

## About Iron Alloy



Objects composed of iron alloy are all around us, in the form of tools, weapons, hardware, containers, toys, kitchenware, ornaments, and art objects. The term “iron alloy” is used to describe a metal composed of iron which has been alloyed with another metal to change its properties. One well-known example is steel, which is iron that has been alloyed with carbon and other elements to increase its tensile strength. Iron alloy objects are more vulnerable to corrosion than other metals. They are often utilitarian objects, which means they are also more prone to getting dirty and being damaged from frequent handling.

## Handling

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Using gloved hands, examine the structure and surface of your object carefully, looking for cracks, weak areas, old repairs, and loose or missing parts. To protect your object from scratching, marking, or bumping, remove dangling necklaces, sharp rings, and protruding belt buckles.

It is important to determine if there are original decorative or protective surface finishes on the object before beginning to clean. **Paint** is a good example of an organic decorative and protective coating material. Because they are so reactive, iron alloy objects

are often protected with paint coatings. **Plating** is a coating of one metal over another metal, and tin or zinc plating may be found on some objects created with thin sheets of iron. Zinc plating is generally referred to as gal-





vanizing. Another important type of decorative and protective surface sometimes applied to iron alloy items is a patina. A **patina** is a thin chemically induced layer of relatively stable corrosion on the surface of an object. Patina can also form over time from use and handling and can give an object the “patina of age”. Many iron

alloy artifacts, particularly weapons, may have original patinated surfaces of dark brown or dark blue. Brown patination may easily be mistaken for rust. **Organic coatings, plating, and patinated surface layers should not be removed and could easily be ruined by the cleaning procedures listed below.**

## Cleaning

Thick layers of iron corrosion are highly expansive, disfiguring, and difficult to reduce. The cleaning procedures listed below are not appropriate for heavily corroded objects, as they are ineffective on these surfaces.

**In summary, the cleaning and waxing procedures below should not be carried out on iron alloy objects that:**

- Are fragile or structurally unsound
- Have plating of another metal over the iron alloy (such as brass, bronze, silver, or gold)
- Have patination on the surface

(such as the “bluing” commonly seen on weapons)

- Have paint on the surface or an organic coating
- Are very heavily corroded

It can sometimes be difficult to determine the structural or surface condition of an object. If in doubt, please call a conservator.

The cleaning and waxing of iron alloy objects, while seemingly simple, is a process that requires careful thought and attention to detail for a successful outcome. Before you begin the process, please review the section above to make sure your object can be safely cleaned and waxed without causing irreparable damage. **Do not apply a wax coating to objects that will be used for food.**

Commercial cleaning products are generally to be avoided, as many contain corrosive chemicals such as ammonia, harsh abrasives, acids, or bases, which



can permanently damage artifacts. They may also contain corrosion inhibitors that can cause unusual and tenacious patterns of re-corrosion on your object. The materials and techniques listed below have been tested and found to be safe and effective when used in a careful and sensitive manner.

Provide a clean, well-ventilated work area for the cleaning and waxing process. Lay a towel down, followed by a clean sheet to create a padded work

## Procedure



1. Remove any loose dirt or dust by brushing lightly with a soft brush or camel hair paintbrush. If brushes have metal ferrules, cover them with tape to prevent them from scratching the object. Do not use dusting cloths, as they will not get into small crevices, and can scratch artifacts if trapped grit is rubbed over surfaces. If the artifact has soil that is firmly attached, a stiff paintbrush or stippling brush may be needed. Vacuum away any residues, brushing the dust towards the vacuum nozzle.

surface. A sheet of polyethylene plastic can be placed on the sheet to help contain the mess during the cleaning process. Wear nitrile gloves to avoid contaminating both the object and yourself. Oils, salts, and acids from your skin can easily cause corrosion to metal surfaces. Remove or mask out any non-metallic elements, such as wooden handles, with polyethylene plastic to protect these parts from cleaning materials.

