOLOGY


AIR HANDLING UNIT
FILTER
KEY HVAC COMPONENTS
DUCTWORK

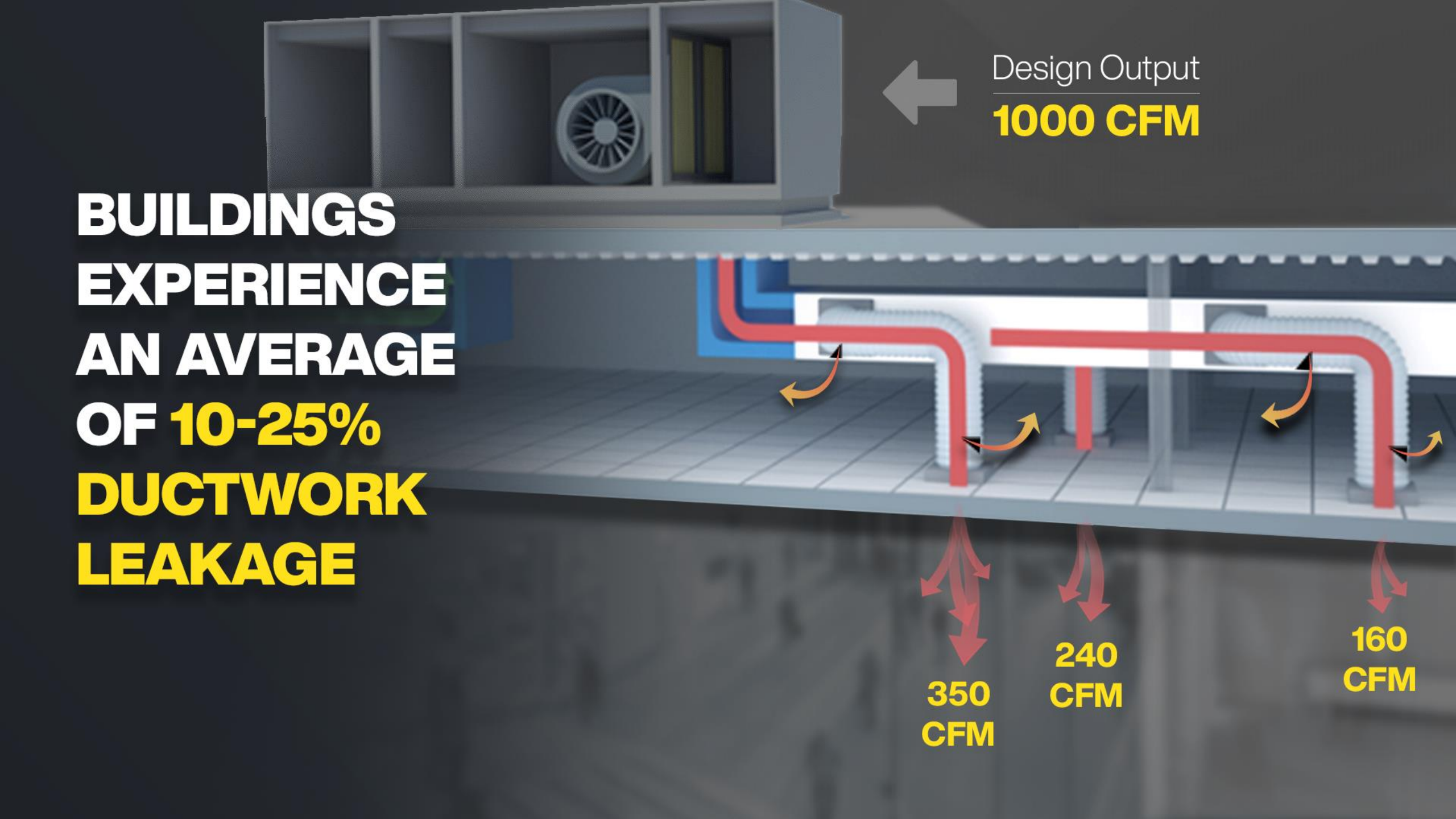
AIR HANDLING UNIT

THE HEART

DUCTWORK

THE ARTERIES


ASHRAE®
DUCTWORK THE ARTERIES


Design Output
1000 CFM
BUILDINGS EXPERIENCE AN AVERAGE OF 10-25% DUCTWORK LEAKAGE
350 CFM
240 CFM
160 CFM

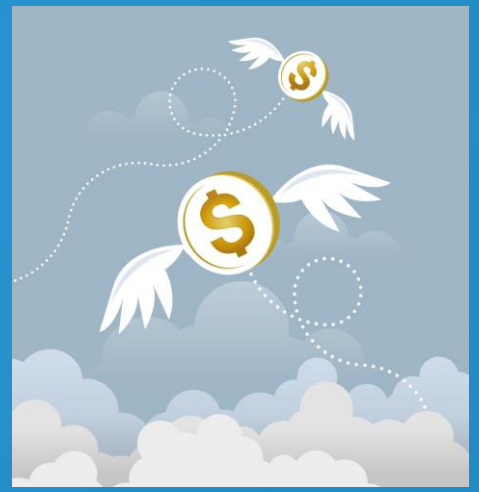
LEAKS AND ENERGY WASTE

#1 Most Expensive Problem:

- Building Commissioning states duct leaks as the No. 1 most expensive building fault and costs billions a year in energy costs.

