



Architectural Arts

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4.1

Introduction

Architectural arts encompass a wide range of object types, materials, functions, and contexts. Generally, they are crafted as embellishments that are integral to a building and may or may not serve a practical purpose. Usually, they are intended to contribute to its artistic or aesthetic interest while sometimes serving a function, such as stained-glass window. Architectural arts may be integral to or independent of a building and able to be removed from the site.

The significance of an architectural art within a building varies widely. The object may be emblematic, symbolic, or otherwise serve as a point of focus; or it may serve as architectural ornament of minor significance to the overall design and function, such as a light fixture.

Architectural arts may be made of a wide range of materials or combination of materials, including metals, woods, plasters, concrete, stone, paint and other finishes, paper, and synthetic materials, including composites and plastics. They may also be made of natural organic substances, such as earthen materials, like clay.

4.2

Site impact

Because architectural arts are usually integral to a building, their care requires the understanding of the architecture and the relationship of the object to the architecture. Specifically, it is important to understand the methods and materials of construction, to be familiar with the past and current conditions of these materials and materials relationships, and to be able to anticipate future impact from the architecture, such as settling of the structure. Failures to the building's structure or ornament should be identified in order to arrest the cause of deterioration and to anticipate future maintenance needs.

The location and details of construction surrounding the object affect its condition in specific ways. Architectural arts in interior and exterior environments respond differently. Similarly, objects in different physical relationships to the building respond differently. Works installed in an exterior space without shelter are affected by certain conditions, whereas those mounted in a climate-controlled interior space are affected by others. Faulty roofs, leaking downspouts, damp infiltration, ferrous corrosion of a reinforced concrete wall, and a host of other conditions can adversely impact works of art.

Although the condition of indoor objects may fluctuate, they are generally more stable than those outdoors. Outdoor objects are subjected to damage from the weather, human contact, animals, and impact from the landscape. People are often the cause of the most serious damage. They may use outdoor art as a vehicle for recreation, such as climbing, sitting, and skateboarding. They may also intentionally damage the object with graffiti or other types of destruction.

Surrounding landscape materials often damage an outdoor object. Shrubs or trees may be located near the object causing excessive moisture and microbiological growth, such as mold, moss, lichen, etc. Vines may grow on the artwork. Mud may splash on the object. Gravel located around an object may affect it as people inadvertently kick the gravel into the object.

The effect of animals on the object is considerable. Birds resting on an object result in the presence of guano. The object may become the favorite stop for dogs. Rodents may burrow and live near the object. Bees and hornets may build nests in the object.

Some of these conditions may be mitigated. Installation of clear nylon netting is sometimes appropriate to discourage the presence of birds. Pruning or removal of plants is effective for deterring microbiological growth.

Mitigating the damage from these sources and relationships requires the involvement of landscape specialists, architects, engineers, building contractors, and a conservator. If adequate barriers to the object have not been originally designed, it may be necessary to add an appropriate buffer zone or other type of deterrent. Interpretive signage is also recommended.

A note about neglect

Experience has revealed that neglect and vandalism beget more vandalism. Therefore, it is very important that the evidence of neglect and vandalism are quickly removed, even if it is not possible to consult a conservator. Graffiti should be immediately removed using weak solvent systems widely used for graffiti removal. Guano, animal nests, and debris should also be removed immediately by hosing down the object, not only because they are possibly damaging but also because, in degrading the object, it becomes more likely that additional damage will occur.

Justice by Leo Friedlander
Plaster Models for Estes Kefauver
Federal Building, Nashville, TN
Art Conservation Associates

Left: During conservation: Note conservators fabricating backing and support for the back of the plaster bas relief.

Right: After conservation.



Environment

One of the most important considerations for buildings and objects are their climactic environment. It is generally considered that one of two conditions are most damaging: problems with relative humidity, and the presence of water and its byproducts.

Air pollution, particularly the presence of airborne salts and of sulfur dioxide, is also problematic. When combined with fluctuating environmental conditions and the presence of water, they promote deterioration.

Essential to the discussion of environment is relative humidity (RH)—the measure of the amount of water held in the air at a given temperature.* There are three different types of deterioration that are influenced by RH: (1) change in size and shape, (2) chemical reaction, and (3) biodeterioration. Particular architectural materials may be subject to these types of RH-related deterioration.

