PREPARATION OF SURFACES FOR ADHESIVE BONDING

A clean, dry surface is a necessary prerequisite for adhesive bonding; and adhesives will either stick to the surface to which a bond is desired or to a film of extraneous material directly on that surface. Rarely can a structural adhesive penetrate through surface contaminants to provide an optimum bond on an unclean surface.

Porous materials are simple to bond to, providing they are dry. The surface should be sanded till clean and free from dust. Non-porous surfaces, as found on metal and plastic materials, should be degreased, dried, and roughened by sanding, sandblasting or chemical etching, the etching being required for certain surfaces.

In order to avoid contamination of these surfaces proper care must be taken prior to bonding. Handlers should wear clean cotton gloves to prevent body oils from contaminating the clean surfaces. Contamination can be caused by a fingerprint, not perfectly clean clothing, or through the use of sub-standard degreasing or chemical solutions.

For best results, surfaces can be prepared by three pretreatment procedures, which are listed by increasing effectiveness.

1. Degrease only.
2. Degrease, abrade, and degrease again.
3. Degrease and chemically pretreat.

Degrease, Abrade, and Chemical Pretreatment:
An optimum bonding surface is perfectly clean, free of oil and grease. Degreasing should be performed even when the bonding surface appears clean.

1. Suspend piece(s) in trichloroethylene or wipe bonding surfaces with clean cloth saturated with trichloroethylene. Allow piece(s) to thoroughly dry.
2. Abrade surface to allow for greater adhesion. Implements for abrading; sandblaster, wire brush, emery cloth, and or glass paper. Metal surfaces (Use grade 80-150 abrasives for steel and materials resistant to scoring. Use grade 300-600 abrasives for light alloys and less resistant materials). Painted surfaces should be stripped prior to pretreatment for better adhesion.
3. For maximum strength a chemical or electrolytic pretreatment is required.

Note: Bonding of surfaces should be done as soon as possible upon completion of any pretreatment procedure.

Follow the procedures listed below, wherever practical:

Acrylic Glass (Plexiglas, Perspex, Resartglas).

1. Degrease (detergent solution).
2. Abrade (emery cloth).
3. Remove dust with dry-air (or non-clouding solvent).

Aluminum and Aluminum Alloys

1. Degrease with trichloroethylene.
2. Dip in the following solution for ten minutes (for certain alloys, such as No. 360 only one to three minutes is required):

3 parts	sodium dichromate
10 parts	96% sulfuric acid
20 parts	water

   (Be careful to dissolve sodium dichromate in the water, then add the sulfuric acid slowly).
3. Rinse in ambient tap water.
4. Rinse in hot (150-170°F.) distilled water.
5. Air dry.

Cadmium
1. Degrease with trichloroethylene.
2. Abrade with emery cloth or sandblast.
3. Degrease.

Cast Iron
1. Degrease with trichloroethylene.
2. Abrade surface (sandblast or emery cloth).
3. Degrease.

Concrete
1. Remove 3mm of surface to be bonded by mechanical scarification or 1.5mm sandblast.
2. Remove dust particles (preferably by vacuum cleaner).

Copper, Brass and other Copper Alloy
1. Degrease with trichloroethylene.
2. Dip in a solution consisting of 6 parts ferric chloride, 30 parts concentrated nitric acid and 200 parts water. (Dissolve the ferric chloride in the water, add the nitric acid slowly). OR Dip in a 25% aqueous solution of ammonium persulfate for 1-2 minutes.
3. Rinse with distilled water and dry.

Epoxy Resin Mouldings and Castings
1. Remove release agent with solvent.
2. Abrade surface (emery cloth).
3. Degrease.

Ferrous Alloys other than Stainless
1. Degrease with trichloroethylene.
2. Sandblast, sand (100 grit) or etch in 15% aqueous hydrochloric acid (equal parts concentrated muriatic acid and water) for 10 minutes. Etched surfaces should be rinsed immediately and dried with hot air. Freshly sandblasted or etched steel begins to rust immediately; therefore, adhesive should be applied as soon as the surface has been prepared.

Foam Plastics (polystyrene and polyurethane)
1. Sand lightly to remove any release agent or residue.
2. Clean surface (do not use solvents).

