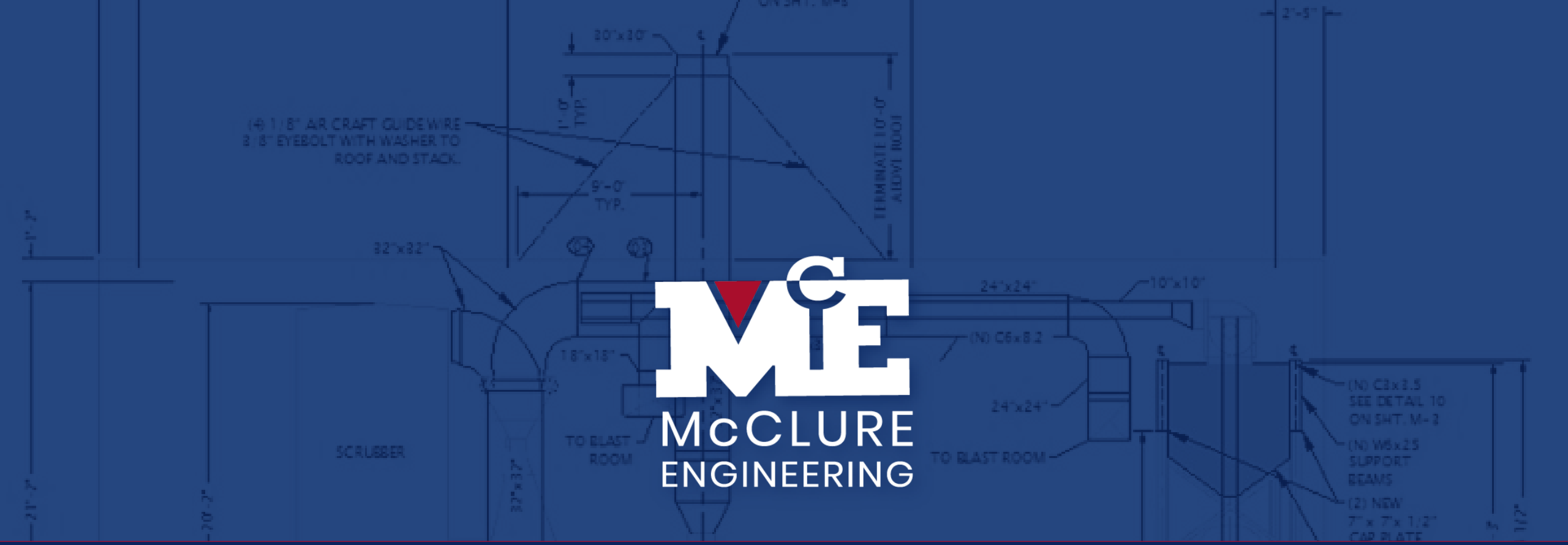

IMPROVING INDOOR AIR QUALITY THROUGH NEEDLEPOINT BI-POLAR IONIZATION (NPBI)

OCTOBER 22ND, 2020

OVERVIEW

- What is Indoor Air Quality and how does it impact learner success?
- What is NPBI and how does it work to make air cleaner?
- What has been done to support technology adoption in schools?
- How can we work together to protect school occupants?

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WHAT IS INDOOR AIR QUALITY?

Indoor Air Quality (IAQ) (*n.*) – A measure of the *healthiness of air inside a building.* It examines the gases inside the building envelope and may include measurement of levels of carbon monoxide (CO), carbon dioxide (CO_2), volatile organic compounds (VOC's), and other measures of air quality to protect the health and safety of occupants. Also may monitor levels of dust, pollen, and pathogens in the space to keep occupants safe and healthy.

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WHAT IS INDOOR AIR QUALITY?

Air quality management involves:

1) Ventilation system types, their fresh air, and operating settings.
2) Air purification and filtration practices, introduction of fresh air, and relative humidity.
3) What the building is made of, facility management, and age.
4) Monitoring building space parameters to adjust HVAC performance.
5) Types of activities happening in the space, and people's habits (following CDC / WHO / ASHRAE Guidelines).