Each of the material types encountered in architectural arts will be briefly discussed below.

Objects in storage and transit

The specifications below are of a general nature. Handling and storage of works of art in GSA's Fine Arts Collection should be coordinated through the Fine Arts Program. The Fine Arts Program maintains the Fine Arts Storage Facility and coordinates professional art transport for the collection.

Works of art in storage are problematic because they are out of view and often in uncontrolled environments. In some cases, works in storage are also in closed cases or other environments that may create a microclimate in which air circulation is blocked.

When architectural arts are removed from their original site and placed in storage, it is important that the same site conditions be continued to the extent possible. Objects should be routinely examined in their crates or cases. They should be monitored for relative humidity, moisture, and pest infestation. The presence of salts, cracks, flaking, crumbling, or other alterations in color, shape, or texture should be noted.

Movement should be extremely careful. Experienced and recognized art handlers should conduct transport.

*RH = amount of water in a given quantity of air x 100. (100 is the maximum amount of water that the air can hold at that temperature.)

4.4

Maintenance and care requirements

The following section presents recommendations for conservation care of architectural arts. To make the information as specific as possible, this section is organized according to type of material. “Do’s” and “Don’t’s” are listed for each type of material or object.

Because of the wide variety of materials included in architectural arts, this section considers each aspect of the care and maintenance program. Recommendations for other conditions of the objects as noted above should be included where appropriate.

4.5

Wood

Wood comprises the fibrous tissue of trees and shrubs. The influence of climate on wood is relatively complex and depends on many factors, including wood type, dimensions of the individual wood units, orientation of the cut, manner of construction, age, condition, and extent to which the wood is seasoned. The moisture content of wood ranges by environment, with a higher content in climates with higher ambient relative humidity. Eventually the moisture content reaches a balance with ambient conditions.

Moisture within wood adjusts to balance external conditions. As a result, wood is relatively less vulnerable to moisture than other materials. Thin wood, such as wood veneer, however, has little ability to adjust to changing environmental conditions and can easily suffer from ambient drying and resulting warping. Extremely dry conditions and extreme fluctuation between wet and dry conditions are particularly dangerous for wood.

Relative humidity

- Maintain consistent relative humidity within the range of 55 to 65 percent. If relative humidity falls below this level, adjust the RH by lowering the heat, adding humidity with humidifiers, or both.
- Avoid conditions that cause extreme fluctuations, such as extreme lowering of RH during the day and raising at night by adjustments in heat or air conditioning. Fluctuations in relative humidity occurring over longer periods of time, such as seasonal fluctuations, are less damaging than daily or weekly fluctuations. Frequent fluctuations accelerate deterioration by promoting warping, detachment, and extreme drying.
- Avoid high humidity as it promotes insect infestation.
- Do not place an object over a heat vent, in the direct path of sun, or near a source of heat, such as a halogen lamp. If such placement is unavoidable, take protective measures. For sunlight, place UV filters over the window. For heat, redirect the heat away from the object. For lamps, relocate the lamp.
- Note changes in size or shape, indications of biodeterioration, or evidence of chemical reaction.

Light

- Filter direct light and heat on fragile wood objects.
- Avoid direct light on painted wood objects.

Pests

Wood deteriorates because of insect infestation, such as termites. Indications of insect infestation are apparent from boring holes, loss of strength, powdery residue, etc.

- Routinely check for insect infestation. Note powdery residue, presence of holes, and a hollow sound when tapped.
- Note presence of rodents or birds. Look for guano.

Care and handling

- Dust with dry, soft cotton cloths without cleaners, oils, or waxes.
- Examine on annual schedule. Note buckling, warping, insects, etc.
- Monitor climate on annual schedule. Monitor relative humidity with read-out hygrometers. Calibrate hygrometers at least four times a year. Retain records. Notify GSA of severe fluctuations.
- Do not oil, wax, or use proprietary materials of any sort.
- Remove or repair immediately, if vandalism occurs.
- Install interpretive signage

Handling and storage

- If a wood object is moved, it should be properly packed and padded. It is important that its environment is not radically changed to an extremely dry or very damp environment.
- If a wood object is stored over a long period of time, the climate in the crate should be monitored.
- Gloves should be worn while moving the object.
- If the object is moved, employ professional art handlers to handle the object.