2. Remove any waxy or oily accretions prior to rust reduction. Thick areas of wax can be pushed off with the blunt end of a bamboo skewer and thin layers can be lightly brushed with a natural bristle brush or cotton swabs dampened with mineral spirits. Rinse the brush in a small container of mineral spirits or replace the cotton swabs as they become soiled. Clean the brush or replace the swabs regularly to avoid scratching the surface with loosened rust and accumulated grime.

3. To remove minor rust deposits, wet small wads of 4/0 ultra fine steel wool with the penetrating lubricant and rub gently. If the corrosion is more tenacious, apply some of the lubricant with a brush and allow it to penetrate for up to 48 hours, keeping it covered with polyethylene sheeting to reduce evaporation. After a sufficient amount of

## Materials to Have on Hand

- Clean towel and clean sheet to create a padded work surface
- Heavy polyethylene sheeting to protect the padded work surface
- Cotton swabs or pads, as needed
- Nitrile gloves (recommended when working with mineral spirits)
- Mineral spirits
- Ultra fine (4/0) steel wool
- A penetrating lubricant such as WD 40® or CRC 3-36®
- Soft clean natural bristle brushes, such as haké, watch, or paint brushes
- Stiff natural bristle brushes and bamboo skewers,
- Apron or smock
- Clear microcrystalline paste wax, such as Renaissance® wax, or a clear hard paste wax available in hardware stores such as Behlens® paste wax.
- Clean natural bristle stippling or stencil brushes, or shoe buffing brushes, for waxing and buffing



**WARNING:** When working with solvents, be sure to follow all recommended safety precautions noted on the containers. Mineral spirits are strong, reactive chemicals and their fumes can be harmful to your health when not used as instructed. **Nitrile and Neoprene gloves offer the best protection against mineral spirits and the solvents present in the wax mixture. Avoid using latex gloves, as they do not offer adequate protection against the solvents used during this activity. Always be aware of the location of the nearest fire extinguisher when working with flammable solvents and waxes.**

time has elapsed, the rust should be easier to rub away. Do not use bronze or tin wool in a mistaken attempt to reduce potential abrasion. These materials will actually leave a thin layer of copper alloy or tin on the surface that will increase the rate of corrosion through a process called galvanic interaction. Never immerse an iron object in water, as it could begin rusting almost immediately.

4. Once the corrosion has been re-

### Waxing

1. Apply a small amount of paste wax to a clean stencil brush and rub thinly over the entire surface of the object, being careful to get complete coverage. Do not apply too much- a **little** wax goes a long way.

2. Wait a minute or two and buff the wax out with a clean stencil or shoe buffing brushes. Wax has a plate-like structure, and buffing helps to align and compress it into a more continuous and protective coating. If you accidentally leave the unbuffed wax too long simply apply a little more wax to soften the

duced, clear any residues with clean mineral spirits using swab, brushes, or clean pieces of soft cotton rags. A clean soft brush may be used to remove any remaining residues from crevices or recessed design elements. Allow the artifact to air dry. Finally, remove the protective wrap applied to non-metallic components.

5. Your piece is now ready for the application of a clean wax coating. The wax used for this purpose is a clear microcrystalline paste wax. Clean nitrile gloves should be worn to protect your hands and also avoid contaminating the object. Non-metallic elements such as wooden or ivory handles can also be *lightly* waxed following the same directions if they are approached with care. Only objects that have been properly cleaned and dried should be waxed.

previous coat, then buff immediately.

3. To maintain the coating, periodically



dust the artifact with a soft haké brush, checking each time for evidence of rust or corrosion. The wax should provide good protection for at least a year, depending on atmospheric and handling conditions. (When corrosion is noted, remove the old wax with mineral spirits, reduce any rust that may have formed, and re-apply as above.)

4. For items on permanent view, or for pieces that will not be used, consider

having a conservator apply a more durable clear organic coating. Stable organic coatings can provide up to twenty years of protection and minimize repeated handling of objects. This procedure should only be carried out by a professional conservator.

If you have any concerns about the care of metal objects, consult a conservator in your area for further guidance.

