

Public Art 101 Pittsburgh Arts Council

"Making it Last" Jim Gwinner

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I. There are three major concerns when conceptualizing public artwork that need to be considered.

- 1. Material: Fabrication techniques, design,**
- 2. Location: Environmental concerns, public access**
- 3. Maintenance: Theft, graffiti and vandalism**

II. Materials

A. Metals: Ferrous and Non-ferrous

1. Ferrous metals :

a) Ferrous comes from the Latin term ferrum meaning Iron. These metals include iron, steel, and alloys of other metals such as stainless steel.

(1) Mild steel and iron are typically unsuitable for outdoor sculpture! There are coatings that can be applied and if maintained regularly then these alloys can be used.

(2) Stainless Steel alloys are acceptable 304 and 316 are the most common. Remember its stainLESS not never stain. Stainless steel alloys are ferrous metals and develop rust colored oxides.

2. Non-Ferrous metals

b) Do not contain iron. Bronze, copper, aluminum are all examples of non ferrous metals. These metals do not rust but they do develop oxides if not sealed.

(1) Bronze: The queen of all metals. Alloy made of copper, silicon, and manganese. Excellent material for durability

(2) Aluminum: lightweight material can be cast formed,

welded coated and anodized.

3. Metal compatibility: Scale of Nobility. Be aware that when certain metals come into contact with each other they will begin to oxidize. This is known as galvanic corrosion. The more noble the metal (Cathodic) the more it is resistant to corrosion. Mixing two metals from either end of the nobility scale will result in the galvanic corrosion of the least noble metal (Anodic). The use of dielectric gaskets can be used to insulate the two dissimilar metals from each other.

4. Coatings: Painted steel artworks should use stainless as a base metal to reduce the risk of corrosion if the top coating is compromised. Non ferrous metals can also be used.

5. Patination: A patina is produced by oxidizing the bronze through a chemical process. Not one patina is better than another for durability. Formulas should be documented so that repairs can be made

B. Wood.

1. Wood: Wood is an organic material and as such is susceptible to natural deterioration, insect infestation and mold and fungus. The quality of the wood used-as well as the type-can have a huge impact on longevity. Generally heartwood is less susceptible to insect and fungal attack than sapwood.

a) **Hardwoods:** the harder the wood the more resistant to environmental concerns, and public interaction.

b) **Softwoods:** should not be used in an outdoor environment due to inability to withstand environmental damage and vandalism

c) **Wood does not move in all directions equally.** The greatest movement is across the grain. There is very little movement along the length. Some of the variables to consider:

d) **Whether the piece is flat sawn or quarter sawn.**

e) **Sapwood content.** Sapwood will usually change moisture content more rapidly than heartwood.

f) **Grain structure-open or closed pores.**

g) **Defects in the wood.**

h) **Changes in grain direction.**

- i) Consistency of moisture content throughout the board. It is likely to have a higher moisture content in the center than on the surface.
- j) Tension in the wood.
- k) Location of the wood in the tree.
- l) Age of the Wood.
- m) Size of the piece

2. Coatings: Wood coating can be comprised of paint, stains, dyes lacquers, polyurethanes, and waxes. -As is the case with all coating methods. Make sure it is sustainable and repairable.

C. Stone: Igneous (granite) Sedimentary(limestone, Sandstone) Metamorphic (marble) Are well suited to public artwork however stone can deteriorate rapidly when exposed to freeze thaw cycles, environment (foliage, salts) and as with all materials public access.

- a) Mechanical deterioration i.e. water damage, salt crystallization. Porous stone, is susceptible to water damage either by freeze thaw cycling or by salt crystallization (soluble salts enter the porous stone then harden.)
- b) Graffiti and vandalism: Anti graffiti coatings should be applied to prevent ink pen staining, and paint absorption.
- c) Biological Damage: lichen, algae, and bacterial growth can cause staining. Placement is crucial.
- d) Staining, from treated water and structural elements should be avoided-use stainless steel for the internal structural elements.

D. Concrete, Cast Stone and Terrazzo ; Concrete cast stone and terrazzo have some inherent advantages to Stone for use in outdoor sculpture. New concrete formulations, and advances in polymer concrete, have improved the long term performance of this material.

- a) Formulation, Not enough can be said about the correct ratio of water to cement. Too much water and material becomes brittle-not enough and the material lacks strength and adhesion.
- b) As with stone moisture and freeze thaw cycles can be damaging. Make sure all seems are properly filled.
- c) Environmental and weathering damage: Concrete is susceptible to the same damages as stone, With the added exception of staining, and uneven wearing due to casting. (air pockets) . Staining and runoff of attached dissimilar materials.

d) Concrete can be pigmented, stained-painting is not recommended. All concrete or cast stone should have a sealant applied to aid in water repellency and staining-anti graffiti coating should also be applied.