4.6 Plasters

Plaster refers to the material made by mixing a dry powder with water and letting the mass set by drying, carbonation, or hydration. Plasters may be used to cover surfaces, such as walls or buildings, molds, or casts. They may also be sculpted. Plaster architectural arts include three dimensional sculptures, cast ornaments, and bas-reliefs.

State Pride by Leo Friedlander
Plaster Models for Estes Kefauver
Federal Building, Nashville, TN
Art Conservation Associates

Left: Before conservation.

Right: After conservation.



Plaster of Paris

Plaster of Paris is a fine, hard, white plaster composed of hemihydrated calcium sulfate produced by heating gypsum at high temperatures. Plaster of Paris is known for its rapid setting properties and, when used as a mold or cast, its ability to render detail. It is soluble in acids and only slightly soluble in water.

Plaster of Paris may be affected by sustained exposure to water. While water slowly dissolves it, dry conditions do not appreciably change or damage the material. Relative humidity fluctuations may precipitate the migration of soluble salts, contributing to its breakdown. If plaster contains salt impurities, they may migrate and form efflorescence on the surface.

The interaction between Plaster of Paris and incompatible materials may be quite damaging. Because Plaster of Paris has no elasticity, the movement of attached materials may transfer to the plaster, causing damage. Without the addition of buffers or movement joints, thermal expansion of attached metal, for example, may cause severe cracking or other damage to the plaster. Likewise, wood attached to plaster may expand or bend with relative humidity fluctuations, shifting its movement to the brittle plaster and causing cracking.

Materials integrated into plaster that are incompatible may adversely affect the plaster. For example, metal corrosion and its subsequent enlargement through formation of salts may cause the breakdown of the plaster.

Lime plaster

Many historic finishes are composed of lime plasters. They include interior and exterior lime renders as well as lime-painted washes. Lime plasters are selected because of their durability, long working time, and ability to integrate pigment into their surface, thereby making them permanent, (i.e., fresco). Lime is calcium oxide. It is prepared by heating calcium carbonate derived from chalk or limestone and then adding water to the altered calcium oxide (slaking).

Lime plaster is usually augmented with a binder such as sand, marble powder, hair, or straw, which helps to control shrinkage and subsequent cracking.

Like Plaster of Paris, the interaction between lime plaster and incompatible materials may be harmful to the object. Differences in thermal expansion and deterioration of other materials embedded or in contact with the plaster can cause damage to the plaster.

Portland Cement is made from hydraulic cement obtained from a mixture of lime and clay. It is very hard. Portland Cement and other hydraulic cements are commonly used in modern construction. Uses include exterior rendering, pointing and bedding mortar, cast architectural ornament, as well as poured and reinforced units used for building construction.

Hydraulic cements resist deterioration better than lime plasters. When weaker and more porous materials, such as lime plaster or brick, is in contact with a cement as strong as Portland cement, the weaker materials often deteriorate because moisture and salts are forced to move into the more porous material.

Depending on the nature of their primary supports, plasters are relatively resistant to light, climatic fluctuations, and pests. However, they are vulnerable to movement, and over a long period of time, to salts migration.

Light

- Avoid direct illumination with daylight. Filter direct light with ultraviolet light filters.

RH

- Monitor relative humidity with read-out thermohygrograph. Calibrate four times a year. If fluctuations in RH exceed 40 percent, make the necessary adjustments by altering the temperature or humidity levels.
- If a very high RH is reached, it may cause damage to Plaster of Paris objects through partial dissolution and the formation of soluble salts. Adjust climate.
- Where incompatible materials are combined in one object, such as metal and plaster, note fluctuations in relative humidity.
- Note cracks or fissures.
- Note exfoliation (scaling) of plaster.
- Notice changes in color, surface texture, or sheen.
- Note changes in size or shape, indications of biodeterioration, or evidence of chemical reaction.

Pests

- Routinely check for insect infestation.
- Note presence of rodents or birds. Look for guano.

