



Walter G. LEGGE Co., Inc.

444 Central Ave., Peekskill, NY 10566
Tel. # 800-345-3443 fax 800-332-2636
email address: info@leggesystems.com
website: www.leggesystems.com

PROPER METAL SURFACE PREPARATION

Steel Structures Painting Council

No coating, no matter how effective, is any better than the surface over which it is applied. Good surface preparation is an investment that will be repaid handsomely through achieving longer life and a superior, overall appearance of coatings. Prepare the surface by the method suitable for exposure and service. Surfaces are to be properly prepared as outlined on the data sheet of the appropriate recommended primer. Always clean off any contamination between coats prior to applying subsequent topcoats.

IMPORTANT: All blast cleaned or pickled steel must be primed within eight hours after blasting or before visible rusting occurs.

METAL SURFACES: The first step is to remove all visible deposits of surface dirt, grease and oil in accordance with Solvent Clean SP-1. Otherwise, these agents may be driven into the pores of the material by subsequent surface preparation. Appropriate solvents should be used where necessary and the surface thoroughly cleaned.

Common contaminants found on metal surfaces are rust, mill scale, weld spatter, chemicals or old coatings. Round off all rough welds and sharp edges, remove weld spatter.

All steel surfaces shall be prepared in strict accordance with the Steel Structures Painting Council specifications on surface preparation and the job specifications.

Solvent Cleaning: Solvent Cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds and other soluble contaminants from steel surfaces.

Hand Tool Cleaning: Hand Tool Cleaning removes all loose mill scale, loose rust, loose paint and other loose detrimental foreign matter.

Power Tool Cleaning: Power Tool Cleaning removes all loose mill scale, loose rust, loose paint and other loose detrimental foreign matter.

White Metal Blast Cleaning: White Metal Blast Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust and

paint.

Commercial Blast Cleaning: Commercial Blast Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust and paint. Generally, evenly dispersed very light shadows, streaks and discolorations caused by stains of rust, stains of mill scale, and stains of previously applied paint may remain on no more than 33% of the surface. Slight residue of rust and paint may also be left in the craters of pits if the original surface is pitted.

Brush-off Blast Cleaning: Brush-off Blast Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust and loose paint. Tightly adherent mill scale, rust and paint may remain on the surface.

Near-White Blast Cleaning: Near-White Blast Cleaning is a method of preparing steel surfaces which, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust and paint. Generally, evenly dispersed very light shadows, streaks and discolorations caused by stains of rust, stains of mill scale, and stains of preciously applied paint may remain on no more than 5% of the surface.

SURFACE PREPARATION OF CONCRETE AND MASONRY

GENERAL SURFACE CONDITION

It is essential that concrete and masonry surfaces be clean and properly prepared at time of painting. Grease, dirt and all foreign matter must be removed for the proper adhesion of a coating system. If very smooth surfaces are involved (such as produced by steel troweling or steel forms), they should be roughened slightly to obtain a suitable surface condition for proper paint adhesion.

New concrete must age at least 60 days prior to coating. Form release agents, curing compounds, salts, hardeners, sealers and other surface contaminants such as dirt, dust, grease and oils will interfere with proper coating adhesion and must be removed and surface correctly prepared by mechanical abrasion, abrasive blast or acid etching.

FORM OILS

It is important that wax type and oil type form lubricants that adhere to the concrete be avoided. These will prevent proper bonding of the paint or coating to the concrete substrate.

LAITANCE

This condition accounts for premature failure of paint and coatings on concrete. Laitance is a cement residue made up of very fine cementitious particles that float to the surface of green concrete - particularly in the case of troweled or floated surfaces such as floors. If painted over, peeling likely will occur - with the underside of the film exhibiting a dry chalky powder. Laitance must be removed by etching or sweep blasting.

CURING MEMBRANES

Curing membranes should be eliminated from the concrete surface with a cleaning agent applied with a power scrubber. The cleaner should be allowed to soak into the surface for 30 minutes or more; the floor should be flooded with a mixture of detergent and water and scrubbed, and then dried thoroughly and checked for residue. After the floor is scrubbed a second time with clean water, it should be allowed to dry thoroughly. It should be checked again for moisture content and residue before coating is applied.

