

THE WORLD LEADER IN CLEAN AIR SOLUTIONS



## Museums and Historic Storage Clean Air Solutions

**PARTICULATE AND GASEOUS FILTRATION**



# Protecting Historical Objects and Collectibles

## Clean Air Solutions for Museums and Historic Storage

Around the globe, AAF is meeting the need for clean air in environments where preservation of our national and historic treasures takes place. From inexpensive disposable panel filters to high-efficiency, extended surface filters with antimicrobial and gas-phase filtration, we market the widest range of air filtration products available.

Preserving historical objects and collectibles can generate many challenges to museums and historic storage facilities. Controlling airborne pollutants and gaseous contaminants is fundamental to protecting priceless collections of artifacts, historical assets, artwork, and literature. By maximizing the life of these objects, we essentially protect our heritage, as well as our vintage treasures.

## Environmental Factors

Damage to collectibles can be caused by uncontrolled temperature and relative humidity, dust and dirt, as well as gaseous pollutants such as ozone and sulfur dioxide. Temperature and humidity, if not controlled properly, can speed up the rate of chemical reactions that cause much of the deterioration of sensitive objects. Dust and dirt contamination can cause artifacts to discolor and can potentially scratch precious gems, while gaseous pollutants may cause significant and irreversible deterioration of artifacts, metals, historic records, photographs, and marble through chemical reactions. Poor Indoor Air Quality (IAQ) can also have adverse health effects on employees and visitors.

AAF can custom design air filtration products to meet the most demanding airflow and efficiency requirements and provide critically controlled environments with regard to temperature, humidity, and air purification in any museum or historic preservation setting.



*Our air filtration team understands that the requirements for preservation of our national and historic treasures differ for each application. Our experience in developing air filtration products for a variety of industries gives us the know-how to tackle any project.*

*Historical assets, such as this antique photo, can be effectively preserved with the proper filtration solutions in place.*

## Typical Gases Found in Museums and Historic Storage Facilities

Gaseous Contaminants	Possible Effects	Susceptible Materials	Possible Causes
Hydrogen sulfide	Corrosive (tarnish, discolor)	Metals, especially silver	Construction, industrial, and biological processes, standing waters
Nitrogen dioxide	Acidic, corrosive (discolor, weaken textiles, tarnish)	Marbles, limestone, photographs, papers & organic textiles	Often from vehicle emissions, tobacco smoke, emissions from burning fossil fuels, urban areas
Sulfur dioxide	Acidic, corrosive (blackening)	Marbles, limestone, photographs, papers & organic textiles	Power plants and factories. Reacts with humidity to form stronger acids. Accelerates the decay of paints, monuments, statues, and sculptures
Formaldehyde	Premature aging	Papers & textiles	Decomposition of chemical resins used in plywood & carpeting, emissions from embalming fluids & automobile exhaust. Building materials and furniture
Ozone	Premature aging (discolor, weaken textiles)	Organic materials, paintings, textiles, papers, wood, silks, leather, tapestries, clothing, rubber, metals	Office equipment, urban smog
Formic acid	Corrosive	Glass	Humidity
Acetic acid	Corrosive, premature aging	Metals, silicone rubber, wood, tile, limestone artifacts, terra cotta, and loss of fiber strength in manuscripts	
Carbonyl sulfide	Corrosive	Metals	Biological processes
Halogens (chlorides, fluorides, iodides)	Powerful oxidant, bleach, drying agent	Paper, paintings, textiles, metals	City water (contains chlorine), proximity to ocean (fluorides), fumigants (sulfuryl fluoride)





## Environmental Monitoring Technology

Environmental Monitoring is used to characterize the destructive potential of the gaseous environment. Since every application is unique, AAF offers a comprehensive range of reactivity monitoring devices to determine the concentrations of various gaseous contaminants—an essential tool in keeping your artifacts preserved. Utilizing the latest technologies, copper and silver indicators work together to detect the presence of chlorine and other gases, in addition to changes in humidity. Looking at corresponding pairs of copper and silver indicators (see Table 1) can provide information as to whether the amount of corrosion formed was due more to the presence of gaseous pollutants or to humidity effects alone.

### SAAFShield® Technology

Allows users to take immediate action to protect priceless works of art by monitoring corrosion in real time or on a periodic basis to determine equipment or material vulnerability to corrosion. The SAAFShield Detecting Unit works together with either the SAAFShield Reading Unit or the SAAFShield Communications Module to display and trend corrosion data over time, which allows users to evaluate operational procedures, environmental factors, or other items that occur at specific times for their impact on sensitive materials.



SAAFShield® Detecting Unit, SAAFShield® Reading Unit, and SAAFShield® Communications Module

The SAAFShield® Detecting Unit utilizes quartz crystal microbalance to measure the corrosion of metal due to reactions with the environment.

### SAAF™ Reactivity Monitoring Coupons (RMCs)

Reactivity Monitoring Coupons function by reacting with environmental conditions to form various corrosion films. Analysis of the corrosion that forms on the specially prepared copper and silver strips (coupons) provides an excellent indication of the type and amount of gaseous contamination present in the environment. Typically placed in the environment for 30 days. Available in metal and glass options.