Care and handling

- Note failure to the architecture such as leakage, failure of mechanical systems, damage to roof, damage to drains, etc. that may affect the object.
- Dust once a year with soft, dry, natural-bristle brush without oils, waxes, or cleaning materials.
- Do not use proprietary cleaning materials of any type, such as Formula 409™ or Comet™.
- Do not oil, wax, apply paint, or any other material to the surface.
- Do not move.
- Do not apply attachments.
- Do not allow human contact, such as leaning, touching, etc.
- Do not allow residues from animals or insects.
- Install interpretive signage providing the title, artist, date of execution, and methods of execution of the object.
- If vandalism occurs, remove or repair the object immediately.

Handling and storage

- If an object made of plaster is moved, it should be well padded and guarded against impact or jarring.
- In cases of storage, the object should be well padded and supported.

4.7 Wall paintings

Wall paintings refer to paintings executed on a wall, as opposed to painting executed on other supports, such as canvas or board, and applied to the wall. Wall paintings encompass a range of materials and techniques. They include media-bound paints applied to dry plaster or other wall surfaces as well as wetted pigments applied to damp calcium oxide plaster, in which the pigments are bonded to create *buon* fresco or fresco painting.

The effect of the environment on wall paintings depends on the original materials and techniques of execution. The materials considered include the substrate, the primary support (discussed below) as well as the materials and techniques of the painting itself.

In addition to deterioration of the substrate or support, the paint layer itself deteriorates because of salts migration, microbiological growth such as mold and mildew, or chemical and physical alterations to the pigment or binder. Most conditions may be detected through close examination and observation of changes in color, texture, or evidence of deterioration byproducts, such as white salts efflorescence, mildew growth, or other residues.

Light

- Painting on plaster, like any painting, is adversely affected by ultraviolet light. Depending on the type of pigment, the paint may fade or otherwise alter. Therefore, it is necessary to filter direct light with ultraviolet light filters or to screen out the light with blinds.

RH

- Monitor relative humidity with read-out thermohygrograph. Calibrate four times a year. If fluctuations in RH exceed 40 percent, make the necessary adjustments by altering the temperature or humidity levels.
- Check for the presence of salts. Note surface efflorescence on the surface or crumbling or cracking of the surface plaster.
- Note cracks or fissures.
- Note powdering paint or plaster.
- Note changes in size or shape, indications of biodeterioration, or evidence of chemical reaction.

Pests

- Routinely check for insect infestation. Note powdery residue, presence of holes, and a hollow sound when tapped.
- Note presence of rodents or birds. Look for guano.

Care and handling

- Note peeling or flaking of paint or other surface film.
- Note cracks, fissures, exfoliation, disaggregation.
- Note failure to the architecture such as leakage, failure of mechanical systems, damage to roof, damage to drains, etc. that may affect the object.
- Dust once a year with soft, dry, natural-bristle brush without oils, waxes or cleaning materials.
- Do not use proprietary cleaning materials of any type, such as Formula 409™ or Comet.™
- Do not oil, wax, apply paint, or any other material to the surface.
- Do not move.
- Do not apply attachments.
- Do not allow human contact, such as leaning, touching, etc.
- Do not allow residues from animals or insects
- Install interpretive signage providing the title, artist, date of execution, and methods of execution of the object
- If vandalism occurs, remove or repair the object immediately.

4.8 Mosaics

Mosaic refers to a decorative or artistic rendering created by inlaying pieces of stone, tile, glass, or enamel into a cement mortar or plaster matrix. Mosaics may deteriorate because of the deterioration of the substrate or support (see plasters above), because of a failure of attachment, or because of weakening of the surface of the *tesserae*, i.e., mosaic pieces.

Light

- Avoid direct illumination with daylight. Filter direct light with ultraviolet light filters.

RH

- Monitor relative humidity with read-out thermohygrograph. Calibrate four times a year. If fluctuations in RH exceed 40 percent, make the necessary adjustments by altering the temperature or humidity levels.
- Note changes in size or shape, indications of biodeterioration, or evidence of chemical reaction.

Pests

- Routinely check for insect infestation. Note powdery residue, presence of holes, and a hollow sound when tapped.
- Note presence of rodents or birds. Look for guano.