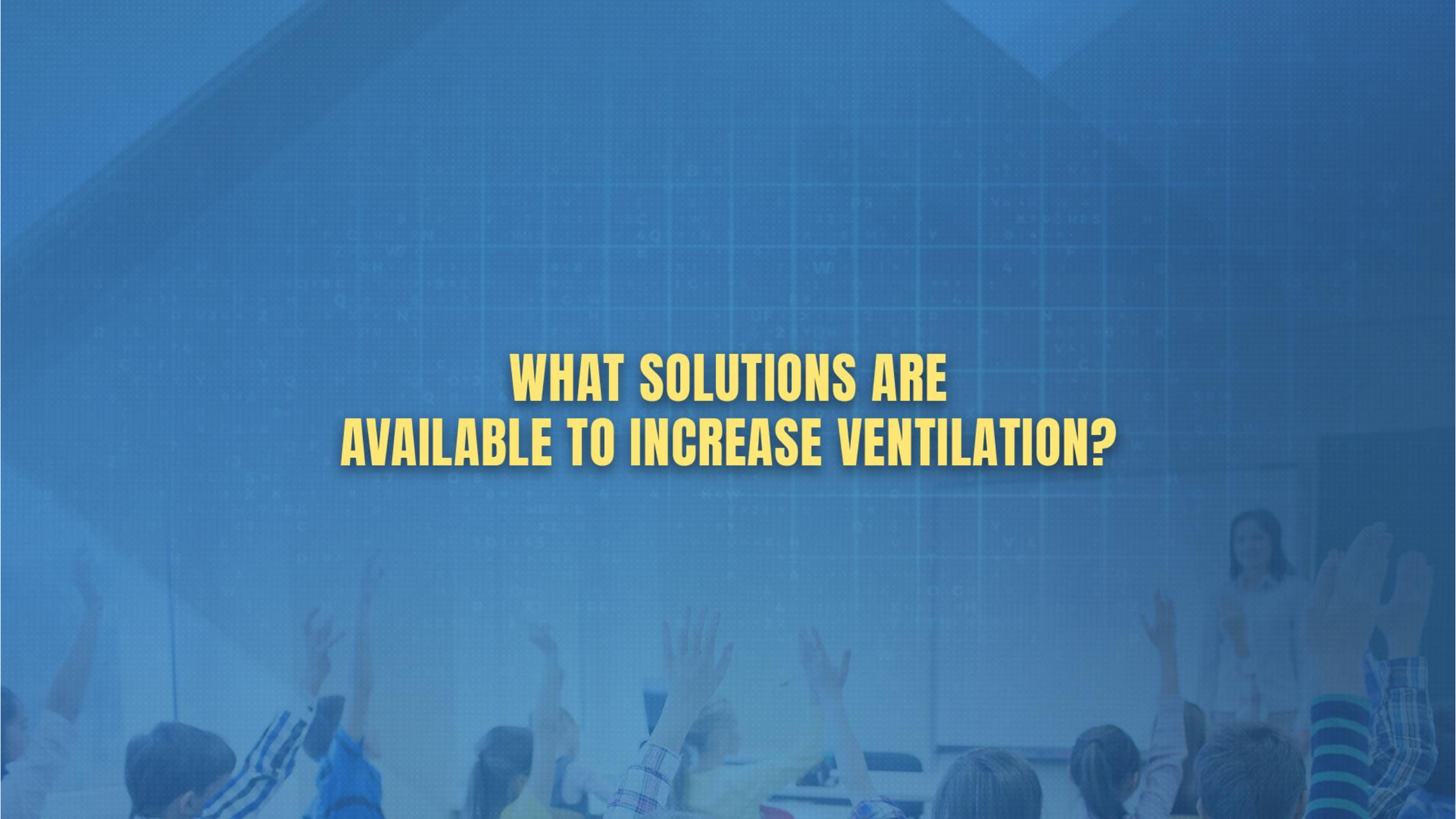
- Source:
  - Source: Building Commissioning: A Golden Case For Reducing Energy Costs, E. Mills, 7/09 Lawrence Berkeley National Laboratory

Top 10 Building Faults	Annual Cost
Duct Leakage	**$2.9B**
HVAC left on when unoccupied	$1.9
Lights left on when unoccupied	$1.7
Airflow not balanced	$0.7
Improper refrigerant charge	$0.7
Dampers not working properly	$0.5
Insufficient evaporator airflow	$0.3
Improper controls set up	$0.2
Control component failure	$0.2
Software programming errors	$0.1



ASHRAE HPB - **Duct Leakage Testing is a Must** - https://www.hpbmagazine.org/duct-leakage-testing-is-a-must/

WHAT SOLUTIONS ARE AVAILABLE TO INCREASE VENTILATION?