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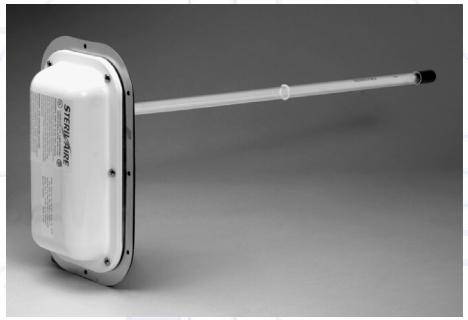
WAYS TO IMPROVE IAQ

INSTALL ADD-ON TECHNOLOGIES:

- ULTRA-VIOLET LIGHT



- HEPA OR MERV-13 FILTERS
- AIR MONITORING

Wave Mini for Business | Wave Plus for Business | Hub for Business

- NEEDLE-POINT BI-POLAR IONIZATION

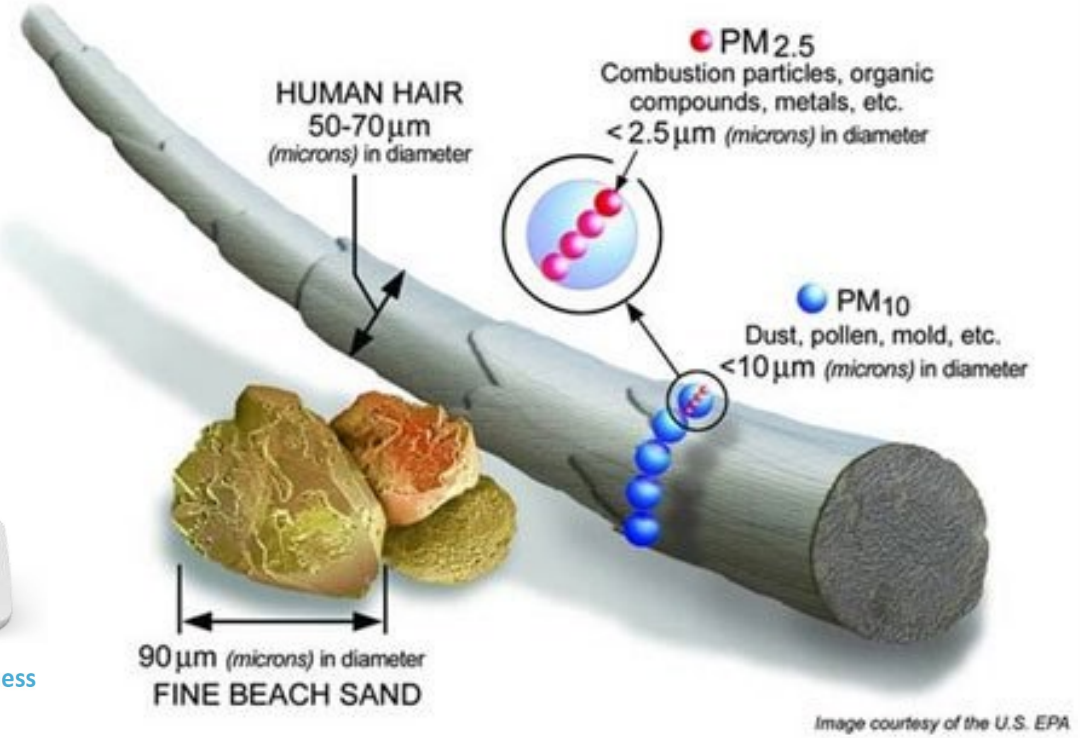


Image courtesy of the U.S. EPA

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HOW DOES IAQ EFFECT LEARNING?

Studies indicate that ***cognitive function*** and ***decision making are inversely linked to*** levels of CO_2 and VOC's [1-3].

Recent events have also caused teachers and students to be ***anxious about meeting in person*** for fear of contracting COVID-19.

Some IAQ purification technologies (i.e. NPBI) ***neutralize pathogens by blocking the receptors*** which allow our bodies to contract a virus. In addition, third-party testing has shown that they ***can reduce the levels of many viruses in a laboratory setting.***

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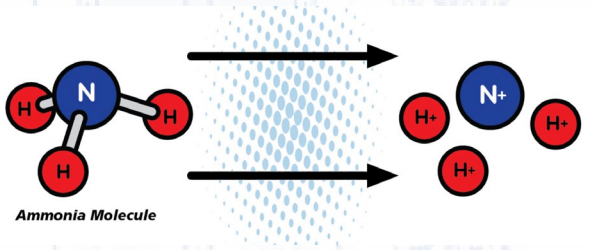
WHAT IS NPBI AND HOW DOES IT WORK?

