

Care of aluminum



table of contents

1 aluminum finishes

1. non-finished
1. anodized
2. chemical conversion
2. painted
2. porcelain enameled
2. plated
2. laminated

2 simple finish tests

3. simple finish tests

3 cleaning aluminum

5. common sense cleaning rules
6. cleaners and techniques
6. mild soaps and detergents and non-etching cleaners
6. solvent and emulsion cleaners
6. abrasive cleaners
7. etching cleaners
8. special cleaners

4 care and cleaning of aluminum products

9. architectural aluminum
9. pre-installation practices
9. on-site storage
9. installation care
9. protective coverings
10. when to insulate
11. care after installation
11. general cleaning tips
13. protection after cleaning
13. transportation equipment
13. automobiles
14. trucks, trailers and rail/rapid transit
15. in and around the home
17. mobile homes and recreational vehicles

5 pre-fabrication handling and storage

18. proper handling
18. mechanical damage
19. water-staining
19. storage
20. air-borne contamination
20. oiling and interleaving

reference tables

20. easy-reference to cleaners
21. list of cleaning products and protective coatings

The 2007, seventh edition has been revised through the support of the Technology Committee of the Sheet and Plate Division.

ALUMINUM ASSOCIATION SHEET AND PLATE DIVISION COMPANIES

Alcoa Inc.	JW Aluminum
Aleris Rolled Products	Kaiser Aluminum and Chemical Corporation
ALSCO Metals Corp.	Koenig & Vits, Inc.
AMAG Rolling GmbH	Logan Aluminum, Inc.
ARCO Aluminum, Inc.	Nichols Aluminum
Golden Aluminm	Novelis Inc.
Gulf Aluminium Rolling Mill Co.	Rio Tinto Alcan
Impol Aluminum Corp.	United Aluminum Corporation
Jupiter Aluminum Corporation	Wise Metals Group

About The Aluminum Association

The Aluminum Association, Inc. is the trade association for producers of primary aluminum, recyclers and semi-fabricated aluminum products, as well as suppliers to the industry. Based in Arlington, Virginia, with offices in Detroit, Michigan, the Association provides leadership to the industry through its programs and services which aim to enhance aluminum's position in a world of proliferating materials, increase its use as the "material of choice," remove impediments to its fullest use, and assist in achieving the industry's environmental, societal, and economic objectives. Member companies operate about 200 plants in the U.S and many conduct business worldwide.

NOTICE

Disclaimer

The use of any information contained herein by any member or non-member of The Aluminum Association is entirely voluntary. The Aluminum Association has used its best efforts in compiling the information contained in this book. While the Association believes that its compilation procedures are reliable, it does not warrant, either expressly or implied, the accuracy or completeness of this information. The Aluminum Association assumes no responsibility or liability for the use of the information herein.

All Aluminum Association published standards, data, specifications and other technical materials are reviewed and revised, reaffirmed or withdrawn. Users are advised to contact The Aluminum Association to ascertain whether the information in this publication has been superseded in the interim between publication and proposed use.



1525 Wilson Blvd.
Suite 600
Arlington, VA 22209
www.aluminum.org

Documents
Document Sharing Hub

table of contents

1 aluminum finishes

- 1. non-finished
- 1. anodized
- 2. chemical conversion
- 2. painted
- 2. porcelain enameled
- 2. plated
- 2. laminated

2 simple finish tests

- 3. simple finish tests

3 cleaning aluminum

- 5. common sense cleaning rules
- 6. cleaners and techniques
- 6. mild soaps and detergents and non-etching cleaners
- 6. solvent and emulsion cleaners
- 6. abrasive cleaners
- 7. etching cleaners
- 8. special cleaners

4 care and cleaning of aluminum products

- 9. architectural aluminum
- 9. pre-installation practices
- 9. on-site storage
- 9. installation care
- 9. protective coverings
- 10. when to insulate
- 11. care after installation
- 11. general cleaning tips
- 13. protection after cleaning
- 13. transportation equipment
- 13. automobiles
- 14. trucks, trailers and rail/rapid transit
- 15. in and around the home
- 17. mobile homes and recreational vehicles

5 pre-fabrication handling and storage

- 18. proper handling
- 18. mechanical damage
- 19. water-staining
- 19. storage
- 20. air-borne contamination
- 20. oiling and interleaving

reference tables

- 20. easy-reference to cleaners
- 21. list of cleaning products and protective coatings

SEVENTH EDITION, NOVEMBER 2007

The 2007, seventh edition has been revised through the support of the Technology Committee of the Sheet and Plate Division.