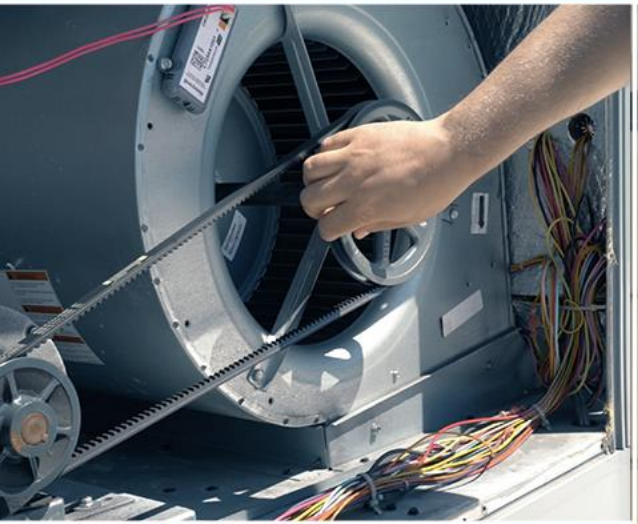


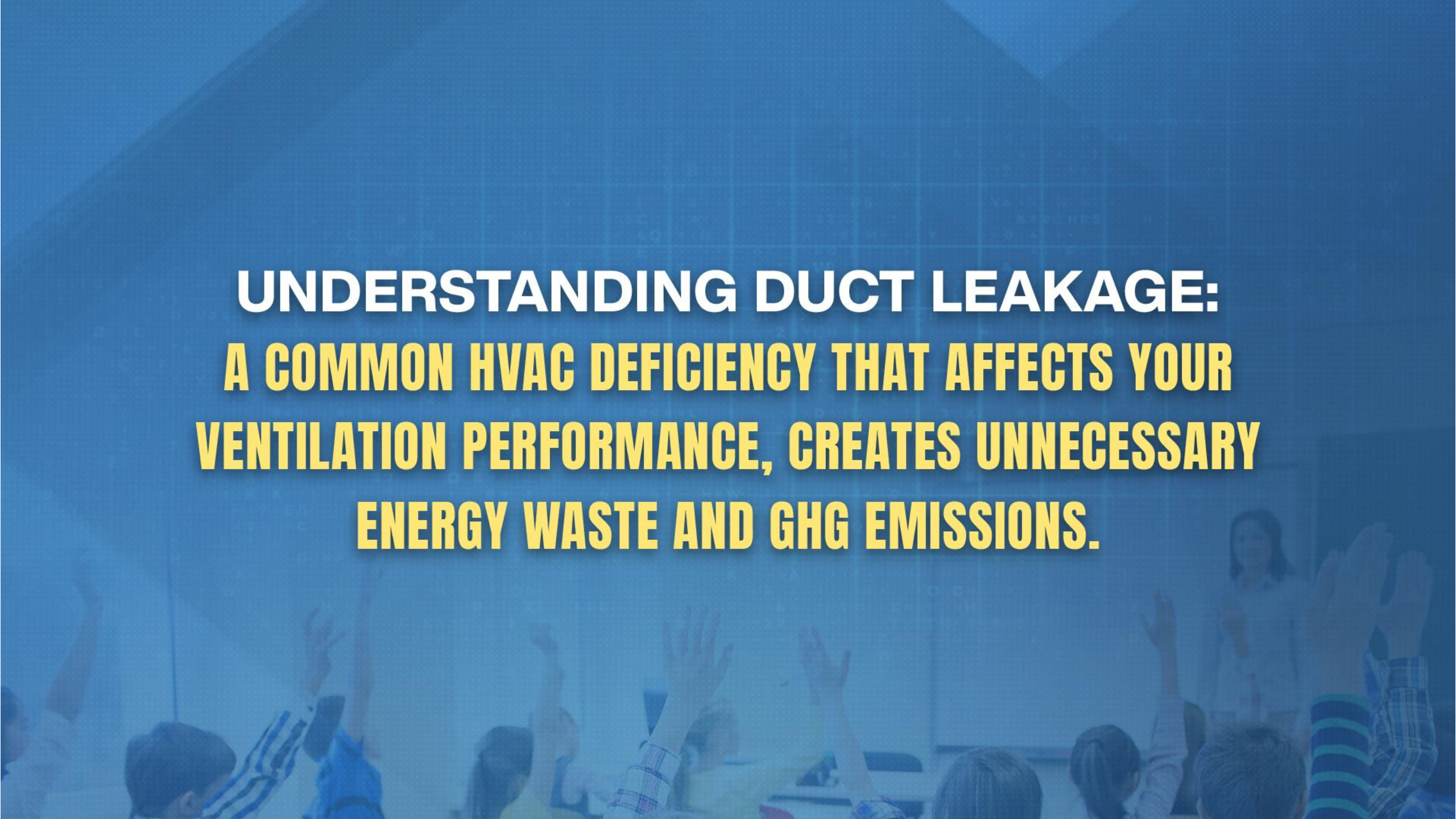
COSTLY & DISRUPTIVE

MECHANICAL REPLACEMENT

PROVEN & SUSTAINABLE

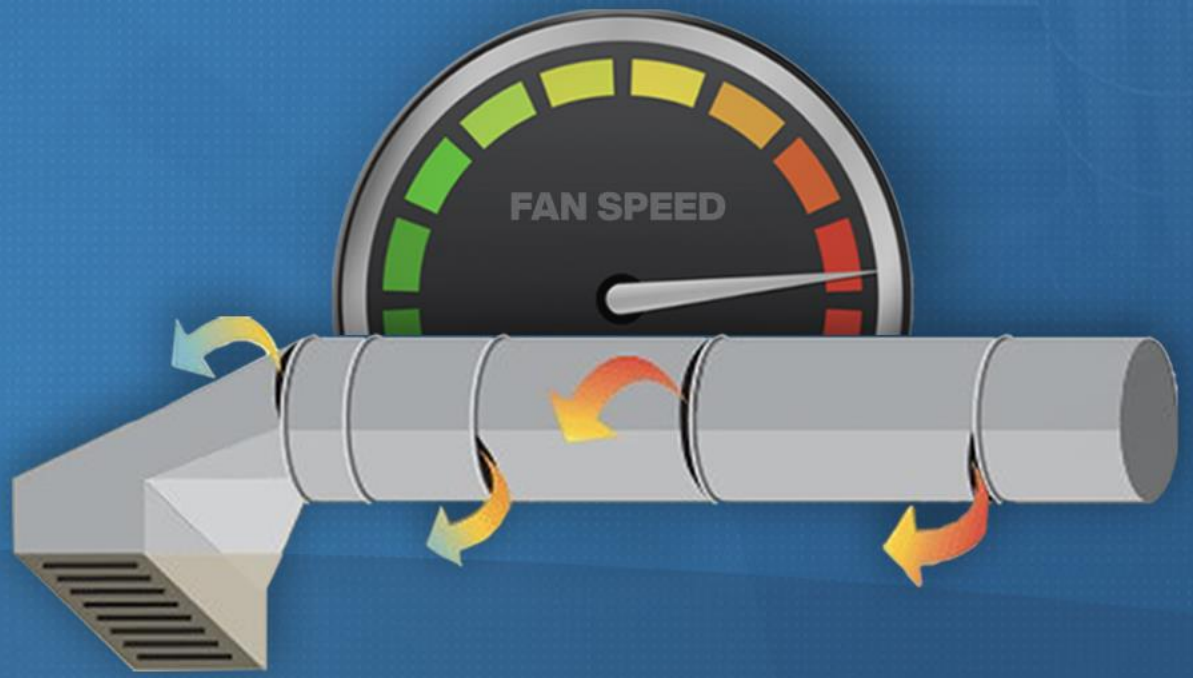
HVAC OPTIMIZATION + DUCTWORK REHABILITATION