Needle Point Bi-Polar Ionization (***n.***) – an IAQ technology which creates ionic bonding of molecules found in nature. Ionizers create ions like those produced in nature through rushing water, crashing waves, and sunlight. This is one reason the air feels fresh and clean in these places. Examples of ionic bonds include:

Formation of Table Salt: $Na^+ + Cl^- \rightarrow NaCl$

Dissociation of Water: $H_20 \rightarrow H^+ + OH^-$



Ions bond with pathogens, viruses, bacteria, molds and other substances neutralizing them and reducing risk of exposure.

This happens through agglomeration and neutralization.

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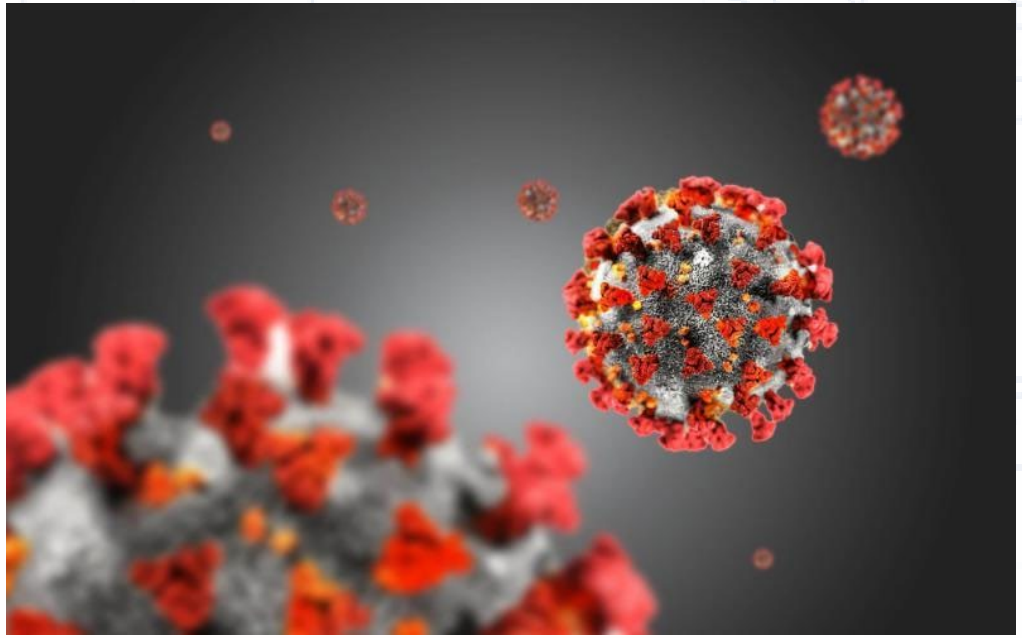
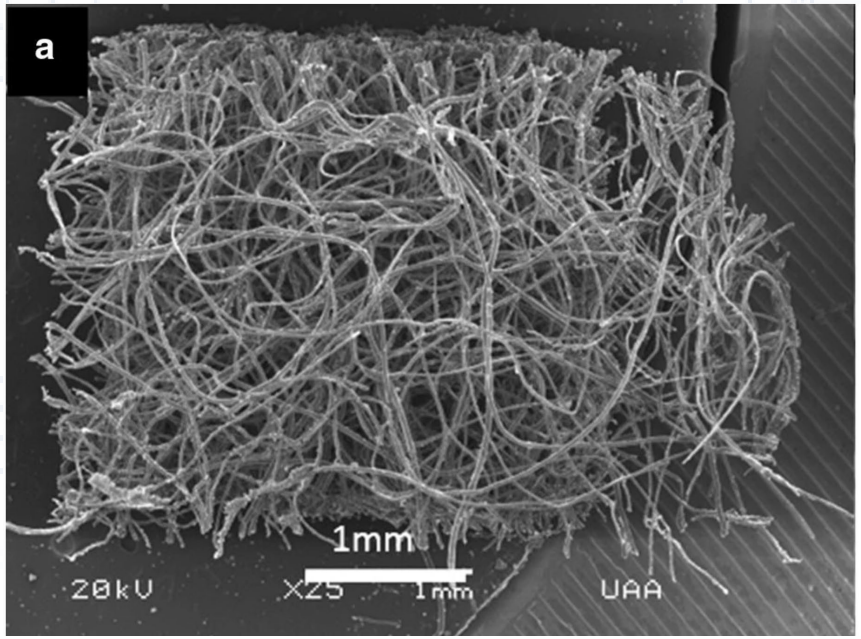
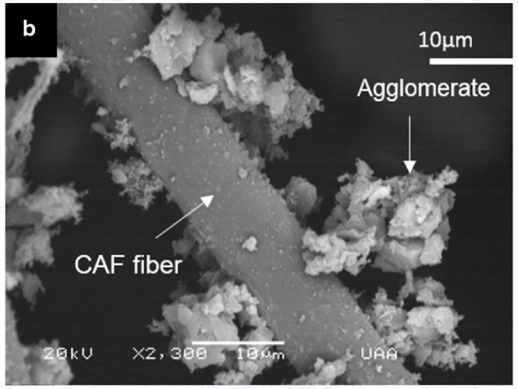
WHAT IS NPBI AND HOW DOES IT WORK?