CURING TIME

Green concrete should not be painted as a general rule. Because of the chemical changes and hardening process that occur during the drying and curing of concrete, it is advisable to wait 2 months prior to painting.

ALKALINITY

The high content of calcium in concrete and mortar produces an alkaline surface condition that can saponify some paint binders (alkyd resin and linseed oil, for example), causing early film deterioration. In previous years it was advisable to neutralize this condition prior to painting. The only requirement today, however, is selecting a paint or coating that is unaffected by alkalinity.

SURFACE POROSITY

This is a major problem in masonry construction, particularly the lightweight type block units. When used as exterior, weather exposed walls, penetration of moisture through to the inside can occur, and the normal latex, vinyl or acrylic type paints should not be used unless a suitable block filler or slurry coat is applied first to eliminate the porosity.

ETCHING NEW OR HARD TROWELED CONCRETE FLOORS

This treatment consists of wetting the surface with muriatic acid 15% concentration. The acid "etches" the concrete by attacking and dissolving calcium portions. The resulting surface will feel "grainy" to the touch. The surface should have the texture of medium grade sand-paper and should be tightly adherent, not powdery. The etched concrete will have excellent surface configuration for paint adhesion. This etching process is especially desirable when painting pools and concrete floors.

Use a wooden bucket, a plastic or enameled pail and a stiff fibered brush. Apply by brush or garden spray until the solution runs or one gallon of solution per 100 square feet of floor. Wet concrete well with the acid solution, let bubble 15 to 30 seconds. Wash surface thoroughly with clean water. Scrub well during the washing process to remove any surface salts, oils, grease and other contaminants. Surface should be slightly granular and free of glaze. Flush and rinse surface completely to remove all salt and acid residue and allow to dry thoroughly. Never apply coatings to damp or wet surfaces as blistering or poor adhesion will occur.

If the muriatic solution wash does not bubble and create the desired grainy surface profile, mechanical abrasion or abrasive blast cleaning will be necessary. Surface must then be swept and/or vacuumed thoroughly to remove all spent abrasives, dust and other foreign matter.

DANGER - Muriatic acid is an aqueous solution of approximately 35% hydrochloric acid and, as such, is capable of producing severe chemical burns as a result of skin or eye contact. Muriatic acid is also capable of producing marked irritation of the eyes, nose and throat resulting from inhalation of muriatic acid vapors. All persons handling etching materials should be advised as to this danger.

Any eye contact should be followed immediately by irrigating the eyes with plenty of water, and by calling a physician promptly.

Areas of the body which become contaminated due to contact with etching materials should immediately be washed thoroughly with plenty of water. Burns should be treated according to medical advice. Contact a physician promptly.

The use of rubber gloves, splash goggles and rubber footwear during etching operations is extremely important in preventing serious burns from skin or eye contact. The use of chemical cartridge respirator suitable for protection against acid gases is necessary where vapor concentrations are high enough to produce eye, nose or throat irritation.

The etching solution is made by adding ONE PART MURIATIC ACID TO THREE PARTS WATER. ALWAYS ADD ACID TO THE WATER TO PREVENT SPLASH OF HOT ACID.

SWEEP BLASTING

This is a rapid blasting operation to "etch" smooth concrete and to remove laitance. This light blast provides an excellent surface condition and anchor pattern for paint.