UNDERSTANDING DUCT LEAKAGE:
A COMMON HVAC DEFICIENCY THAT AFFECTS YOUR VENTILATION PERFORMANCE, CREATES UNNECESSARY ENERGY WASTE AND GHG EMISSIONS.

NERVA
ENERGY

THE EFFECTS OF DUCT LEAKAGE



SICK BUILDING SYNDROME

VIRUS & BACTERIA RECIRCULATION

ENERGY LOSS

INCREASED GHG EMISSIONS

COMMON DUCTWORK DEFICIENCIES

NERVA
ENERGY

4-PHASE PROCESS

DESIGNED BY
AWARD-WINNING ENGINEERS

STEP 1 FACILITY BASED AUDIT

STEP 2 REHABILITATE INFRASTRUCTURE

STEP 3 AEROSOLIZED DUCT SEALING

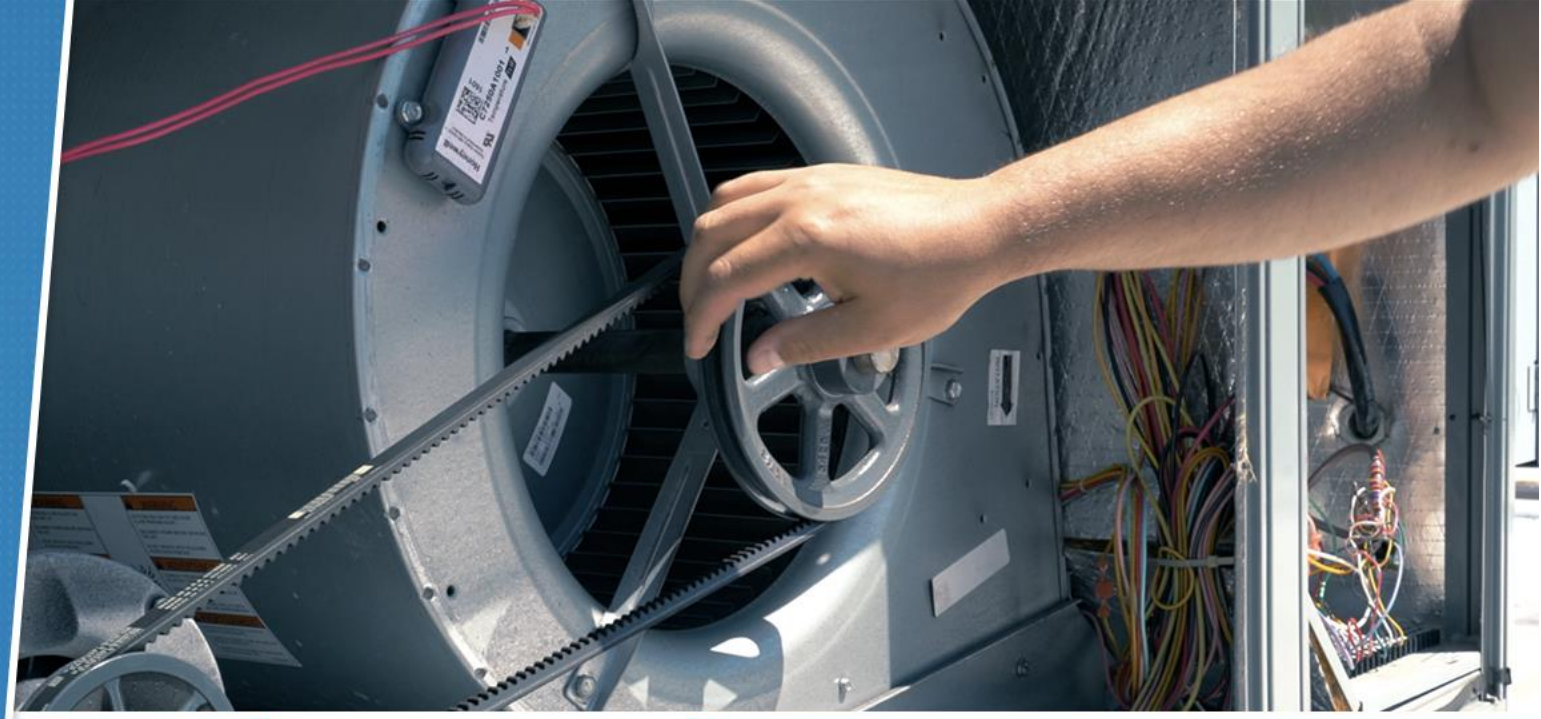
STEP 4 PERFORMANCE VALIDATION

NERVA
ENERGY

STEP 1

FACILITY BASED AUDIT

- ✓ Mechanical review
- ✓ Inspect filtration
- ✓ Air volume testing
- ✓ Inspect dampers & VFD's



NERVA
ENERGY

STEP 2

REHABILITATE INFRASTRUCTRE

- ✓ Identify major leaks
- ✓ Repair defective ductwork
- ✓ Clean clogged diffusers
- ✓ Inspect coils

