Canadian Conservation Institute
Institut canadien de conservation

CCI Notes 15/4

Indoor Display of Industrial Collections

Whenever possible, industrial artifacts like machine tools, printing presses and woodworking machines should be stored and displayed indoors. No other single factor will contribute so much to the long-term preservation of these artifacts. Some of the advantages of indoor storage are listed below.

The term "indoor" here means completely enclosed in a building. The building must be secure from fire, vandals, rodents and birds. It must be weatherproofed against leaks and rising damp, and it should be ventilated in some fashion. Environmental controls are desirable, but not absolutely necessary.

Advantages of Indoor Display

Fully enclosed display offers three major advantages:

1. Physical protection: An indoor environment protects industrial artifacts from every major source of deterioration. This includes precipitation (rain, snow, dew, ice and hail), temperature extremes, direct sunlight, pollutants and airborne dust, dirt and absorbent debris. Vandals, rodents and birds are also prevented from damaging and soiling the objects.

2. Accurate presentation: Indoor display allows a museum to present its industrial artifacts more accurately to the public. For example, the bare metal working surfaces of a machine can be left unpainted, just as they are on an operational machine, without severely rusting. Areas that still have original paint and decals will not fade or peel as they would in direct sunlight, so they will not have to be repainted. Parts will not have to be welded in place or removed to prevent loss or damage. In short, the artifacts can be presented in a complete, only slightly modified, state. They are truer, closer links to the past than artifacts that have been heavily modified for static display outdoors.

3. Enhanced interpretation: Indoor display makes it possible to free up movable parts and to keep them movable for year-round operation (e.g., hand operated by interpreters). This makes interpretation more interesting and meaningful. A machine kept indoors is much easier to maintain in this condition than one exposed to the elements outdoors.

Problems of Indoor Display

Displaying industrial artifacts indoors solves many problems, but it is not a perfect solution. Some responsibilities still remain for the owner. The machines are not maintenance free, and the physical interaction between artifacts and visitors is a serious concern.

With any industrial artifact on display, one should ask the following questions:

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1. Could anyone be hurt by this artifact?
2. Could the artifact be damaged or vandalized?
3. Can the bare metal surfaces be protected from the corrosive effects of moisture and fingerprints?

1. Could anyone be hurt by this artifact?

The most serious concern in displaying industrial artifacts indoors is public safety. As museums become more interactive, visitors—particularly children—are being encouraged to touch and handle certain objects, while others are off limits. In this environment of mixed messages, visitors might interact with the wrong objects, i.e. with artifacts that are inherently unsafe. Unless the physical interaction is closely supervised or demonstrated only by trained interpreters, visitors may be severely injured. To aggravate matters, the museum could face lawsuits and negative publicity.

The best way to discourage visitors from interacting with industrial artifacts is to implement a combination of physical barriers, vigilant security staff and motion detectors. If these measures are not affordable or desirable, preventive measures can be taken to inhibit the movement of the artifacts and reduce the potential risks. All of the measures should involve non-permanent alterations. Some suggestions are discussed below.

Assessing potential hazards

Survey each artifact methodically for potential hazards. Involving at least one other person in the exercise will make the assessment easier and more thorough. Ask the following questions:

Can any part of the machine be turned easily by hand?

This is extremely important. Moving one part may cause a connected part to move unexpectedly, injuring the hand resting on it. The momentum of turning parts can make them difficult to stop quickly.

Watch for exposed gears that engage and rotate if a belt is tugged or a pulley is turned. Probing or inattentive fingers could be severely injured by the engaging gear teeth.

Determine whether or not moving vertical parts such as stamping dies or drill bits stay clear of the worktable when they are lowered. The hand of an inattentive person could be injured if it is resting on the worktable.

Check for horizontal rollers or cutting blades that rotate easily. These can pull in probing fingers, resulting in injury.

Are any saw blades or other sharp cutting parts within easy reach?

Sharp cutting edges within reach are an obvious hazard. Also, cuts from dirty or rusted parts can become infected.

Can rollers be lifted out of their bearings?

A loose roller can fall on someone's foot from waist-height.

Is there any foot-operated motion?

Foot levers can transmit a large amount of force to moving parts that are not obviously connected. The parts can move very rapidly, causing head or hand injuries. The downward motion of a foot lever could also injure a foot or hand underneath it.

Foot-operated machines often have spring-loaded moving parts to make the return action easier and faster. The upward motion of the lever and the return travel of any connected parts could be dangerous.

Blocking measures

If visitors cannot be kept a safe distance from the artifacts, then the artifacts will have to be immobilized.

