Canadian Conservation Institute
Institut canadien de conservation

CCI Notes 15/8

Outdoor Storage and Display: Basic Principles

Introduction

Many museums and heritage sites display and store their industrial artifacts outside, either because of limited space within their buildings or to draw attention to their collections. Unfortunately, the outdoor environment damages most materials and finishes. The best that can be done in this situation is to *slow down* the deterioration with remedial measures and regular maintenance (see CCI Notes 15/9 *Outdoor Storage and Display: Remedial Measures*). Before doing anything, however, it is necessary to appreciate the nature and magnitude of the problems that exist.

Agents of Deterioration and Destruction

Industrial artifacts are attacked by many forces. Some, such as fire and vandalism, are catastrophic events while others, such as rot and corrosion, are slow and steady processes. Some involve the natural environment, while others are due to human activity.

The survival of an artifact outdoors is strongly affected by its *design* and *materials*, i.e. the thickness, shape, flammability, and water absorbency of its various components. For example, a fire or flood may completely destroy a wooden railway car fitted with upholstery, curtains, and carpeting, but do comparatively little damage to a steel box car. Similarly, vandals can do much more damage to a wooden carriage or a fabric-covered airplane than to a steel tractor or iron cannon.

Major Threats

The highest priorities for most historic sites and museums are fire prevention and security. Fire and vandals can do more damage in one hour than neglect can do in 20 years. When these threats have been addressed (see Technical Bulletin No. 18 *Fire Prevention Programs for Museums* and Technical Bulletin No. 19 *Security Hardware and Security System Planning for Museums*), the remaining problems will be water, direct sunlight, and pests such as insects, birds, and rodents.

Water

Water in any form (e.g. rain, snow, ice, dew, high humidity, condensation, and dampness in soil) is a major cause of deterioration in outdoor industrial collections. When water combines with oxygen, it causes most metals to corrode. Road de-icing salt, dirt, and air pollutants accelerate the process. Water that collects in pipes and tubes can freeze and expand in cold weather, rupturing the components. Moisture ruins wooden parts, making them swell, warp, and rot. It also destroys leather and textiles by encouraging mildew, rot, and insect attack.

Direct sunlight

The ultraviolet radiation in sunlight breaks down organic materials such as wood, leather, textiles, and rubber, leaving them weathered, cracked, and brittle. Sunlight also attacks paint, varnishes, and decals, leading to faded, peeling, and cracked finishes. In addition, it dramatically heats up the enclosed interiors of airplanes, automobiles, and railway cars (by a "greenhouse effect"), drying out materials and speeding up deterioration.

Pests

Insects, birds, and rodents can be a serious problem for artifacts with enclosed areas that contain large amounts of vulnerable organic materials (e.g. the interiors of railway cars, automobiles, and airplanes typically include textiles, wood, leather, and paper). In this respect, these objects have much in common with furnished buildings.

Preliminary Assessment of Problems

Caring for an outdoor object requires planning. The first step is to identify the existing or potential problems at the site.

Start with the location and orientation of the objects. Note the drainage patterns of the ground the object sits on and the presence of tall grass, weeds, and overhanging trees. These may be sources of moisture or moisture-retaining debris (leaves, pine needles, twigs, etc.). Observe how much direct sunlight strikes the object in the course of a summer day.

Next, carry out a systematic assessment of each industrial artifact in terms of its *design* and *materials*, noting the following:

- **Absorbent materials** such as textiles (canvas, felt, linen, etc.), wood, leather, and paper or fibreboard — Most absorbent materials would have been factory-coated on at least one side to repel water. However, the repellent finish is likely to have broken down with age, wear, or damage. Thus absorbent materials tend to soak up moisture and stay wet for long periods, destroying adjacent materials such as sheet metal. Insulating materials such as asbestos, fibreglass batting, and rock wool can also be problematic. Although they are generally resistant to water, they can retain moisture for long periods inside wall panels and jacketing.
- **Bare metal surfaces** — Working metal surfaces and movable parts rust quickly in all but the driest conditions. When the artifact was operational, these surfaces would have been kept rust-free with lubricants, heat, and/or friction.
- **Fine surface finishes** — Paint and varnish are relatively thin coatings that are easily damaged or destroyed. Once lost, they are difficult to replace accurately and authentically. The surface of plexiglass is extremely vulnerable to scratching and pitting.
- **Thin materials** — The thinner the material, the greater the chance it will be ruined by deterioration. This is readily apparent with sheet metal, wood panelling, and veneers. Thin metal is quickly perforated by corrosion, while thin wood and fibreboard are prone to warp or cockle.
- **Configuration** — Hollow shapes (boxes, bins, and pipes) act as traps for water and organic debris. They often deteriorate faster than parts that can shed water and dirt. Structural seams, interior corners, holes, recesses, and horizontal surfaces also trap wet debris and encourage the rotting of wood, the corrosion of metals, and, in some cases, the growth of plants (moss, weeds, etc.) on the object.
- **Entry points for water** — Look for gaps or holes in roofs and around window sashes, doors, and hatches or access panels. Check for the presence of weather-proofing around windows, doors, and fittings such as handles, mirrors, and lights (see CCI Notes 15/7 *Rubber Components in Industrial Collections*).
- **Entry points for insects, birds, and rodents** — As above, look for gaps or holes in roofs and walls, particularly where hardware and operational fittings have been removed.
- **Pooling water** — Watch for puddles of water on horizontal surfaces and in recesses. This is best done soon after a rainy period.

Analysing the Problems

In most cases, the object will already have been damaged by prolonged exposure outdoors. It is possible to identify the problems — both past and present — by studying the damage that has accrued. One can "read" the signs of deterioration much as a detective studies the scene of a crime.

Look for:
- perforated sheet metal
- pockets of bright orange rust
- decayed wood
- faded or water-stained fabrics, wood, and paper materials
- rust streaks and stains
- nesting materials
- insect, bird, and rodent debris and excrement

Next, try to trace the damage back to its source. In most cases, the trail will lead to an entry point for water and pests. It may be something as obvious as a broken window or as subtle as the gradual failure of roofing material, weatherstripping, or a coat of paint.

Note that contaminants such as dirt, organic debris, road de-icing salt, and sulphur-laden air pollution accelerate the corrosion of metals. Determine if these are a factor and, if so, how they are reaching the surfaces of the object.

Setting Priorities

The sheer size and diversity of an outdoor industrial collection can make caring for it discouraging. It is therefore essential to establish priorities for remedial measures and maintenance. Determine which materials and components are most at risk on a case-by-case basis and target these for remedial measures as funding and labour become available. The remaining problems can be resolved as resources allow.

Conclusion

Battling deterioration outdoors is a losing proposition. Much labour, expense, and permanent damage can be avoided simply by bringing the objects indoors. This should always be the long-term goal.

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