NERVA
ENERGY

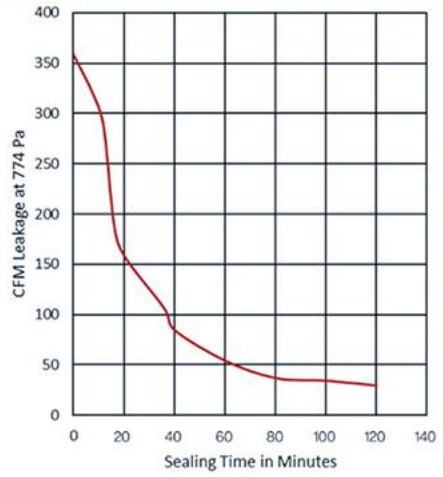
STEP 3

AEROSOLIZED DUCT SEALING

- ✓ Award winning technology
- ✓ Seals from the inside-out
- ✓ Guaranteed results
- ✓ Increase ventilation

Overall Sealing Results:
BEFORE SERVICE 359 CFM of Leakage, equivalent to a 14.4 Square Inch Hole or 23% of the system capacity of 1,540 CFM
AFTER SERVICE 27 CFM of Leakage, equivalent to a 1.1 Square Inch Hole or 2% of system capacity
This corresponds to a **92% Reduction** **In Duct Leakage** or a **98% Total Seal Rate**
NOTE: Duct leakage results are calculated in Cubic Feet per Minute (CFM) measured at a STANDARD OPERATING PRESSURE of 774 Pa

Sealing Progress:

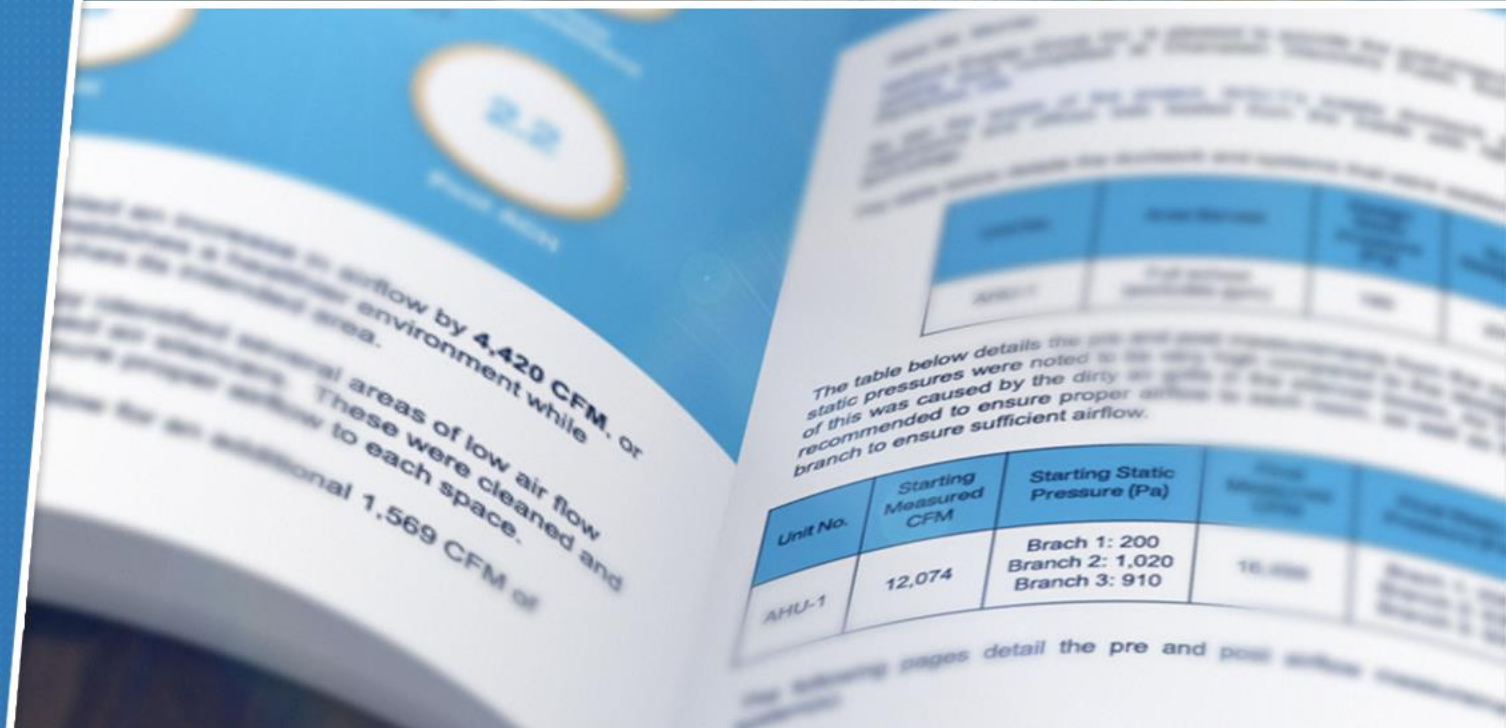


NERVA
ENERGY

STEP 4

PERFORMANCE VALIDATION

- ✓ Post air volume testing
- ✓ Validate system performance
- ✓ Quantify improvements
- ✓ Air volume report & warranty



MECHANICAL SYSTEMS CHART

CONSEIL SCOLAIRE CATHOLIQUE NOUVELON

Sacré-Coeur

Unit No.	Area Served	Starting Measured CFM	Final Measured CFM	Airflow Improvement
AHU-3	Com. Lab	2,272	2,694	19%
AHU-2	Admin	1,685	2,870	70%
HRU-3	1st, 2nd Lab, Storage	4,512	5,405	20%
HRU-1	Classroom	3,862	6,011	56%
AHU-1	Library	Exposed ductwork sealing space - duct sealing not required		
MUA-2	Gym	Exposed ductwork sealing space - duct sealing not required		