ALUMINUM ASSOCIATION SHEET AND PLATE DIVISION COMPANIES

Alcoa Inc.	JW Aluminum
Aleris Rolled Products	Kaiser Aluminum and Chemical Corporation
ALSCO Metals Corp.	Koenig & Vits, Inc.
AMAG Rolling GmbH	Logan Aluminum, Inc.
ARCO Aluminum, Inc.	Nichols Aluminum
Golden Aluminm	Novelis Inc.
Gulf Aluminium Rolling Mill Co.	Rio Tinto Alcan
Impol Aluminum Corp.	United Aluminum Corporation
Jupiter Aluminum Corporation	Wise Metals Group

About The Aluminum Association

The Aluminum Association, Inc. is the trade association for producers of primary aluminum, recyclers and semi-fabricated aluminum products, as well as suppliers to the industry. Based in Arlington, Virginia, with offices in Detroit, Michigan, the Association provides leadership to the industry through its programs and services which aim to enhance aluminum's position in a world of proliferating materials, increase its use as the "material of choice," remove impediments to its fullest use, and assist in achieving the industry's environmental, societal, and economic objectives. Member companies operate about 200 plants in the U.S and many conduct business worldwide.

NOTICE

Disclaimer

The use of any information contained herein by any member or non-member of The Aluminum Association is entirely voluntary. The Aluminum Association has used its best efforts in compiling the information contained in this book. While the Association believes that its compilation procedures are reliable, it does not warrant, either expressly or implied, the accuracy or completeness of this information. The Aluminum Association assumes no responsibility or liability for the use of the information herein.

All Aluminum Association published standards, data, specifications and other technical materials are reviewed and revised, reaffirmed or withdrawn. Users are advised to contact The Aluminum Association to ascertain whether the information in this publication has been superseded in the interim between publication and proposed use.



1525 Wilson Blvd.
Suite 600
Arlington, VA 22209
www.aluminum.org

www.aluminum.org/bookstore

titles and for easy, secure on-line purchase.

Aluminum 2002 - Proceedings of the TMS 2002 Annual Meeting: Automotive Alloys and Aluminum Sheet and Plate Rolling and Finishing Technology Symposia
SKU:TMS-2002-516199
Non-Mbr: \$112.00 / Mbr: \$79.00

Aluminum Press Forming Processes (Video)
SKU:AV-PFP-792606
Non-Mbr: \$100.00 / Mbr: \$50.00

Alumitech '97: Complete Proceedings CD-ROM (CLEARANCE)
SKU: AT97-CDROM-516178
Non-Mbr: \$10.00 / Mbr: \$10.00

Alumitech '97: Three Volume Set (CLEARANCE)
SKU: AT97-SET: Three-Volume Set
Non-Mbr: \$50.00 / Mbr: \$50.00

Alumitech '97: Volume II: Packaging/Sheet and Plate Continuous Casting (CLEARANCE)
SKU: AT97-Vol. II
Non-Mbr: \$20.00 / Mbr: \$20.00

Equipment for the Slitting Line (Video)
SKU:AV-ESL-792609
Non-Mbr: \$100.00 / Mbr: \$50.00

Guidelines for In-Plant Handling of Aluminum Plate, Flat Sheet and Coil, 2006
SKU: TR-7-792602
Non-Mbr: \$35.00 / Mbr: \$20.00

Guidelines for Minimizing Water Staining of Aluminum, 2004 (English)
SKU: TR-3-792601
Non-Mbr: \$35.00 / Mbr: \$20.00

Guidelines for Minimizing Water Staining of Aluminum, 2004 (Spanish)
SKU: TR-3SP-792601
Non-Mbr: \$20.00 / Mbr: \$10.00

Guidelines for Minimizing Water Staining of Aluminum, and Spanish editions)
SKU: TR-3SET-792601
Non-Mbr: \$45.00 / Mbr: \$25.00