**Table 1: Museum/Archival Environmental Classifications**

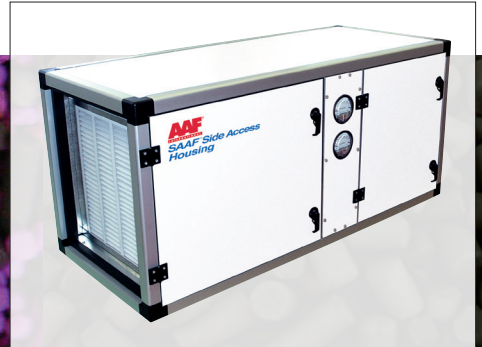
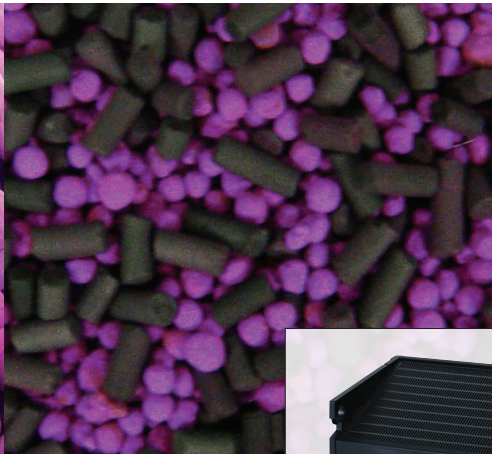
Silver Corrosion		Copper Corrosion		Air Quality Classification	Description
Class	Corrosion Amount	Class	Corrosion Amount		
S1	<40Å 30 days	C1	<90Å 30 days	Extremely Pure	Ideal air quality for archival environments, metal collections, and rare books
S2	<100Å 30 days	C2	<150Å 30 days	Pure	Desired air quality for museums, storage locations in museums and libraries
S3	<200Å 30 days	C3	<250Å 30 days	Clean	Suggested air quality for museum/archival environments
S4	<300Å 30 days	C4	<350Å 30 days	Slightly Contaminated	Air quality suggests that corrective actions should be initiated
S5	<300Å 30 days	C5	<350Å 30 days	Polluted	Undesirable air quality for museum/archival environments

# Gaseous Filtration Solutions

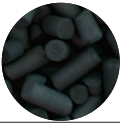

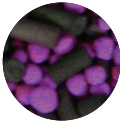
AAF has assumed an industry leading position with the development of its innovative SAAF™ (pronounced as “SAFE”) product line, designed to reduce or eliminate harmful gaseous contaminants. In combination with our expertise in airborne particulate filtration, SAAF products and solutions allow us to develop unique and effective total filtration solutions to protect historic objects and collectibles.

No other company offers this combination of experience, expertise, innovation, and capability to combat airborne contaminants, particulate and/or gaseous, and deliver the best clean air solutions.

The SAAF product line features:



- Patented chemical media cassettes with superior sealing and energy savings. These cassettes also fit in most legacy units. The housings are designed for quiet operation and durability.
- Complete chemical media line – adsorbents, oxidants, and blends configured by and produced under the supervision of our world-class global research and development teams
- Environmental Measurements related to the ISA Standard S71.04: “Environmental Conditions for Process Measurement and Control Systems. Airborne Contaminants to determine types of contaminants and their relative concentrations”
- RoHS compliant Corrosion Control
- Comprehensive, industry leading software – SAAF Tech Tools analyzes applications, develops solutions, configures equipment and media, and delivers a complete technical proposal
- Full line of gas-phase equipment, including side access housings, air purification systems, and machine intake filter systems

SAAF™ Media for Museums and Historic Storage*	Targeted Gases
SAAFCarb™ 	Diesel fumes, Nitrogen dioxide, Hydrocarbons, Chlorine, and VOCs
SAAFoxidant™ 	Sulfur dioxide, Nitrogen dioxide, Formaldehyde, Hydrocarbons (VOCs), lower molecular weight Aldehydes and Organic Acids
SAAFBlend™ GP 	Sulfur dioxide, Hydrogen sulfide, Nitric oxide, Formaldehyde, lower molecular weight Aldehydes and Organic Acids

\*SAAFBlend™ Protect – Custom blend for heritage protection in museums, archives, and historical storage applications available.



# Particulate Filtration Solutions

## Pleated Panel Filters

The AAF pleated panel filter line provides the industry's broadest selection of high performance, high capacity filters, including specialty and standard capacity options. This enhanced line of filters offers consistent air quality, improved process performance, social responsibility, and optimized Total Cost of Ownership.

## High Efficiency Extended Surface Filters

These rigid, extended surface filters are ideal for use in all high efficiency applications. The supported pleat filters provide strength and integrity in high flow, turbulent, and variable airflow conditions.

These filters are designed to remove airborne biological contaminants in critical areas, such as historic storage facilities and other environments with unique requirements or strict regulations.



The Pleated Panel Filter line features:

- Filter classes G2–M5 (EN779:2012)
- ISO coarse to ePM10 (ISO 16890)
- Industry's lowest life cycle pressure drop and highest Dust Holding Capacity (DHC) reduces energy consumption and total operating costs
- Highest performing self-supported pleated filter on the market
- High efficiency pleated filter supports achievement of LEED® credits by significantly improving Indoor Air Quality (IAQ) and reducing energy consumption
- Filter options for high temperature and high velocity environments



The High Efficiency Extended Surface Filter line features:

- Filter classes M6–E10 (EN779:2012; EN1822:2009)
- ISO ePM2,5 to ePM1 (ISO 16890)
- Patented Impress® Technology delivers a higher DHC and a lower pressure drop for greater energy efficiency
- Heavy-duty construction and high performance in tough operating conditions
- Dual density media increases DHC and reduces operating costs
- 100% separatorless and self-supporting microglass filters for easy disposal
- Inline space-saving designs for high efficiency without having to compromise space



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