AHU - 3 (Com. Lab)

Total Diffusers: 9

Airflow Increase	# of Diffusers
0- 25%	7
26-50%	0
51-100%	1
101-150%	0
151-200%	1
200+%	0

AVERAGE AIRFLOW IMPROVEMENT:

18.57%

AHU - 2 (Admin)

Total Diffusers: 11

Airflow Increase	# of Diffusers
0- 25%	3
26-50%	1
51-100%	2
101-150%	3
151-200%	0
200+%	2

AVERAGE AIRFLOW IMPROVEMENT:

70.33%

HRU - 3 (1st, 2nd Lab, Storage)

Total Diffusers: 49

Airflow Increase	# of Diffusers
0- 25%	33
26-50%	12
51-100%	4
101-150%	0
151-200%	0
200+%	0

AVERAGE AIRFLOW IMPROVEMENT:

19.79%

HRU - 1 (Classroom)

Total Diffusers: 39

Airflow Increase	# of Diffusers
0- 25%	13
26-50%	4
51-100%	12
101-150%	3
151-200%	2
200+%	5

AVERAGE AIRFLOW IMPROVEMENT:

55.64%

DELIVERING INCREASED AIRFLOW... ONE SCHOOL AT A TIME!

GRAND ERIE DISTRICT SCHOOL BOARD

SCHOOL	AIRFLOW IMPROVEMENT
Elementary School 1	72%
Elementary School 2	28%
Elementary School 3	24%
Elementary School 4	22%
Elementary School 5	22%
Elementary School 6	18%

RENFREW COUNTY DISTRICT SCHOOL BOARD

SCHOOL	AIRFLOW IMPROVEMENT
Elementary School 1	68%
Elementary School 2	63%
Elementary School 3	41%
Elementary School 4	37%
Elementary School 5	36%
Elementary School 6	25%
Elementary School 7	18%
Elementary School 8	10%
Secondary School	38%
Board Office	12%

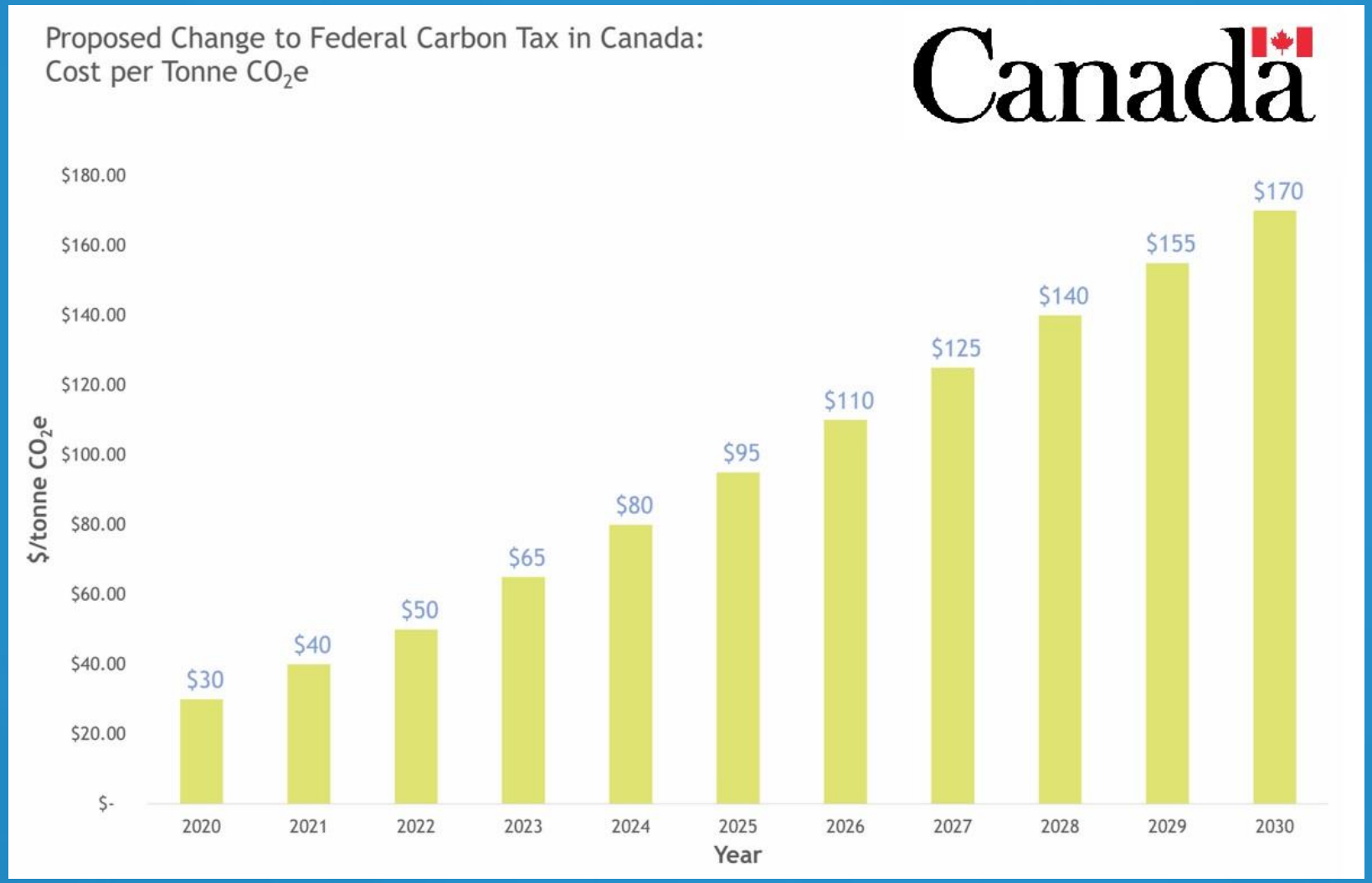
TRIILIUM LAKELANDS DISTRICT SCHOOL BOARD