Sheet (Video)
SKU:AV-LCTL-792611
Non-Mbr: \$100.00 / Mbr: \$50.00

Proceedings of the International Casting and Rolling Conference, 1999
SKU: ICRT-1-792625
Non-Mbr: \$20.00 / Mbr: \$20.00

Rolling Aluminum: (Video)
SKU:AV-RAMM-792617
Non-Mbr: \$170.00 / Mbr: \$115.00

Rolling Aluminum: 2007
SKU:RAFM-792618
Non-Mbr: \$140.00 / Mbr: \$70.00

Rolling T (CLEARANCE)
SKU: ATS-1 792624
Non-Mbr: \$10.00 / Mbr: \$10.00

Slitter Tooling and Set-Up (Video)
SKU:AV-STSU-792608
Non-Mbr: \$100.00 / Mbr: \$50.00

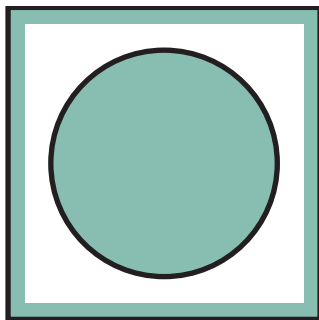
Theory and Techniques of Aluminum Coil Slitting (Video)
SKU:AV-TTACS-792607
Non-Mbr: \$100.00 / Mbr: \$50.00

Visual Quality Characteristics of Aluminum Sheet and Plate, 2002
SKU:QCA-1-792615
Non-Mbr: \$50.00 / Mbr: \$25.00

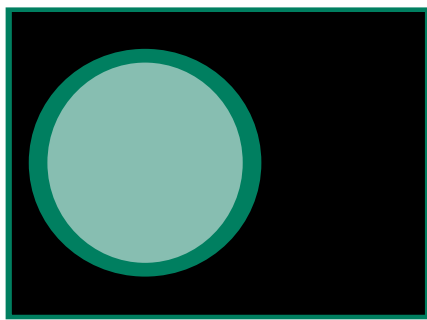
how to order

An Aluminum Association Pulbication and Audio Visual Price List can be ordered by calling: 301-645-0756.

Order any of The Aluminum Association publications by website 24 hours-a-day at www.aluminum.org. Member login required for member prices.



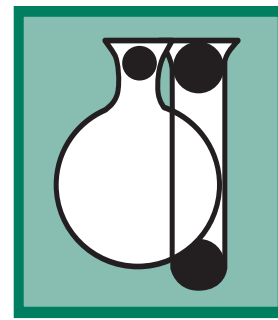
non-finished



anodized finishes



painted finishes



chemical conversion finishes

care of aluminum introduction

One of aluminum's most desirable attributes is its natural resistance to corrosion. When the bare metal is exposed to air, it readily combines with oxygen to form a tough, transparent, protective oxide coating. This oxide layer allows aluminum products to perform virtually "maintenance-free" in a wide variety of environments.

Aluminum can also be treated or "finished" in many ways. Painting, anodizing and plating with other metals can provide a variety of surface appearances and provide further protection to the base metal.

Apart from the purely aesthetic reasons for keeping aluminum surfaces clean, there are also practical reasons as well. In certain aggressive environments, especially those containing salt, excessive surface oxidation and pitting can occur. These can shorten service life of the aluminum by reducing its strength and promoting fatigue failures.

All the finishes, including the non-finished or bare, may be kept clean and bright with mild soap and water alone. However, if cleaning has been postponed for too long, and the dirt is especially tenacious, a more aggressive cleaner and cleaning technique may be required.

This publication will provide insight into the proper methods and materials to be used to maintain the various finishes of aluminum products — from architectural to transportation, from industrial to home and recreational products. Sections include:

- tips to help identify surface finishes
- properties of various types of cleaners
- step-by-step care and cleaning procedures for a variety of aluminum products
- proper handling and storage techniques for aluminum products
- a comprehensive list of commercially available cleaning products and their producers

1 aluminum finishes

Aluminum is available commercially in at least seven different finishes, each with its own characteristics. Aluminum care and cleaning programs must, therefore, be tailored to the metal's finish as well as to the needs and conditions of service.

non-finished

Non-finished (bare) surface is simply the metal's own, self-produced oxide layer. It is thin but tough, transparent, tenacious and protective. Bare finishes vary in appearance depending on fabrication technique. The texture may be smooth and mirror-like, similar to satin or embossed with stucco, woodgrained or other patterns.

