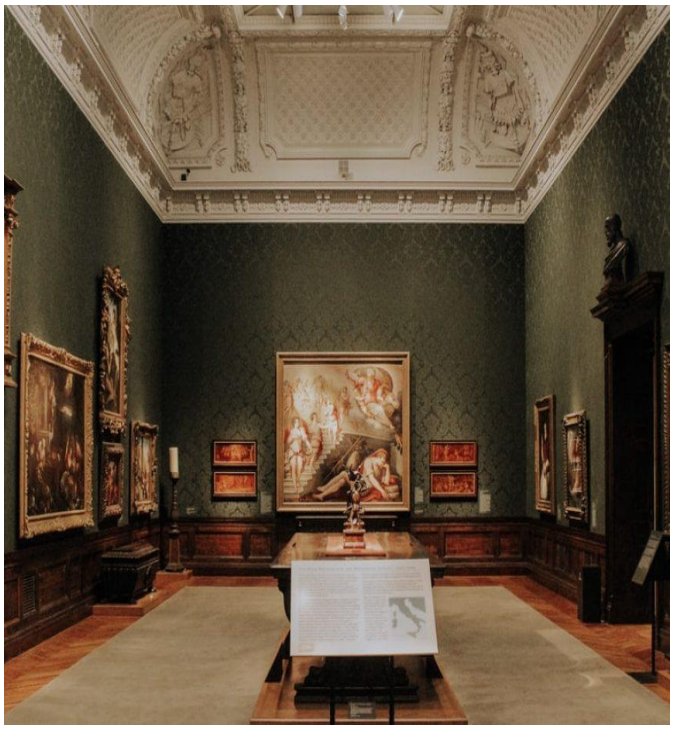
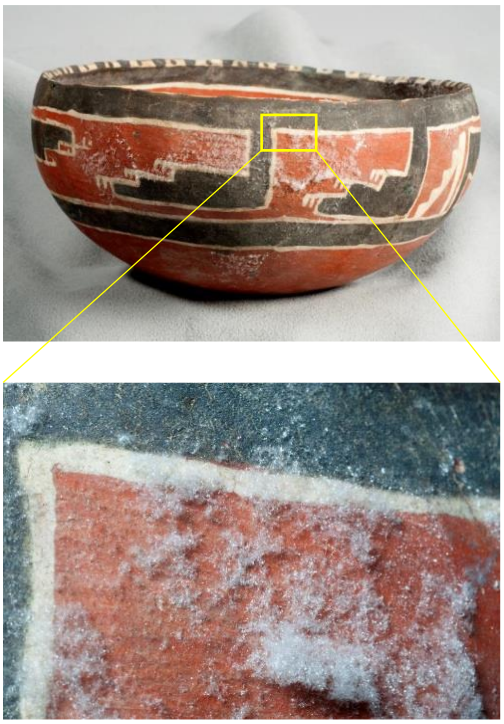
Indoor Air Quality Solutions Museums and Historic Storage





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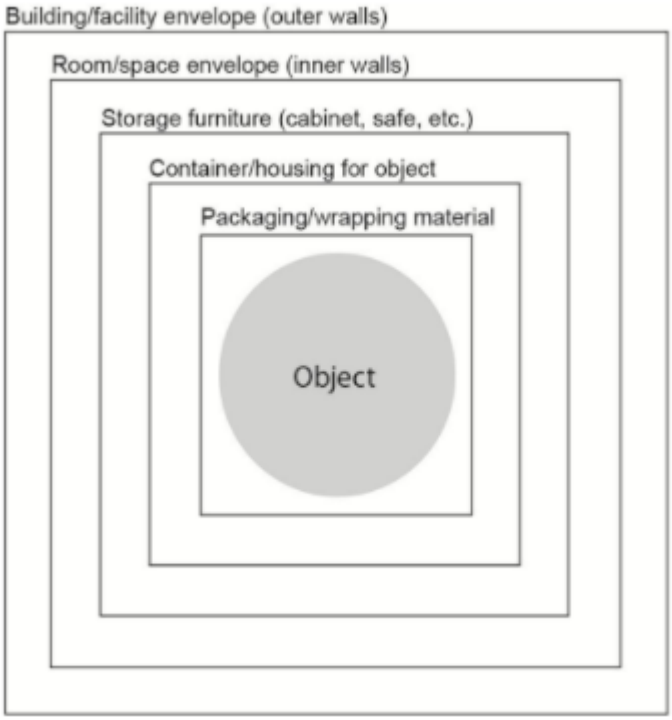
The main purpose of museums, archives, art galleries, and historic storage buildings or premises is to collect, preserve, and exhibit precious objects of artistic, cultural, or scientific significance.

