Process Bulletin

3000-A – Solid Film Lubricants & Engineered Coatings

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RECOMMENDED APPLICATION PROCEDURE FOR SOLID FILM LUBRICANTS & COATINGS

Before beginning application, it is important to understand that solid film lubricants and other engineered coatings should be viewed as a system, taking into account the base material, surface pretreatment, method of application and correct cure cycle. Eighty percent of all solid film lubricant failures are due to incorrect surface pretreatment and application. The rest are generally because the wrong coating was chosen.

SELECT PRETREATMENT ACCORDING TO BASE METAL

GENERAL CONSIDERATIONS

Soft metals such as aluminum, copper, and magnesium should only be grit blasted to remove oxides and impart the degrees of roughness necessary for good adhesion of the coating. 16 to 32 micro-inch roughness is generally ideal. Too much pressure in grit blasting could cause grit particles to imbed in the metal surface, although high pressure grit blast is acceptable on steel and titanium. Before beginning, adequately mask any areas to remain uncoated. Never touch pretreated parts with bare hands; always wear white cotton gloves

FOR ALUMINUM

Vapor degrease the surfaces to be coated with perchloroethylene or other suitable solvent, depending upon local environmental restrictions. Continue with one of the following:

- Anodize per MIL-A-8625.
- Grit blast and/or chromate conversion coat per MIL-C-5541.

FOR COPPER

Vapor degrease as for aluminum. Grit blast and follow with chromate conversion coat per MIL-C-5541

FOR MAGNESIUM

Vapor degrease as for aluminum. Follow with one of these procedures:

- Dichromate per AMS-M-3171, Type III.
- Anodize per ASTM D-1732
- Grit blast

FOR STEEL (EXCEPT STAINLESS)

Degrease as for aluminum. Grit blast, or grit blast and phosphate per MIL-PRF-16232 or TT-C-490. Phosphate coating, although not mandatory, will enhance wear life and corrosion resistance and is highly recommended.

FOR STAINLESS STEEL

Vapor degrease as for aluminum. Grit blast and passivate per MIL-S-5002 as per AMS-QQ-P-35.

FOR TITANIUM

Alkaline clean surfaces to be coated. Then grit blast and titanium anodize or apply a phosphate fluoride conversion coating.

Coating should be applied as soon as possible after surface preparation. If a delay of more than 8 hours is necessary, parts should be cleaned and degreased before coating

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PREPARE THE COATING MIXTURE

- Mix the coating thoroughly. For solvent-based coatings, we recommend an Indco air mixer with a low shear blade such as a Jiffy brand. (If you have had the coating compound in storage for some time and the solids have settled into a mass, a high shear blade may be necessary to achieve a complete suspension, although a high shear blade should never be used with coatings containing copper.) For water-based coatings, mix by stirring only…agitating will cause unwanted air bubbles.

- If you purchased your coating in the read-to-apply condition, no further preparation is necessary. For concentrate, thin using the solvent and dilution ratio recommended on the individual Technical Data Sheet. If a mixture of two different solvents is required, always pre-blend the solvents before introduction into the coating material

APPLYING THE COATING

You will get the best results using the spray method, although dip, brush, or automatic application are acceptable, depending upon the configuration and quantity of parts to be coated.

For spraying, we recommend any conventional, Airatomized spray gun which utilizes a 0.040"-0.070" (1.02-1.78mm) fluid nozzle. An atomizing air pressure of 25-35 pounds is suggested. A spray booth with exhaust fan is mandatory. Observe all the usual precautions for handling laquers and paints: full ventilation, organic respirator masks, and avoid skin contact, flames, and any other ignition sources.

Pressure pot systems may be used, however we recommend the following: keep the coating under constant agitation, minimize the length of the hoses to reduce the chance of pigment settling, and always clear the lines when the equipment is not going to be used for a lengthy period of time (i.e. breaks, lunch, or unexpected down time.