With time, the unfinished surface may darken and discolor. Near the sea it tends to turn gray. In cities and near factories it tends to turn brown or black.

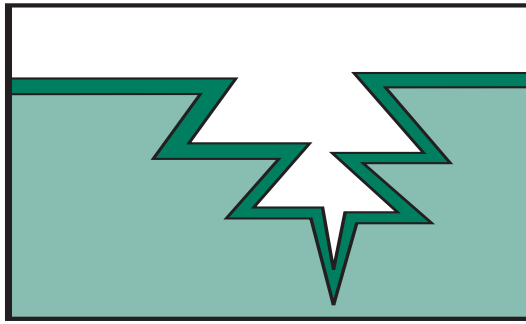
anodized finishes

Anodized finishes are extra-thick oxide coatings produced by electrochemical treatment. The thickness of the anodic layer can be varied from 0.05 to 1.5 mils (0.0013-0.038 mm).

The anodic layer may be transparent or integrally colored; in both



porcelain enameled finishes



plated finishes



laminated finishes

cases the metal's natural luster will be visible. Or the anodic layer may be pigmented, dyed or impregnated with a lubricant, a wax or both.

Anodizing substantially improves aluminum's resistance to weathering. When anodized aluminum is to be used architecturally, it is sometimes given a clear organic coating for protection against alkaline building products during construction and to facilitate cleaning afterwards. Anodic layers — due to their aluminum oxide/hydroxide chemical composition — may also be tailored to enhance wear and abrasion resistance.

chemical conversion finishes

Chemical conversion finishes are coatings generally created by chemical means alone. They are thinner and less abrasion resistant than anodic coatings. Most often they are used as a base for paint. Occasionally, conversion coatings are used as final surfaces for products and utilitarian structures. Conversion coating may be clear or colored gold, gray, golden brown, green or blue-green.

paints finishes

Painted finishes are organic coatings of various kinds applied to the surface of aluminum.

In the plant, paint is applied over conversion coatings. In the field, paint or clear organic coating (lacquer) may be applied to any weathered aluminum surface or to a clean and grease-free aluminum surface after it has been roughened mechanically or chemically, or treated with suitable wash primers.

porcelain enameled finishes

Porcelain enameled finishes are ceramic coatings which have been fired permanently onto the surface of the aluminum. Porcelain finishes are very hard, impervious to soils and many acids and alkalis. These finishes come in many colors, with smooth or textured surfaces.

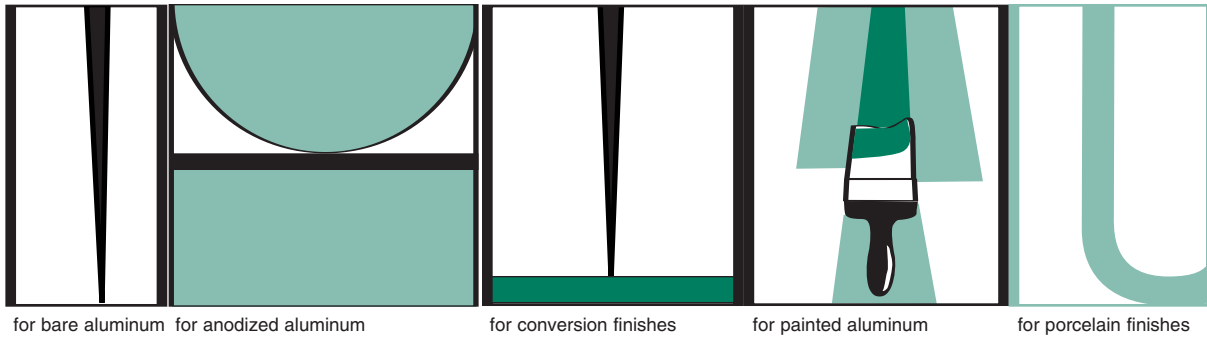
plated finishes

Plated finishes are produced by electrodepositing one or more different metals on aluminum. Nickel, chromium, copper, tin, silver and gold are often used. Sometimes the plated metal is deposited directly onto the aluminum, and sometimes an intermediate metal is used.