GENERAL REQUIREMENTS AND CONDITIONS

1. All surfaces including metals, should be free of rust, mill scale, dirt, grease, oil, wax, loose paint and all other foreign matter.
2. Do not paint in direct sunlight.
3. Do not paint on exterior work in foggy, damp weather, immediately after rain, during rainy weather or when the temperature falls below 45°F. Surface must be completely free of moisture and dry. Coatings shall be applied when: air temperature ranges from 45° - 100°F, surface temperature is 5°F above dew point and the relative humidity is not above 85%.
4. All paints and enamels should be thoroughly mixed, preferably by “Boxing” from one container to another. Always refer to the Product Data Sheet for proper mixing instructions.
5. Do not apply latex base paints over surfaces previously painted with calcimine or casein which are water soluble and will lift or bubble upon application.
6. Wood surfaces shall be thoroughly cleaned and free of all foreign matter, with cracks, nail holes, and other defects properly filled and smooth. Wood trim should be sandpapered to a fine finish and wiped clean of dust. Seal KNOTS with pigmented shellac sealers made for this purpose.
7. All coats should be thoroughly dry and hard before applying succeeding coats. Always clean off any contamination between coats prior to applying subsequent topcoats.
8. Paint materials should be delivered to job-site in sealed cans bearing the manufacturer’s name and product identification.
9. Follow label instructions for proper applications, mixing instructions and surface preparation.
10. Interior painting should not be permitted until the building has been thoroughly dried.
11. Do not apply gloss enamel over previously painted glossy surfaces without an undercoated or sanding in order to secure proper inter-coat adhesion.
12. The primer or first coat is the foundation of all paint systems and it is the success of any paint job. Paints, therefore, should be applied only after proper surface preparation.
13. New smooth, hard-troweled concrete floors should be etched with 15% solution of muriatic acid in order to obtain proper paint adhesion. Area must be completely dry before applying paint. (See Surface Preparation of Concrete and Masonry)
14. Previously painted surfaces should be clean, dry and thoroughly prepared. If peeling, cracking, blistering or other serious conditions exist, old paint should be properly removed. The condition should then be corrected before painting.

Before applying coatings over previously painted surfaces, underlying paint must be properly cured and compatible. Check compatibility by applying small test patch application. Then make cross-hatch cuts through the coating and check adhesion by firmly applying masking tape to cross-hatched area and removing with a fast pull. If the coating remains intact and there is no wrinkling, lifting, blistering, or any other sign of incompatibility, coating work may then proceed.

Always consult your Walter G LEGGE Company, Inc., technical service representative for specific coating recommendations over previously painted surfaces.

15. All prime coats and undercoats should be tinted to approximate the color of the finish coat. Permit enough variation in color for a guide coat.

16. Mildew should be removed by washing thoroughly with a solution of one of LEGGE's germicidal detergents. Follow directions for use on the chosen product. Note that most of our germicides are concentrates and should be mixed at either ½ ounce or 1 ounce per gallon of water. The surface should then be rinsed well with water and allowed to dry completely before applying paint.

17. The Walter G LEGGE Company, Inc. products are not to be thinned with various thinning oils, paints, or solvents.

18. Wherever The Walter G LEGGE Company, Inc., coatings are used, it is essential that there be adequate ventilation. The use of masks during application is recommended for all spray applications.

19. Eggshell or Semi-Gloss Finishes may vary in sheen with texture or porosity of surface, film thickness and method of application.

20. REASONS FOR BLISTERING OR PEELING

1st Cause: Moisture under the paint film. This moisture condition generally behind the walls must be corrected by constructional repairs or modifications to eliminate the accumulation of water. Generally, aluminum vents are helpful.

2nd Cause: Painting during inclement weather or when the temperature is below 45°F or high humidity.

3rd Cause: Painting after rain or when the surface is moist due to condensation during the night or early morning.

21. **IMPORTANT:** Stated average spreading rates are theoretical and represent calculations of volume solids **over smooth surfaces**. Application loss factors depends upon surface profile, size and shape of object, roughness and porosity of surface, skill of applicator, method of application, various irregularities, material lost during mixing, climatic conditions and excessive film build.

22. **SPRAYING:** Equipment must be handled with due care and in accordance with manufacturer's recommendations. Spraying of any material can be hazardous. Wear respirator, eye protection, and protective clothing. Although water based, keep material away from fire, open flame and heat.

23. Vacuum thoroughly all blasted areas of foreign matter.

24. All blasted metal surfaces must be coated within 8 hours or before visible rusting occurs.

25. To minimize problems with irregular weld surfaces, it is required that seams be treated with a brush coat prior to applying first full coat. Special attention should be given to edges, corners, crevices, pitted areas, boltheads, welds, rivets, and other irregular surfaces to insure they receive the proper film thickness equivalent to that recommended for all adjacent areas.