<u>Agglomeration</u> (*v.*) – The clumping together of tiny molecules to form larger molecules due to ionic bonding. Particle types which agglomerate include pollen, dust, pathogens, viruses, mold, etc. When agglomeration is enhanced, the effective efficiency of the filter increases because the larger particles are easier to remove.







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WHAT IS NPBI AND HOW DOES IT WORK?

Neutralization (*v.*) – the act of making harmful pathogens (viruses, bacteria, mold, etc.) incapable of spreading and causing harm.

INDEPENDENT LABORATORY TESTING RESULTS SUMMARY

Pathogen	SARS-CoV-2	Norovirus*	Human Coronavirus 229E	Legionella	Clostridium Difficile	Tuberculosis	MRSA	Staphylococcus	E. Coli
Time In Chamber	30 min	30 min	60 min	30 min	30 min	60 min	30 min	30 min	15 min
Rate Of Reduction	**99.4%**	**93.5%**	**90.0%**	**99.7%**	**86.8%**	**69.0%**	**96.2%**	**96.2%**	**99.6%**
Testing Lab	INNOVATIVE BIOANALYSIS	ATS	ALG	EMSL	EMSL	EMSL	EMSL	EMSL	EMSL

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HOW TO INSTALL NPBI?

Four easy steps can be seen in this link but here is the summary:

1) Gain Access to Blower Section
2) Mount GPS Ionization Unit
3) Connect Electrical Wires
4) Test Automatic Self-Cleaning Function

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WHERE HAS NPBI BEEN USED?

Many applications including:

- Boston Children's Hospital
- Clean Room Applications
- The Learning Experience
- University of Maryland
- Valencia College
- Greer High School

250K+ Satisfied Installations

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WHAT HAS BEEN DONE TO ADOPT?

Twin Falls School District #411

- Emailed Superintendent Dickinson – 7/7
- Site visit w/Ryan Bowman, Bill Southwick & Emory Warren – 7/30
- Proposal #20021 – 8/4

Rockland School District #382

- Site visit w/Greg Larsen and follow up with Ray Turnbeaugh 8/6
- Proposal #20027 – 8/13

Fremont County Joint School District #215

- Teleconference call with Byron Stutzman, Jason, Tyler – 8/24
- Site visit with Byron Stutzman, Jason, Tyler – 8/28
- Proposal #20038 – 9/9

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WHAT HAS BEEN DONE TO ADOPT?

Letter to Senators and Representatives – 9/10

- Andrus, Armstrong, Clow, Guthrie, Hartgen, Heider

Inquiry from David Leroy – 9/16

Response to David Leroy – 9/18

Scheduled this meeting – 10/5

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HOW CAN WE WORK TOGETHER?