E. Ceramics: Earthenware, Stoneware, and porcelain are common types of ceramics used in sculpture.

a) Earthenware (low fire) is porous and often requires glazing to help seal the porosity. Earthenware is soft and the glazes do not penetrate deeply leaving the artwork susceptible to damage-generally not recommended as exterior artwork except in the case of mosaic tiles.

b) Stoneware (high fire) has very low to no porosity. Though often glazed, it is not required for protection of the surface. Stoneware glazes tend to penetrate deep into the ceramic body. Stoneware may be acceptable in exterior environments provided the artwork cannot easily be broken or damaged by public interaction³⁷ or environmental hazards.

c) Porcelain (high fire) is non-porous and may be acceptable in exterior environments provided the artwork is adequately protected from public interaction and environmental hazards.

d) Moisture and water in exterior environments are particularly damaging. Freeze-thaw effects can break the ceramic from the bonded substrate if not properly sealed. Snow melt and rainwater run-off are factors to be considered for exterior ceramic artwork.

e) Saltwater and alkaline environments can be particularly damaging to ceramics, especially low fire ceramic bodies, as they develop and push salts through their porous ceramic body. The salts accumulate between the body and the glaze and weaken the bond between the two layers

f) Mosaics: surfaces should be prepared and a proper underlayment should be used to prevent cracking due to substrate movement. Don't forget the expansion joints!

F. Glass: Like bronze and concrete glass can cast, and p making it a highly desirable sculptural material.

1. Cast Glass – Molten glass is poured, injected, or blown into a mold. The glass is then annealed^{d56} in a kiln and the temperature reduced slowly.

2. Fused Glass – Solid glass components are laminated and fused together inside a kiln that melts the glass into a near liquid state.

3. Flat Glass – Panes are prefabricated industrially by rolling, drawing, or floating the glass. Ultra Violet (UV) light inhibitors

can be added to the glass for use in exterior environments. Glass panes can be etched or sandblasted to create imagery or design effects.

a) Glass is susceptible to Thermal Shock-parts of the glass can heat up or cool down faster than others. This causes cracks and breaks to occur

- i. Environmental extremes (freeze thaw)
- ii. Infrared light
- iii. Artificial lighting!

b) Moisture can cause chemical leeching (potassium and Sodium) which combines with water creating hydroxides that will damage the surface. Also Freeze thaw cycles are to be avoided.

c) Commonly known as safety glass, tempered glass is treated beyond the annealing process to toughen the material. There are a couple of processes for tempering glass, each with different results in toughness. The benefits of tempered glass are increased resilience to vandalism and thermal shock. The disadvantages to tempered glass are the inability to work the glass after the tempering process and any breaks or gouges will completely fracture or shatter the glass, making repairs virtually impossible.

G. Plastics: relatively new medium is sculpture. Considered to be largely experimental in the outdoor sculpture

a) Susceptible to the same environmental extremes as glass with the added difficulty of being softer

H. Fabrication: Although some of the material pitfalls have included fabrication recommendations there are a few more issues that can ensure your artworks longevity.

(1) Following manufactures Recommendations

(2) Hire Professionals (certified welders, ect)

(3) Know your materials

(4) Consider your environment

(5) Water management

(6) Watch for inherent design flaws (fragile edges, slippery surfaces, desirable items,

(7) Lacquers and Clear coats(Please don't use them)

(8) Coatings: Paint

I. Location Location Location!

1. Interior environments are less stressful than exterior environments. Temperature is usually controlled however there are still concerns:

- a) Temperature: Windows can cause extreme temperature fluctuations and should be avoided for sensitive materials. Direct sunlight may significantly increase the surface temperature of the artwork and stress the medium, support structure, coatings, and finishes. Construction materials like adhesives, caulking, and grout should be selected for their ability to withstand rapid temperature changes.**
- b) Use UV stable materials when exposed to direct sunlight (also indirect in certain cases).**
- c) HVAC systems cause Dust circulations, temperature extremes and vibration**

2. LOCAL ENVIRONMENTAL CONCERNS

- a) The landscape and environment near the artwork should be considered as a factor in selecting appropriate materials.**
- b) Bushes, trees, and foliage planted near an exterior work can create many sources of possible damage. Trees can weep difficult to remove sap onto the artwork, and the leaves plug drain holes and prevent water management systems from working properly. Tree roots may also disturb the placement of the artwork. Grounds crews will likely spray fertilizer around any plantings near the artwork. By spacing the plantings far enough away from the artwork, there will be less of an opportunity for corrosive elements in the fertilizer to damage the artwork when it is sprayed or wind-blown onto the piece.**
- c) Mold and mildew can damage many organic or porous materials. The most susceptible materials should not be considered when designing artwork in coastal zones.**
- d) Artwork near saltwater often develops a layer of briny crust or coating. Some materials will experience accelerated deterioration due to the alkalinity of the local atmosphere.**
- e) Roads, railroad tracks, and waterfront areas in close proximity create opportunities for vandals to throw large rocks at the artwork. Consider only the most durable materials in these environments.**

f) Industrial and automotive pollution can create a dark layer of oily residue on the surface of materials. The residue is difficult to clean and will retain airborne particulates (e.g. dirt, pollen).

J. Cleaning and Maintenance: Regardless of the material cleaning and maintenance should be considered for all artworks.

a) Access for cleaning, maintenance, and repair is necessary. There should also be enough space to remove the work safely should the piece need to be uninstalled.

b) Removal of an artwork may happen for many reasons, such as conservation and/or maintenance of the artwork, new construction or remodeling at the site, or relocating the artwork to a new site. The work should be installed in a manner that will allow future art handlers to uninstall the work without causing unnecessary expense or damage to it. Public buildings are generally remodeled within 20 years, and often non-integrated artwork can outlive interior design trends if originally installed in a reversible manner.

c) Please document all installation procedures.

(1) What Fasteners are used? Material size and Location

(2) What Adhesives and epoxies are used? Brand names Ect.

(3) Is there any location information that is critical to the installation. I.E. Sculpture must be placed to cast no shadow on the winter solstice.