Care and handling

- Note peeling or flaking of paint or other surface film.
- Note cracks, fissures, exfoliation, disaggregation.
- Note failure to the architecture such as leakage, failure of mechanical systems, damage to roof, damage to drains, etc. that may effect the mosaics.

Reverent Grove By Ned Smyth
Ron De Lugo Federal Building
Charlotte Amalie, VI
Art Conservation Associates

Left: Before conservation: Note the force of water from fountain causing damage to *tesserae*, i.e., mosaic tiles.

Center: During conservation: The conservator is replacing *tesserae*, i.e., mosaic tiles.

Right: During conservation: The conservator is cleaning *tesserae*, i.e., mosaic tiles.



- Dust once a year with soft, dry, natural-bristle brush without oils, waxes, or cleaning materials.
- Do not use proprietary cleaning materials of any type, such as Formula 409™ or Comet.™
- Do not oil, wax, apply paint, or any other material to the surface.
- Do not move.
- Do not apply attachments.
- Do not allow human contact, such as leaning, touching, etc.
- Do not allow residues from animals or insects.
- To prevent vandalism, erect a buffer zone or devise a division between human contact and the work of art.
- Install interpretive signage providing the title, artist, date of execution, and methods of execution of the object.
- If vandalism occurs, remove or repair the mosaic immediately.

4.9

Stained glass

Stained glass is a type of mosaic rendered with transparent glass traditionally secured in place with lead cames. The color is achieved by firing a stain into the surface of the glass after forming. Like mosaic, the condition of stained glass is partly determined by the condition of the substrate.

In architectural applications, stained glass is most often found in windows. The primary type of failure results from sagging of the lead cames. Glass *tesserae*, i.e., glass pieces may also be lost or damaged and require replacement. Moreover, damage may have occurred to the glass through faulty manufacture or harsh treatment.

Light

- Because direct daylight illumination is desirable for stained glass windows, it is impossible to avoid its contact. Heat exacerbates the sagging of lead cames. Depending on the amount of heat to which the window is exposed, note flexing and sagging of the lead.
- Note loosening of the glass.

RH

- Monitor relative humidity with read-out thermohygrograph. Calibrate four times a year. If fluctuations in RH exceed 40 percent, make the necessary adjustments by altering the temperature or humidity levels.

Pests

- Routinely check for insect infestation. For the exterior, examine the surface with binoculars if necessary.
- Note presence of rodents or birds. Look for guano.

Care and handling

- Note separation of glass from lead came or from frame.
- Note cracks or fissures in the glass.
- Note presence of salts by efflorescence.
- Note failure to the structure such as leakage, failure of mechanical systems, damage to roof, damage to drains, etc. that may affect the stained glass.
- Dust once a year with soft, dry, natural-bristle brush without oils, waxes, or cleaning materials.
- Do not use proprietary cleaning materials of any type, such as Formula 409™ or Comet™.
- Do not oil, wax, apply paint, or any other material to the surface.
- Do not move.
- Do not apply attachments.
- Do not allow human contact, such as leaning, touching, etc.
- Do not allow residues from animals or insects.
- To prevent vandalism, erect buffer zone or devise a division between human contact and the work of art.
- Install interpretive signage providing the title, artist, date of execution, and methods of execution of the object.
- If vandalism occurs, remove or repair the stained glass immediately.

4.10

Mixed media/ collage

Because works in mixed media are made of a range of materials and methods, they are particularly delicate and subject to damage. In addition to materials already discussed, objects of mixed media may include textiles and paper. In dry conditions, these materials are particularly sensitive to deterioration.

Light

- Minimize contact of direct daylight.
- Filter light as necessary.

RH

- Monitor relative humidity with read-out hygrometer. Calibrate four times a year. Where paper and textiles are components of the object, RH should be maintained at between 45 and 65 percent. If there are fluctuations in RH greater than 20 percent make the necessary adjustments by altering the temperature or humidity levels.
- Note changes in size or shape, indications of biodeterioration, or evidence of chemical reaction.

Pests

- Routinely check for insect infestation.
- Note presence of rodents or birds. Look for guano.