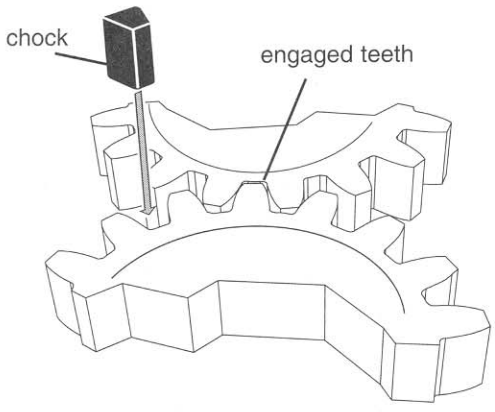

Figure 1. Placing one chock on one side of the engaged teeth.

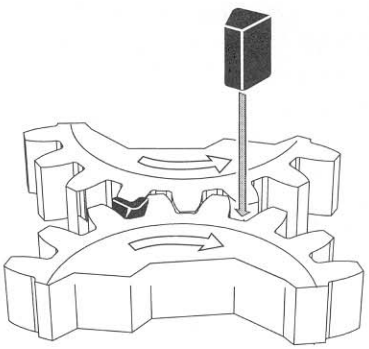

Figure 2. Rotating the gears onto the first chock, and inserting a second chock on the opposite side of the engaged teeth.

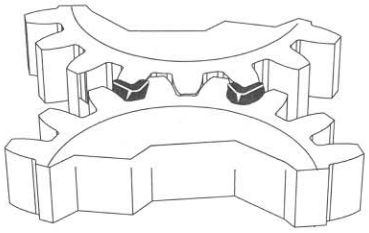

Figure 3. Letting the gears roll back onto the second chock. The gears will now be locked in place.

Gears

Gear teeth and similar movable parts can be blocked effectively with chocks of dense rubber. These can be cut to the required shape and size from thick sheet rubber (1 cm or ½" and up) available from industrial supply firms. Discarded V-belts (fan belts, etc.) offer a convenient solution because of their triangular cross section; they can be cut into short pieces that fit tightly into the valleys (the "roots") between gear teeth.

Installing the chocks requires two people—one to move the gears, the other to place the chocks. First place one chock on one side of the engaged teeth (Figure 1), then rotate the gears onto this piece. While the teeth and chock are engaged, insert a second chock on the opposite side of the engaged teeth (Figure 2). Let the gears roll back onto this chock. The gears will now be locked in place (Figure 3). A tremendous amount of force will be required to turn the parts over the chocks. The blocked parts will yield slightly, cushioning any violent attempts to move the parts.

Foot levers

To immobilize a foot lever, tightly wedge a wooden block under the pedal. This will prevent the lever and any connected parts from moving.

Hand levers

Secure hand levers and quadrants in position with long nylon tie-cables (pull-ties).

Rollers

Secure loose rollers in place with heavy monofilament nylon line (fishing line). Tie the line around the ends and the supporting frame.

Caution: Rubber chocks and nylon ties are non-permanent blocking measures. Determined visitors may be able to remove them. Museum staff must make a point of monitoring the continued presence and effectiveness of these devices.

2. Could the artifact be damaged or vandalized?

Mechanical damage

A serious threat to industrial artifacts is mechanical damage caused by visitors who use excessive force to operate or detach movable parts. As with visitor safety, the recommended long-term solution is the use of physical barriers, security guards and motion detectors. Artifacts should also be positioned in such a way that visitors are not encouraged to operate them by hand. If these options are not viable, other solutions will have to be found.

One solution is to block the parts with rubber chocks or wooden blocks as described above; both materials are effective because they "give" slightly under pressure.

Another solution is to disengage the movable parts so that they rotate freely. Handwheels, cranks and pulleys that spin without any visible effect will not generate much interest. On the other hand, damage could still occur: set-screws can score the shaft on which the part rotates, and the parts can be pulled off and stolen.

As with safety measures, all modifications must be monitored regularly by museum staff. Any deficiencies must be reported and corrected immediately.

Vandalism and theft

Vandalism and theft are related problems. Small, threaded parts such as wing-nuts and grease cups are at the greatest risk of being stolen. They can be secured in place with thread-locking adhesive. Apply a couple of drops of adhesive to the threads just before tightening; when the adhesive dries, it "locks" the threaded parts together. Hand tools are usually required to break the resulting bond. Loctite Threadlocker 242 is recommended for most nut-and-bolt assemblies.

3. Can the bare metal surfaces be protected from the corrosive effects of moisture and fingerprints?

Many machines have bright, unpainted metal parts that were kept shiny by constant use (friction or lubrication). These include worktables, shafts, pulley faces, and guides for moving parts. These parts will have to be coated with a rust-preventive compound to counteract the etching effect of fingerprints and to prevent corrosion caused by high humidity and dust particles.

Parts in sliding contact with each other should be lubricated with a light machine oil. It will serve as both a lubricant and a protective coating. Three-in-One household oil or automotive engine oil (5W-30) are effective for most applications. Where grease is required, as on slow-moving gears, multi-purpose wheel and bearing grease (e.g., Quaker State) is recommended.