We recommend you apply several very thin, uniform coats, allowing each to dry to the touch before applying the next.

A Special Note For Water Base Coatings. For specific information on the application of low VOC coatings, see E/M application bulletins 3001-A and 3002

FOR THERMALLY CURED COATINGS

- Allow coated parts to air dry to the touch, approximately 30 minutes, depending upon atmospheric conditions.
- Remove any masking materials
- Refer to the individual Technical Data Sheet for the correct cure time and temperature.
- Cure in a pre-heated, air-circulating, vented convection oven with an accurate temperature control. Be sure the substrate of all parts is at full temperature for the entire cure cycle. (A thermocouple attached to the part surface will indicate the beginning of the timed cure cycle.)
- Cool parts completely before testing.

FOR AIR DRYING COATINGS

Follow all pretreatment and application procedures described for the heat curing products. Then follow the air drying cure cycle shown on the Technical Data Sheet for each individual coating. With most air drying products, the cure cycle can be accelerated by oven baking at a low temperature. Again, refer to the Technical Data Sheet for detailed information.

INSPECTION AND TESTING

Visually check the parts for a smooth, even finish. The coating should have uniform color, smoothness and thickness, and be free of cracks, scratches, pin holes, blisters, runs, sags, foreign matter, separation of ingredients, and any other surface imperfections.

For solid film lubricants, a glossy, lacquer-like appearance indicates improper mixing of the coating material. A brownish color may be an indicator that the cure temperature was too high. A grainy, rough surface is the result of too-dry spray and will result in poor adhesion and wear.

Perform a tape test to check for adhesion. Place a strip of adhesive tape (per ASTM D-5486 or equivalent), not more than 12 months old, firmly on an area of your coated part, then remove it in one sharp pull. A uniform deposit of powdery material clinging to the tape is not cause for rejection. However, any lifting of the coating that exposes the base or pretreatment material is cause for rejection.

We do not recommend touch up on problem areas. Rejected parts should be stripped and reworked

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STRIPPING

To strip the coating, use one of these methods.

- Walnut shell (or equivalent) blast has a light abrasive action, which may remove the coating with minimum risk of disturbing the base of pretreatment material.
- Immersion for one minute in a boiling 20% chromic acid solution. This method will also remove cadmium plating, anodizing, and some other pretreatment. Use extreme caution with this very hazardous material. DO NOT use with copper.
- High phenolic-bodied paint strippers, designed for epoxy-type finishes, are sometimes used successfully if the immersion time is extended.
- Grit blasting, use with care.