laminates finishes

Laminate finishes are produced by bonding a thin layer of other metals, wood, cloth, plastic or a combination of these materials (and possibly others) to the surface of aluminum. The care and cleaning required by the laminate surface is that required by the facing material. As there are different laminates in use, cleaning procedures cannot be described here but must be found by careful testing and consultation with the manufacturer.

Aluminum finishes are usually designated by a system of letters and digits devised by The Aluminum Association and used throughout the industry. A full description of this system may be found in "Designation System for Aluminum Finishes", published by The Association.



2

simple finish tests

simple finish tests

The following tests are suggested as guides for determining the type of finish employed on aluminum. It should be kept in mind that test results can be misleading. The use of a pocket magnifier can help in identifying the finish. The tests should be performed on a small area or in an area not of esthetic concern. Consultation with the supplier is the most reliable method of determining the finish.

for bare aluminum

A steel needle or similar pointed tool is used to prick the metal's surface. If the metal is easily marked and the scratch is no broader than the tool's point, the aluminum is "bare". If the metal is rubbed with a rubber eraser, the metal may lighten in color and the eraser may darken.

If the surface is rubbed with a hard eraser, bare aluminum is often scratched by rubber fillers, while anodized aluminum is perhaps brightened due to cleaning but is not scratched.

for anodized aluminum

If a clean surface is rubbed with an eraser and neither the color of the metal nor the color of the eraser

changes, the aluminum has been anodized. If either changes, the aluminum is bare.

If the eraser test is not conclusive, as it may not be on perfectly clean and bright, bare aluminum, the needle test may be used. Aluminum oxide is hard and glassy. Considerable force will be necessary to penetrate it. The scratch will be wider than the needle's point, and the sound of the scratch being made will be audible. Anodized aluminum is sometimes given a clear organic coating. This can be detected with a needle or by scratching a small area with a knife-edge.

for conversion coatings

The eraser test should show no change. Penetration by needle point should not be too difficult. Scratch marks will be somewhat broader than the tool's point. Some inorganic chrome conversion coatings can be detected by exposing one side of a thin sheet to hot flame, and observing whether a very dark thin residue forms on the opposite side.

for painted aluminum

All paint, even the hardest baked on paints, is soft compared to metallic and anodized surfaces. Paints have a plastic, gum-like texture. This can be detected with a needle point.

Paints can also be detected destructively by exposing the surface to flame, and seeing if thick charred paint ash develops.

for porcelain finishes

These finishes will resist penetration by needle point almost to the breaking of the needle itself. These finishes are very hard.

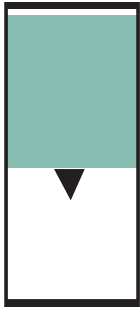
for plated finishes

Gold and silver are soft metals and easily scratched; a deep scratch will reveal the pale gray of the base aluminum, as the precious metal plating is usually very thin.

Platings of other metals can often be identified by their non-aluminum color. They also may be harder to penetrate and thicker than gold and silver, but fine slivers can sometimes be removed with a sharp tool. This cannot be done with any of the other finishes except some brittle paints.

Chromium plating can be identified by its hardness and silvery brilliance. Chromium plating tends to be porous and when not maintained, oxygen enters the pores and produces gray specks.