In most museums, the objects are in multi-layered environmental protection systems.



While considering environmental and deterioration factors, air pollution is the third most common source of damage to objects in museums.

An astonishing factor that contributes to air pollution in the museum is the poor indoor quality. The pollution levels in this indoor air can be up to five times higher than outdoor levels, and in some cases 100 times higher. Indoor air contains tens of thousands of chemical components in both gas and condensed phases. The concentrations of these chemicals change over time and from environment to environment.

Quality indoor air can improve the life span of the museum object. Museum artifacts will deteriorate and eventually disappear if they are not properly protected.

The enclosures used to store artifacts, and the raw materials used for the making of artifacts, each create their unique microclimates.

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)

The most common inorganic pollutants, such as nitrogen dioxide, hydrogen sulfide, ozone, and nitric and hydrochloric acids, enter the museum environment through a variety of mechanisms, including oxidation of other trace gases, off-gassing from sealants and vulcanized rubber, and equipment operation.
Major pathways of volatile organic compound formation in museums include the evaporation of solvents, off-gassing from construction or furnishing materials and objects in the museum, and byproducts of degradation from museum objects.

These objects may sustain damage because of

- Uncontrolled temperature
- Relative humidity
- Rust and dirt
- Volatile Organic Compounds (VOCs)
- Gaseous pollutants, such as ozone, sulfur dioxide, nitrogen dioxide, and formaldehyde
- Everyday chemicals and solvents

Temperature and humidity are also the common causes of deterioration, if not controlled, accelerates the chemical reactions that cause the deterioration of sensitive objects. Dust and dirt contamination causes artifacts to discolor.

Gaseous pollutants may cause significant and irreversible deterioration of artifacts, metals, historic records, photographs, and marble through chemical reactions.

Particles given off by paints, varnishes, cleaning chemicals, and solvents from everyday museum operations can penetrate items on exhibit.

National Air Filtration Association® (NAFA) recommends that nitrogen dioxide levels should not exceed 2.6 ppb, ozone levels reach no higher than 2.0 ppb, sulfur dioxide levels remain below 1ppb, and formaldehyde levels stay at or below 4ppb. Recommended prefilters should be ASHRAE MERV 8 or higher, with fine particulate filters being ASHRAE MERV 15 or higher.
SITE Clean Air Services also offers HEPA and Gas-Phase filters for enhanced protection, as well as software applications to design a specialized solution for individual spaces within your museum. SITE recommends multiple-stage filtration systems to protect museum objects.

Optimize your Filtration and Improve your Museums, Archives, Art Galleries, And Historic Storage Environment.

A thorough audit of your air filtration system is the first step that SITE Clean Air Services recommends providing you with professional guidance and analysis for cost savings and liability reduction opportunities.
By conducting this audit, we document your current state and advise you on how your facility could perform better, helping you save money, save time, and reduce risk. After this evaluation, SITE Clean Air Services can design custom solutions to provide carefully controlled environments for any museum or historic preservation setting.
Contact your SITE Clean Air Services representative to schedule an audit and to find out how the insights from intelligent data tools, including TCO Diagnostic® and Sensor360®, can improve operational outcomes and save you time and money.

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