Always clean the metal surfaces before applying a new coating. Degrease the surfaces with mineral spirits and clean soft rags. If fingerprints are present, use a cloth dampened with a weak solution of detergent and water to remove any residual salts from the surface.

Lubricants are not recommended as protective coatings for non-movable parts. They will soil the hands and clothing of visitors who handle or brush past the artifact, and the materials are slightly toxic. Alternative coatings are listed below.

Mineral oil

Mineral oil is the least toxic coating available. This is an important feature if visitors, particularly children, will be touching the metal areas and possibly ingesting the coating. Mineral oil is a highly refined white mineral oil, containing no hazardous ingredients. It can be obtained in large quantities (1-L bottles) from any pharmacy. It is sold as "mineral oil/heavy/u.s.p."

to be taken orally. It is also safe for use on kitchen cutting boards and blocks, although it will darken the wood.

Mineral oil is also sold as "gun oil," such as Hoppe's No. 9 Lubricating Oil. Gun oil is commonly used to protect the exposed metal parts of firearms from fingerprints and high humidity.

Another alternative is honing oil, such as Norton Sharpening Stone Oil, a "natural, highly refined, light mineral oil." This product is considered safe for external use in the kitchen.

All oil coatings remain tacky, so they will attract and hold dust. In time, the surfaces will become furry. All oil-coated surfaces should be wiped clean several times a year with a soft, clean rag dampened with mineral spirits. A thin coating of oil should be reapplied after each cleaning.

Microcrystalline wax

A thin coat of microcrystalline wax, such as AerOwax or Johnson's Klear, offers some protection for bare metal without the tackiness of mineral oil. The wax contains a solvent (mineral spirits) to keep it soft and easy to apply; once applied, the solvent evaporates, leaving behind a non-toxic wax coating that can be buffed to a high shine. Wax is recommended only for metal areas that will rarely be touched because it is an extremely thin coating. It is best used for protecting the metal from hygroscopic dust particles. It is easily removed with mineral spirits. The coating should be removed and reapplied at least once a year.

Rust-preventive compounds

Industrial rust-preventive compounds are designed to protect bare metal parts in damp environments, such as semi-sheltered or outdoor storage. They provide exceptionally good protection for metals displayed in less corrosive indoor conditions. The disadvantages are their high cost, slight toxicity and the change they make in an object's appearance. Two types are appropriate for indoor display: tacky, non-drying films and tack-free, dry films. They both need to be removed with a rag and mineral spirits before being reapplied.

Non-drying films

Non-drying films remain tacky, much like the common lubricants and mineral oil discussed above. They do not alter the appearance of the underlying metal much, apart from creating an "oiled" look. WD-40 is a popular commercial product that provides an ultra-thin, water-displacing (hence "WD") coating. It offers good short-term protection, but it will have to be reapplied frequently to stand up to severe storage conditions and any amount of handling. A similar product is LPS 1 from Loctite. Both are available in aerosol or liquid form.

As with lubricants and mineral oil, these coatings may be objectionable to visitors who come in contact with the artifacts.

Dry film coatings

Dry films are much less tacky than non-drying films so less dust will accumulate on the coated surfaces. An example of these products is Dow Corning Metal Protective Coating, available in 284-g (10-oz.) aerosol form. This product provides a very thin, slightly waxy coating that requires little maintenance. It does, however, alter the appearance of the metal slightly by leaving a matt, translucent coating.

Conclusion

Industrial artifacts benefit greatly from being kept indoors. At the same time, they must be maintained and monitored to limit damage and deterioration. Most importantly, measures must be taken to protect visitors from any inherent safety hazards.

Suppliers

Dow Corning Metal Protective Coating
Call Dow Corning Canada Inc. for nearest retailer:
(905) 826-9600 Mississauga
(604) 931-2090 Vancouver
(514) 694-0328 or 694-0089 Montreal

Norton Sharpening Stone Oil
Lee Valley Tools Ltd. (7 locations)
Order inquiries: 1-800-267-8761

Hoppe's No. 9 Lubricating Oil
Hardware Stores
Or see Yellow Pages:
Guns & Gunsmiths

Local sources for the following supplies will be found in the Yellow Pages of most telephone directories. Suggested headings are listed for each product.

LPS 1
Loctite Threadlocker 242
Bearings

rubber sheet
Rubber & Rubber Products
Gaskets

V-belts, fan belts
automotive motor oil (5W-30)
Quaker State Multi-purpose Wheel Bearing Grease
Automobile Parts & Supplies

Three-in-One oil
paste wax (Johnson's Klear, AerOwax)
WD-40
Hardware - Retail

mineral oil
Pharmacies

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