ENGINEERING AND DESIGN SUGGESTIONS

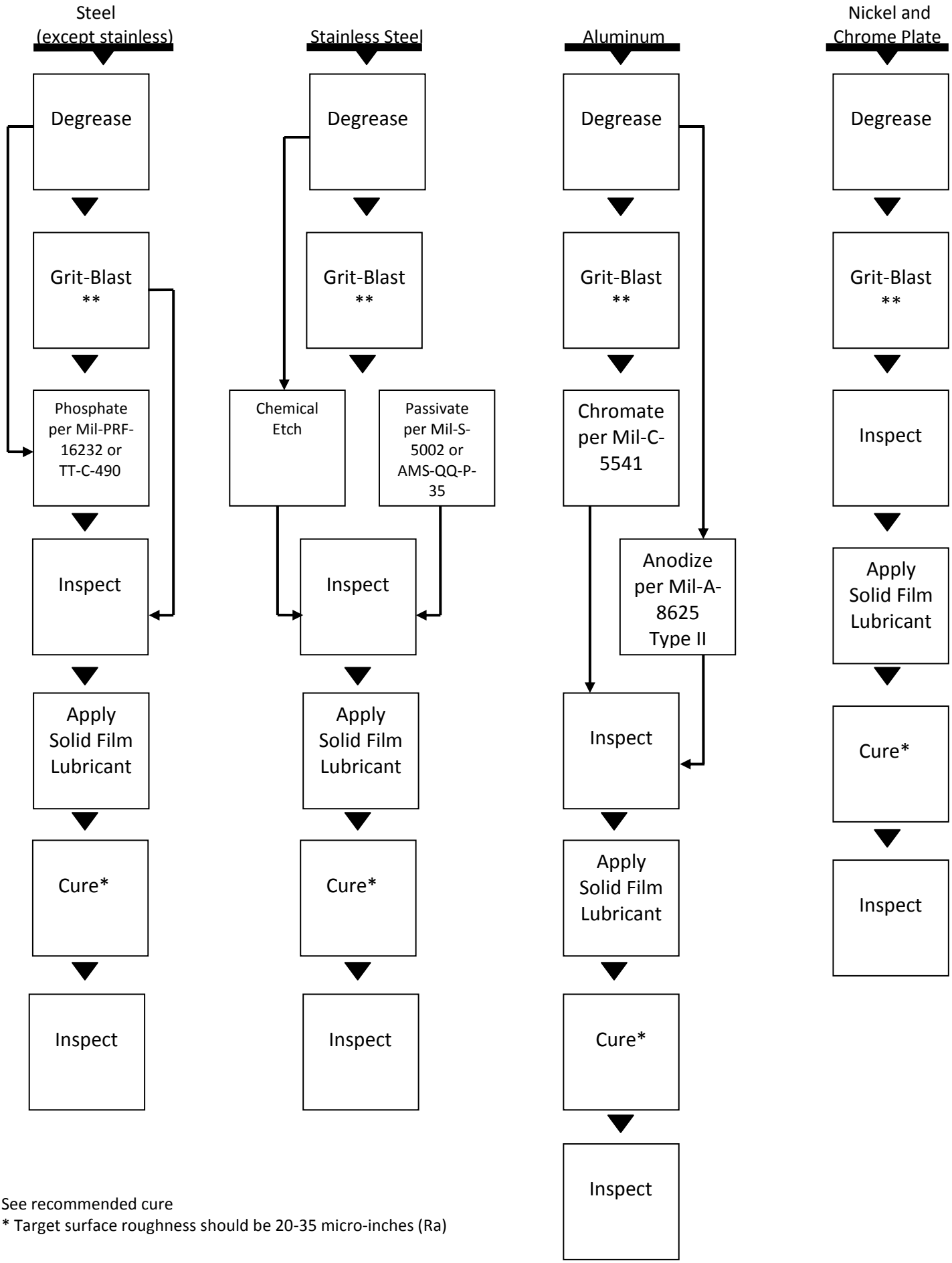
If it is necessary to apply a solid film lubricant to only one surface in a hard/soft bearing system, applying it to the softer material will extend the life of the system. However, the harder a substrate material, the more effectively the lubricant will perform.

In general, the coefficient of friction will be slightly higher if both mating surfaces are coated than if only one surface is coated. However, wear life will increase if both surfaces are coated.

In either of these situations, the user should determine which is more important…longer wear or more effective lubrication.