Care and handling

- Note presence of powder.
- Note cracks or fissures in the glass.
- Note presence of salts by efflorescence.
- Note failure to the architecture such as leakage, failure of mechanical systems, damage to roof, damage to drains, etc. that may affect the stained glass.
- Dust once a year with soft, dry, natural-bristle brush without oils, waxes, or cleaning materials.
- Do not use proprietary cleaning materials of any type, such as Formula 409™ or Comet™.
- Do not oil, wax, apply paint, or any other material to the surface.
- Do not move.
- Do not apply attachments.
- Do not allow human contact, such as leaning, touching, etc.
- Do not allow residues from animals or insects.
- To prevent vandalism, erect a buffer zone or devise a division between human contact and the work of art.
- Install interpretive signage providing the title, artist, date of execution, and methods of execution of the object.
- If vandalism occurs, remove or repair the stained glass immediately.

4.11 Metals

Architectural arts may be composed of a wide range of metals. The chemistry and deterioration of metals is complex. Only cast bronze metals for outdoor sculptures are discussed here.

Bronze is an alloy of copper, tin, and zinc. In some cases, small amounts of lead and other metals are found in bronzes. Bronze sculptures are produced by one of several casting techniques. Although bronzes will form their own patina, or layer of corrosion (usually stable), with time, they develop a patina or are chemically treated to produce a desirable color and finish.

Bronzes, like all metals, corrode when in contact with acidic or alkaline materials. One of the chief causes of deterioration of metals in outdoor urban environments derives from atmospheric sulfur dioxide in combination with RH above 60 to 70 percent. Since little can be done to control the environment, conservators employ techniques to protect the bronzes against corrosion. This includes the application of coatings, such as synthetic varnishes and hot wax coatings.

RH

- In indoor environments, monitor relative humidity with read-out hygrometer. Calibrate four times a year. If the RH rises above 60 percent, lower it.
- Note indications of chemical reaction.

Pests

- Routinely check for insect infestation.
- Note presence of rodents or birds. Look for guano.
- In outdoor settings, immediately hose off guano as it is acidic and promotes deterioration.

Care and handling

- Note presence of corrosion.
- Note pitting.
- Note failure to the adjacent architecture such as leakage, failure of mechanical systems, damage to roof, damage to drains, etc. that may affect the object.
- Dust once a year with soft, dry, natural-bristle brush or clean, soft cotton cloth without oils, waxes, or cleaning materials.
- Do not use proprietary cleaning materials of any type, such as Formula 409™ or Comet™.
- Do not use abrasives of any sort. These include stiff brushes, scouring pads, etc.
- Do not oil, wax, apply paint, or any other material to the surface.
- Do not apply attachments.
- Do not allow human contact, such as leaning, touching, etc.
- Do not allow residues from animals or insects.
- Clear drainage holes with a wire or stick so water may drain away from outdoor sculpture.
- Apply hot wax coating annually.
- To prevent vandalism, erect a buffer zone or devise a division between human contact and the work of art.
- Install interpretive signage providing the title, artist, date of execution, and methods of execution of the object.
- If vandalism occurs, remove or repair the object immediately.

4.12 Appendix

Architectural Examination Form

This form accompanies the GSA Architectural Arts Maintenance Instructions.
Fill out this questionnaire together with the GSA Art Inspection Form.

Architect:

Engineer:

Building manager:

When examined:

Recent history of repair:

Interior structure and condition

Original/added structural material

Water damage

Other type of deterioration

Ceiling Construction

Wall Construction

Floor Construction

Lighting

Exterior structure and condition

Original/added structural material

Water damage

Other type of deterioration

Roof Construction

Flashing

Downspouts

Windows

Wall Construction

Lighting

This form can be enlarged
by photocopying it at 130%
to fit on letter size paper.

Environment

Attach relative humidity records during the course of one year. RH should be noted in the morning and the late afternoon. The thermohygrograph should remain in the same location in the room.

Type of monitor:

Date last calibrated:

Instrument used for calibration:

Highest RH:

Duration:

Date:

Lowest RH:

Duration:

Date:

Average RH:

Frequency:

Climate control devices/measures used in building or room

Type of heat?

Type of AC?

Are windows opened at any time of the year?

Blinds used?

Fans?

Are there humidifiers? Are they maintained? At what time of year are they used?

Are there desiccators?

Air purification systems?

UV filters in window?

Who is in charge of maintenance? Location of records?