McClure Engineering	State Superintendent & Board
IDENTIFY CANDIDATE SCHOOLS TO ADOPT THIS TECHNOLOGY	
1) PREPARE BID PACKAGES	1) SECURE FUNDING
2) CONSTRUCTION OBSERVATION	2) IDENTIFY PRIORITY SCHOOLS
3) QUALIFICATION AND VERIFICATION TESTING OF INSTALLED SYSTEMS	3) MANAGE PUBLIC EXPECTATIONS

CONTINUE TO PROVIDE INFORMATION AND UPDATES ON PROGRESS

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IN SUMMARY

- **IAQ** is a critical element in the health and safety of school occupants.
- **Cognitive function and learning improves** when air quality resembles fresh mountain air.
- **NPBI** safely adds ions to the air without the use of O3 (a respiratory irritant). Ions cause neutralization of pathogens, and agglomeration of pollens, dust, and particles for easier removal through filtration.
- **McClure Engineering Inc.** can support technology implementation statewide.

"The best thing about the future is that it comes one day at a time."

- Abraham Lincoln (1809 – 1865)

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[1] Allen, Joseph G., et al. "Associations of cognitive function scores with carbon dioxide, ventilation, and volatile organic compound exposures in office workers: a controlled exposure study of green and conventional office environments." *Environmental health perspectives* 124.6 (2016): 805-812.

[2] Satish, Usha, et al. "Is CO2 an indoor pollutant? Direct effects of low-to-moderate CO2 concentrations on human decision-making performance." Environmental health perspectives 120.12 (2012): 1671- 1677.

[3] Sunyer, Jordi, et al. "Association between traffic-related air pollution in schools and cognitive development in primary school children: a prospective cohort study." *PLoS Med* 12.3 (2015): e1001792.

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[5] https://nces.ed.gov/ccd/districtsearch/, data accessed 10/10/2020

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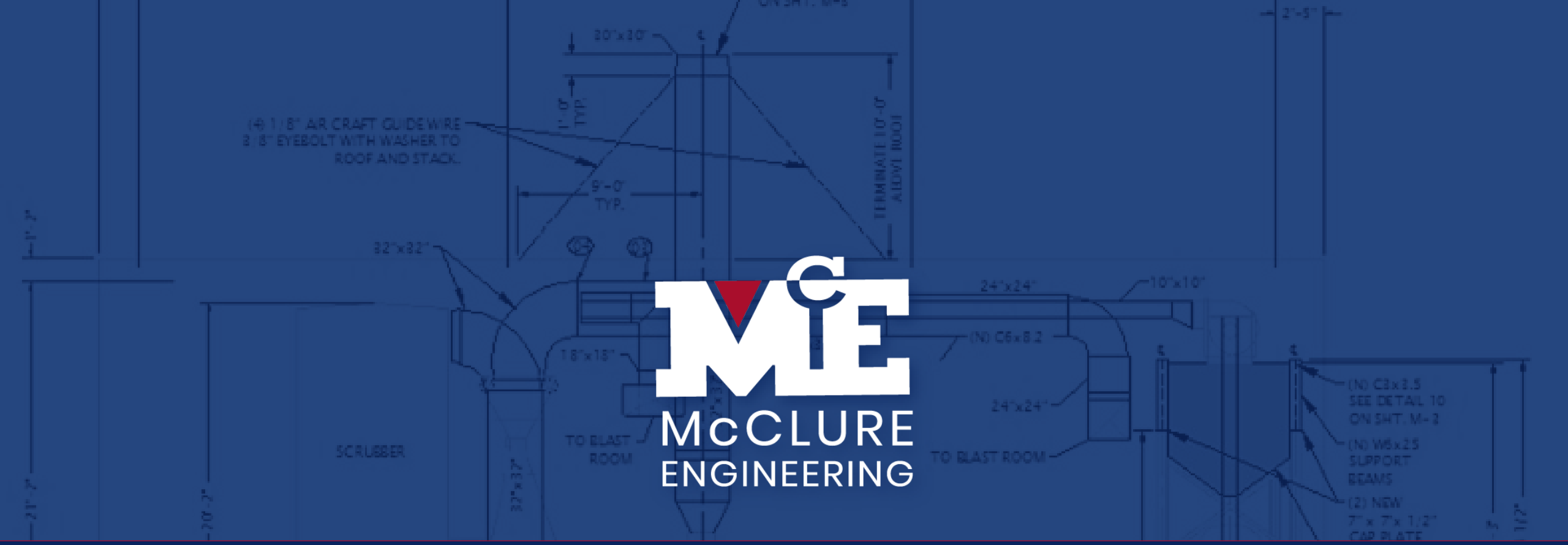

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