## Environmental Control

Iron alloy objects are best preserved by keeping them in a clean, stable environment, where the temperature is kept below 72°F and the relative humidity is kept between 30 and 50%. It is always best to keep these objects indoors, in a space other than an attic, garage, or damp basement. It is recommended that objects with iron alloy components be stored off the floor, to prevent water damage from flooding or leaks. If possible, house the objects in a closed container to prevent dust accumulation, which can attract moisture to the object's surface, resulting in rust. Closed storage also minimizes the object's exposure to atmospheric pollutants and changes in relative humidity. Polyethylene or polypropylene storage tubs are readily available at most hardware stores and can be identified by the "PE" or "PP" imprint found on their underside. Another

storage option is a box composed of acid-free, lignin-free board. Avoid using containers or shelving composed of wood, which can off-gas harmful acidic vapors.

Iron alloy objects should be stored in such a way that they are not touching other metal objects, or laid directly on a metal shelf. Either of these situations can lead to galvanic corrosion. Sheets of acid-free tissue paper, thin polyethylene foam, or clean undyed cotton can be used as a barrier between metal surfaces or as supportive padding underneath an object. Limit exposure to light during both storage and display. Coatings, paint, and non-iron components associated with your object may be irreversibly damaged by overexposure to light.

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## Consulting a Conservator

If your iron alloy object is unstable, damaged, or exhibits original paint, coatings, or applied patina on the surface, it is best to have it looked at by a conservator before trying to clean and wax it yourself. A conservator will be able to assess all the issues relating to its care, and determine an appropriate treatment that does not diminish its value. Conservators can provide basic structural repairs, corrosion reduction, protective coatings, and proper storage materials for objects.

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## Additional Resources

*Care of Metals*. Canadian Conservation Institute. Retrieved from <http://canada.pch.gc.ca/eng/1453994182990>

American Institute for Conservation of Historic & Artistic Works. *Caring for Your Treasures: Metal Objects*. Retrieved from [www.conservation-us.org/docs/default-source/resource-center/paintings.pdf](http://www.conservation-us.org/docs/default-source/resource-center/paintings.pdf).

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## Conservation Suppliers

Most materials listed for cleaning, waxing, and proper storage can be found at hardware stores, art supply stores, or online. The following are recommended resources that carry more specialized supplies needed for the care and long term preservation of objects.

### Conservation Resources International

5532 Port Royal Road  
Springfield, VA 22151  
Toll free: (800) 634-6932  
[www.conservationresources.com](http://www.conservationresources.com)  
*Archival housing/storage supplies, photographic supplies, general*

### Gaylord Archival

P. O. Box 4901  
Syracuse, NY 13221-4901  
Toll Free: (800) 448-6160  
[www.gaylord.com](http://www.gaylord.com)  
*General conservation supplies, housing supplies*

### Hollinger Metal Edge, Inc.

6340 Bandini Blvd  
Commerce, CA 90040  
Toll Free: (800)-862-2228  
[www.hollingermetaledge.com](http://www.hollingermetaledge.com)  
*Archival housing/storage supplies*

### Light Impressions

100 Carlson Road  
Rochester, NY 14610  
Toll Free: (800) 975-6429  
[www.lightimpressionsdirect.com](http://www.lightimpressionsdirect.com)  
*Photographic supplies, housing, matting and framing supplies*

### University Products

517 Main Street  
P. O. Box 101  
Holyoke, MA 01041  
Toll Free: (800) 628-1912  
[www.universityproducts.com](http://www.universityproducts.com)  
*General conservation supplies, housing and matting supplies*

### Talas

330 Morgan Ave  
Brooklyn, NY 11211  
Telephone: (212) 219-0770  
[www.talasonline.com](http://www.talasonline.com)  
*Conservation supplies, photographic supplies, general*

## Gerald R. Ford Conservation Center

1326 S 32 Street  
Omaha, NE 68105  
402-595-1180  
[nshs.grfcc@nebraska.gov](mailto:nshs.grfcc@nebraska.gov)



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Nebraska since 1878.