Graphite and carbon
1. Degrease with trichloroethylene.
2. Abrade with fine emery cloth.
3. Degrease.

Leather
1. Degrease.
2. Rough with glass paper.
3. Degrease.

Magnesium and Magnesium Alloys
1. Degrease with trichloroethylene.
2. Abrade with emery cloth.
3. Degrease.

Plaster
1. Allow surface to dry.
2. Sand surface and remove dust.

Polar Thermoplastics (Nylon, ABS, Polycarbonate, Acrylate).
1. Degrease with acetone, methyl ethyl ketone or trichloroethylene.
2. Mechanically abrade.
3. Degrease.

Polyester Resins
1. Degrease
2. Abrade with emery cloth or steel wool.
3. Degrease with acetone or methyl ethyl ketone.

Precious Metals
1. Degrease.
2. Abrade with fine emery cloth (optional for tarnished metals).
3. Degrease.

Precious Stones
1. Degrease.

Rubber
1. Adhesion is considerably improved using a chlorination treatment.
2. Make a solution by volume as follows: 100 parts water; 3 parts Clorox (5 ¼% sodium hypochlorite); ½ part concentrated hydrochloric acid.
3. Immerse rubber in solution for 1-3 minutes, rinse and dry. Use only fresh solution.

Polyethylene, Polypropylene.
1. Degrease with trichloroethylene.
2. Oxidize by immersing a solution consisting of 7 parts sodium dichromate, 10 parts water and 150 parts concentrated surfuric acid for 10-15 minutes.
3. Rinse with hot distilled water.
4. Dry and coat with adhesive immediately.

Stainless Steel, Chromium
1. Degrease with trichloroethylene.
2. Etch with concentrated hydrochloric or muriatic acid for 15 minutes at room temperature or with a solution consisting of 90 parts water, 40 parts 96% sulfuric acid, and 0.2 parts Nacconol NR (National Aniline) for 10 minutes at 150° F. followed by 10 minutes at room temperature in a solution consisting of 90 parts water, 15 parts 70% nitric acid, and 2 parts 48% hydrofluoric acid.
3. Rinse in hot distilled water and dry with hot air.

Stone, Ceramics, Glass
1. Degrease with trichloroethylene.
2. Wire brush (stone), sandblast.
3. Rinse with water and dry.

Teflon
1. Degrease with chlorine free solvents.
2. Etch with sodium solution.
3. Rinse and dry.

Thermoset Plastics (Epoxies, Polyurethane, Polyester, Melamine, Phenolic, PVC).
1. Degrease with acetone, methyl ethyl ketone or trichloroethylene.
2. Mechanically abrade (sandblast).
3. Degrease.

Titanium
1. Degrease with trichloroethylene.
2. Mechanically abrade (emery cloth or steel wool).
3. Degrease.

Tungsten and Tungsten Carbide
1. Degrease with trichloroethylene.
2. Mechanically abrade (emery cloth or grit-blast).
3. Degrease.

Wood
1. Sand until clean. Ensure wood is dry (moisture content not higher than 8-12%).
2. Wipe surface with solvent. (Wood free of grease requires no pretreatment).

Wrought iron and mild steel

1. Degrease with trichloroethylene.
2. Mechanically abrade (sand-blast or emery cloth).
3. Degrease.

Zinc, Lead, Nickel and Tin

1. Degrease.
2. Mechanically abrade (sandblast).
3. Degrease.

ADHESIVE RECOMMENDATIONS (Based on surface to which it is applied).

Wood, Metal and Ceramic Surfaces:	Smooth-On MT-13, Super-Instant Epoxy, EA-40, Metalset A4.
Thermoset Plastics:	Smooth-On MT-13, Metalset A4.
Thermoplastics:	
Acrylonitrile butadiene styrene (ABS):	Smooth-On EA-40, MT-13, Super Instant Epoxy.
PVC (Rigid):	Smooth-On MT-13.
Cellulose Acetate Butyrate:	Smooth-On EA-40.
High-Impact Styrene:	Smooth-On MT-13.
Polypropylene:	Smooth-On MT-13, Super Instant Epoxy, EA-40.
Teflon:	Smooth-On MT-13, Smooth-On EA-40.

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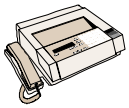

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