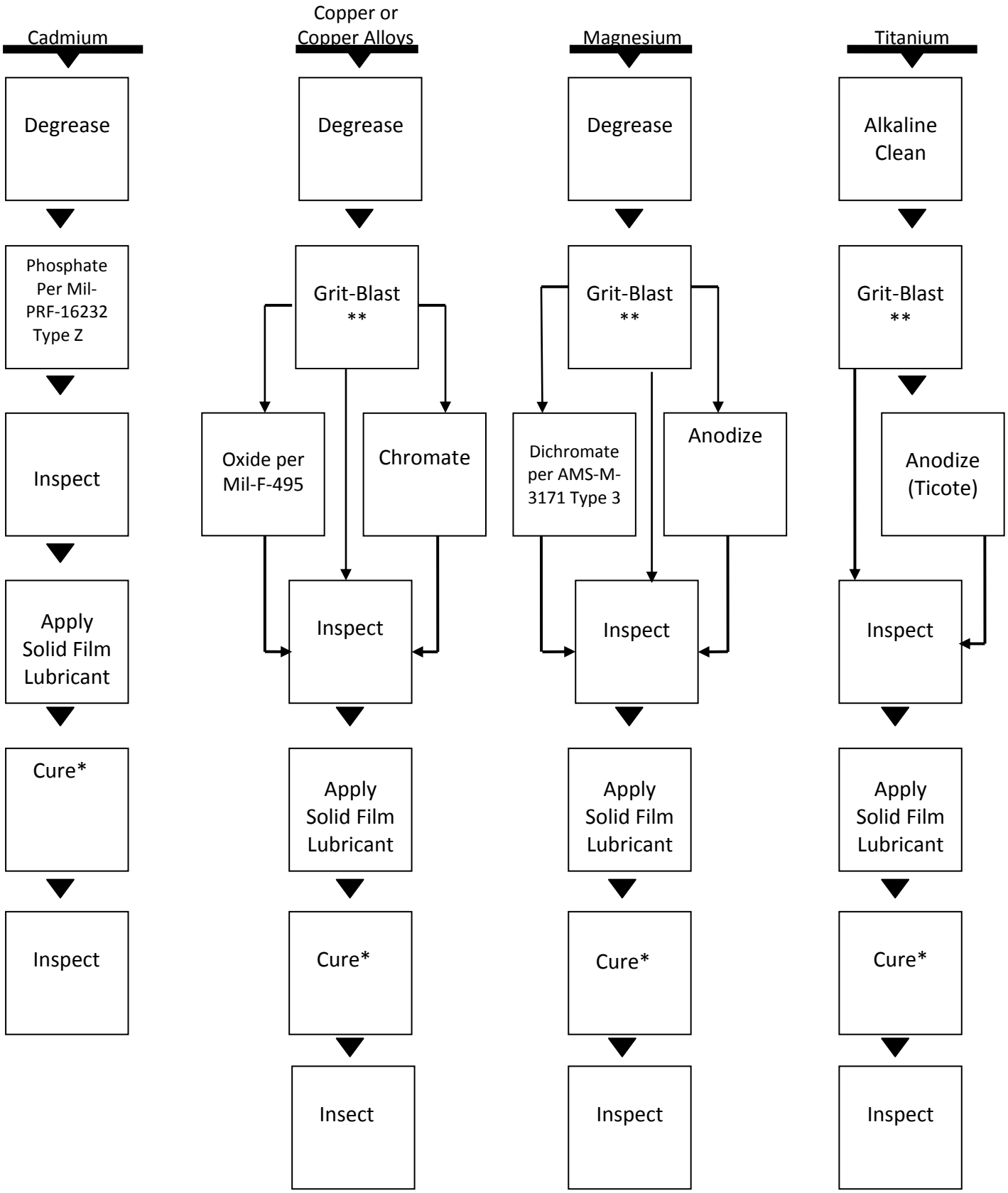
The recommended operating thickness of most E/M solid film lubricants and most other coatings is from 0.0002 to 0.0005 inch thick. (Refer to the individual Technical Data Sheet for each product to be sure of the correct coating thickness.) Such a thin film seldom requires alteration of established clearance between moving parts, except possibly on very small, fine parts which normally operate with very little clearance. In that case, because the cured coating is relatively soft, any interference produced by the thickness of the coating will cause rapid wear (burnishing) of the film to the point where interference is eliminated. Such burnishing may also be done mechanically by using 000 or XXX steel wool or soft (white) Scotch Brite pads.

Application Procedure at a Glance



*See recommended cure

** Target surface roughness should be 20-35 micro-inches (Ra)



Everlube Products recommended process procedure

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