SCHOOL	AIRFLOW IMPROVEMENT
Elementary School 1	45%
Elementary School 2	43%
Secondary School 1	61%
Secondary School 2	32%
Secondary School 3	19%

DISTRICT SCHOOL BOARD ONTARIO NORTH

SCHOOL	AIRFLOW IMPROVEMENT
Elementary School 1	53%
Elementary School 2	48%
Elementary School 3	40%

AVERAGE AIRFLOW INCREASE OF 36%!



Natural Gas (Ontario) → +13% Annually Due to Carbon Tax

- Are you still installing gas-fired equipment with a 20-year life span?
- Are you incorporating this into efficiency project analysis?

NERVA ENERGY

Cleaner Air for SCHOOLS

Grand Erie DSB

Schools	Total Design CFM	Pre-airflow CFM	Post-airflow CFM	Airflow % Improved	Air System Savings Electricity	Air System Savings Gas	Air System GHG Reduction
Elementary School 1	18,260	10,115	17,391	72%	30%	13%	13%
Elementary School 2	6,000	4,678	5,808	24%	58%	30%	30%
Elementary School 3	18,000	13,453	16,398	22%	46%	22%	22%
Elementary School 4	17,500	12,093	15,481	28%	53%	26%	26%
Elementary School 5	32,995	25,165	29,738	18%	50%	25%	25%
Elementary School 6	35,100	23,004	28,021	22%	49%	25%	25%

NET-NET FINANCIAL IMPACT

- ✓ **8-10% reduction on your energy bill**
- ✓ **An average of 18% reduction in carbon**
  (represents 40% of the 45% carbon redution target set by the Paris Accord 2030 goal)
- ✓ **Avoid unnecessary capital replacement costs**
- ✓ **Extend the life of your ventilation systems**

UNDERSTANDING AIR PURIFICATION

PASSIVE VS. ACTIVE

PASSIVE

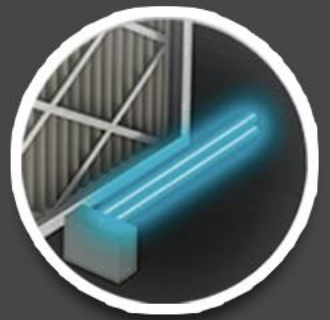
- Pollutants must travel to a physical source for treatment
- System can only treat contaminants that reach the source
- Limited protection against airborne and/or surface viruses and bacteria

ACTIVE

- Releases hydroperoxide ions into the airspace
- Proactively treats every cubic inch of air-conditioned space
- Neutralizes viruses and bacteria found in the air and on hard surfaces

TECH COMPARISON

UVC



Passive Technology

Can Produce Ozone

Can increase energy consumption

High-Ongoing Costs (Bulb Replacement)

BI-POLAR

Active Technology

Does not treat hard surfaces

Lack of studies and results

Not enough proof on its ability to inactivate viruses and bacteria in real-life scenarios.

Photocatalytic Oxidation (PCO)

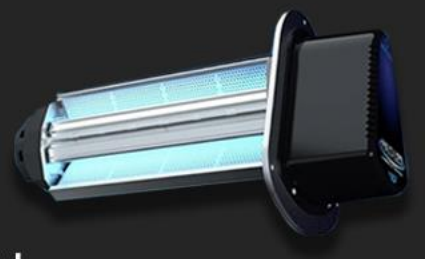
Passive Technology

PCO does not comply with ozone requirements

Can increase energy consumption

High-Ongoing Costs (Bulb Replacement)

REME-LED



Active Air Purification (Ducts, Air & Surfaces)

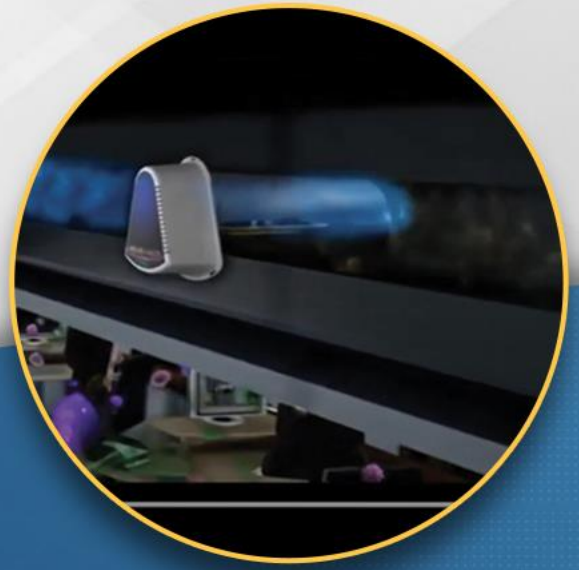
Certified "Zero Ozone" by Intertek (UL 2998)

Only technology to offer a 3-Feet Sneeze Shield

Laboratory tested and proven 99.9% effective against COVID-19, and dozens of other viruses and bacterias.

HOW IT WORKS

REME TECHNOLOGY IN ACTION!