Careful observation of the luster can often help differentiate among the common plating metals: silver is very white unless tarnishing black,

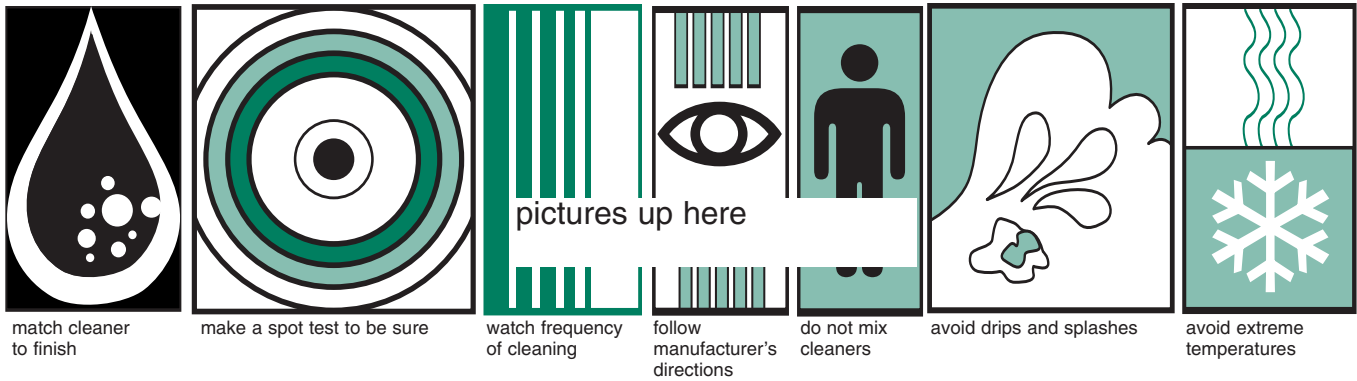


for plated finishes

chromium has a bluish cast compared to aluminum or silver, and nickel has a dark or blackish cast compared to aluminum or silver, even though nickel is usually shiny. Comparison with known samples for color will help the beginner. Spot tests from inorganic chemistry texts can help identify specific metals.

general tests

If available, the use of thickness measurement equipment, such as eddy current testers, can be used to detect the presence or absence of a wide range of thicker coatings. These include anodizing, paint, porcelain, and metal plating, which are often over 0.1 mils (0.0025 mm) thick. If the device is "zeroed" onto bare aluminum and tests of the unknown sample demonstrate a significant thickness, then there is a thicker coating of some type present, although the exact identity and thickness remains unknown without other tests. Conversion coatings are often less than 0.1 mil (0.0025 mm) thick and might not be detected this way.



3

cleaning aluminum

a. common sense cleaning rules

Caution: Because some cleaning materials can be hazardous to human health, the safety recommendations of the cleaner manufacturer should be followed.

match cleaner to finish

Mild soap and warm water may be safely applied to any of the aluminum finishes. But steel wool, strong acids and abrasive cleaners should never be applied indiscriminately; though in their place strong cleaners, used correctly, are highly effective.

make a spot test to be sure

The few moments invested in testing a cleaner on an unobtrusive portion of the finish is good insurance against a major disappointment. Use the same concentration and technique planned for the entire job. Let the cleaner remain in place for the same time. Let it dry and inspect for stains. Test lacquered and painted finishes for softening and possible dissolution.

watch cleaning frequency

Where optimum appearance is desired and frequent cleaning is necessary, use mild cleaners. Abrasive cleaners can wear away the hardest finish.

follow manufacturer's directions

Cleaners should not be applied indiscriminately. Varying concentrations and temperatures or extending the time to which the finish is exposed to the cleaning agent, all in an effort to speed cleaning, may produce disastrous results.

do not mix cleaners

The resultant mixture may be harmful to aluminum finishes and hazardous to the user's health.

avoid drips and splashes

Cleaners harmless to some materials may damage other materials upon contact. Remove run-downs as quickly as possible.

do not vary cleaner concentration

In most instances, increasing or decreasing cleaner concentration from that recommended by the manufacturer leads to highly unsatisfactory results.

avoid extreme temperatures

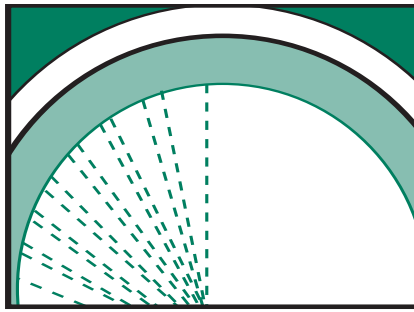
Heat accelerates chemical reactions. The cleaner may become overly active, or its solvent may evaporate before the job is done. In either event the metal may be streaked or stained. On the other hand, cleaning should not be conducted at very low temperatures. Low temperature reduces chemical activity, possibly stopping the action of the cleaning agent entirely. For best results, outdoor cleaning should be conducted on mild, cloudy days or in the shade.