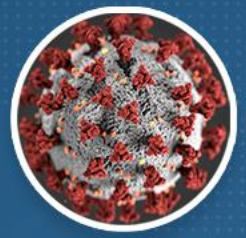


In-duct air purification with Reflective Electro Magnetic Energy

Technology releases Ionized Hydrogen Peroxide Molecules

Reduces microbial, particulate and gaseous contaminants

REME TECHNOLOGY IS THIRD-PARTY LABORATORY TESTED AND PROVEN TO KILL COVID-19 BY 99.9%



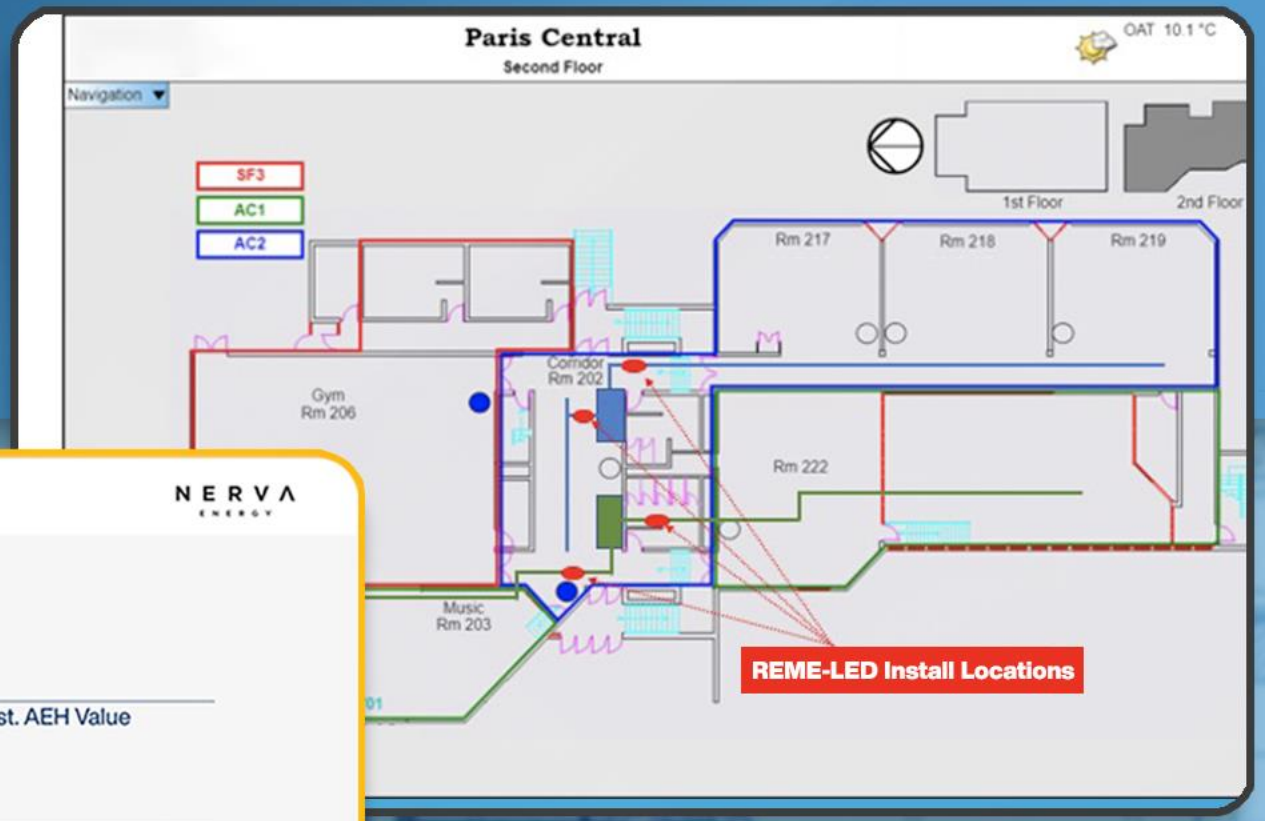
COVID-19
99.9% Reduction

Viruses
99.99% Reduction

Bacteria
99% Reduction

Mould
97% Reduction

PHASE 2:
APPLICATION DESIGN



NERVA ENERGY

H202 EQUILIBRIUM CALCULATOR

Enter Sq. Ft.	CFM Value	Est. ACH Value	Est. AEH Value
Est. Duct Leakage	Type of system? (VAV,VVT,Zone, etc)	Operational Time?	Filter MERV rating?
Is this is a dedicated MUA system?	Does the system have heat recovery?	% of exposed ductwork?	% of concealed ductwork?
Is the ductwork insulated?	Are the hallways ventilated?	Are the windows operable?	Total volume of unventilated spaces?

Total # of **REME Units**

Click here to view engineering plan for this property

December 21, 2020

LLOYDS OF LONDON INSTALLS REME TECHNOLOGY TO MAKE ITS OFFICES COVID-SECURE

"We undertook a lot of due diligence and testing to prove that this system worked including ATP (adenosine triphosphate) swab testing, which found that the level of pathogens on surfaces in the office which were extremely low and identical to the immediate results of fogging."

Terry Blacker, Head of Corporate Real Estate

The New Healthy Building Podcast describes the Lloyds of London project and extensive validation efforts.

Press the play button to listen *now!*


Cleaner Air for SCHOOLS
MOHAWK
TONY CUPIDO, Ph.D., P.Eng
Research Chair,
Sustainable Building Technologies
MOHAWK COLLEGE


Corporate Sustaina
2022
Clean 50
exceptional contributors to the clean economy
contributeurs exceptionnels à l'économie propre
2022 SUMMIT
THE GLOBE AND MAIL
Vancity
CN
enwave
hp
QuadReal
TELUS
SILVER
resolute
DELPHI GROUP
GLOBE SERIES
BRONZE

Increase Airflow with:

DUCT SEALING

Purify the air and surfaces with:

REME TECHNOLOGY

Q&A

GTAA

PARTNERS IN PROJECT GREEN

A PEARSON ECO-BUSINESS ZONE