watch the clock

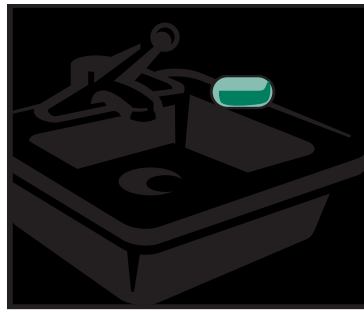
Cleaner-product contact time should not be estimated but carefully timed. The manufacturer's directions should be closely followed and prolonged contact avoided.



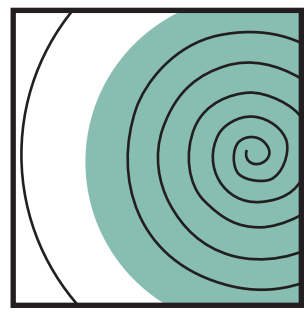
watch the clock



remove cleaner thoroughly



mild soaps and detergents
and non-etching cleaners



solvent and emulsion cleaners

remove cleaner thoroughly

Water-based cleaners should be rinsed with clear water, after which the part or area is permitted to dry or is wiped dry. Cleaners containing wax, oil or silicones are removed with a dry cloth. Traces of cleaner should not be left in cracks and corners.

b. cleaners and techniques

Aluminum cleaners are arbitrarily divided into five groups. See product list on pages 21 to 23.

- Mild soaps and detergents and non-etching cleaners
- Solvent and emulsion cleaners
- Abrasive cleaners
- Etching cleaners
- Special duty cleaners

mild soaps and detergents and non-etching cleaners

Mild soaps and detergents and non-etching cleaners that can be applied with bare hands may be used for cleaning aluminum finishes. Detergents too strong for the hands, such as some automatic dishwasher detergents, should be spot tested first. Some of these can bleach paint and discolor bare and anodized aluminum.

Non-etching cleaners are alkali-

line- or acid-based formulations mixed with inhibitors, which permit the cleaners to remove soil without attacking the metal or its finish. The nature of these chemicals, their strengths and the time they should remain on the work, vary from cleaner to cleaner. Some mixtures may irritate the skin on contact. Rubber gloves or a long-handled fiber brush should be used. After cleaning, the aluminum should be thoroughly washed with clean water and dried. They are most effective against grease and oil based stains.

solvent and emulsion cleaners

While generally mild in their action, solvent and emulsion cleaners are more effective on certain stains and soils than cleaners in the first group. Solvent and emulsion cleaners may be used without difficulty on bare, anodized, conversion coated and porcelainized aluminum. When used on painted (and lacquered) finishes, solvent and emulsion cleaners should be spot tested first. The wrong solvent or solvent containing emulsion can remove many of the paints and clear organic coatings (lacquers) used with aluminum.

Both mild cleaners and the solvent-emulsion cleaners will remove dirt and some stains. They will not, however, restore the appearance of aluminum that has weathered, nor

remove heavy grime encrustation. For these conditions a more aggressive cleaner is required. Note that some solvent cleaners are flammable and/or give off fumes, which must be ventilated safely.

abrasive cleaners

Abrasive cleaners will restore weathered aluminum and remove most stains and grime. These cleaners are sold under various generic descriptions including polish, cleaner, cleaner-polish, wax-cleaner, wax-polish, metal brightener, scouring powder and the like. Their effectiveness on various soils and darkened aluminum depends on their formulation and vigor of application.

Abrasive cleaners contain abrasives to which water, oil, wax, silicones, soap, or an acid or alkali may be added, either singly or in combination. The abrasives cut away the dirt and surface oxidation; the soaps, acids and/or alkalis clean the surface. Traces of the wax, oil or silicones remain behind after the compound has been applied and removed. They provide luster and a small measure of surface protection.

Abrasive cleaners containing fine grit or polishing agents may be used with care on all aluminum finishes. Care is necessary because even the finest polishing agent is an abrasive, and prolonged rubbing may, in time, dull a bright specular finish or cut