26. Always store unopened containers in a cool, dry area, indoors at 45°F to 100°F. Keep heat, sparks, and open flames (electrical equipment, pilot lights, etc) away from container storage sites. Post appropriate warning signs. Place solvent-soaked items like applicators and rags outside the building in a closed container. Store containers in a cool, dry place, and keep them tightly closed when not in use. Do not store in boiler rooms, electrical rooms, near open flames or heated areas.

INSPECTION GUIDE

FILM IRREGULARITIES

The object of application is to deposit a coating on the surface that will provide the decorative and protective properties that are inherent with the coating. This requires the coating to be uniformly applied

at the prescribed thickness, and be free of film defects that would adversely affect the appearance or performance.

Advancements in application technology make it possible to get better applied coatings today than ever before. However, the state of the art has not reached the point where shop or field applicators can apply coating systems that are completely free of film defects. Furthermore, not all film defects will adversely affect performance and/or appearance and many types of minor defects would not be a basis for rejection of the work or even necessitate touch-up or repair. Also, there are differences in the acceptance criteria for a decorative coating, where appearance is the primary factor and a protective coating, where performance is the most important consideration. Therefore, it is important that the inspection and acceptance criteria be defined in advance for the applicator. If dry film thickness measurements are to be taken, or Holiday Detector Tests run, it should be established what type of test equipment is to be used, where and how many readings are to be taken, who will perform the inspection and what kind of inspection records are to be kept.

Defining the acceptance standards for the appearance of a coating is more difficult. Often-times, the specification language emphasizes what coating characteristics are not acceptable rather than what is acceptable. For example: "Finish coats shall be free of runs, sags, skipped and missed areas, etc." This is often backed up with a requirement that a small area or room be coated and approved before proceeding with the rest of the job. On approval, that area or room then becomes the acceptance standard for all similar work on that job.

This procedure points out the need for a common language to describe film irregularities in order to avoid costly misunderstandings and delays in dealing with shop or field applicators. The following table lists a number of common film irregularities and gives their probable causes as well as various methods of correction.

COMMON FILM IRREGULARITIES

FILM IRREGULARITIES	PROBABLE CAUSE	CORRECTION
ALLIGATORING - Cross-hatch pattern of surface cracking	Incompatibility of topcoat and under film or coating over a soft under film	Remove failed coating and re-coat with compatible system suitable for exposure conditions. Do not topcoat until under film is dry enough to re-coat.
BUBBLING - bubbles on the surface of the dried film. May be microscopic in size.	1. Rapid volatilization of solvents within the film.	1. Level surface defects by sanding and re-apply coating at lower air or surface temperature, or add slower solvent to increase open time of wet film.

	<ol style="list-style-type: none"> 2. Air displacement resulting from absorption of wet film into porous substrate. 	<ol style="list-style-type: none"> 2a. Bridge or fill voids by applying a mist coat, a filler or sealer. 2b. Hose down concrete and masonry with water and allow to drain before applying water thinned coating.
<p>CRACKING - visible crack through the surface of the film.</p>	<ol style="list-style-type: none"> 1. Stress or compression cracking of rigid substrate. 2. Bending or flexing on non-rigid substrates. 3. Physical damage: impact, heat, cold, exposure, etc. 4. Surface freezing of fresh latex coating. 5. Application of excessive number of coats. 	<ol style="list-style-type: none"> 1. Patch cracks and re-coat. 2. Replace with coating having sufficient flexural strength to tolerate condition. 3. Replace with coating that will tolerate physical conditions. 4. Re-coat when air and surface temperatures are above minimum recommendations. 5. Remove failed coating and re-coat with appropriate system.
<p>CRATERING - round-shaped thin spots or voids</p>	<ol style="list-style-type: none"> 1. Caused when bubbles break. 2. Water in spray equipment lines. 	<ol style="list-style-type: none"> 1. See "Bubbling" 2. Level defect by sanding. Correct equipment malfunction and flush lines before re-coating.
<p>CRAZING - fine line cracking forming a network or overall pattern</p>	<p>See "Cracking"</p>	<p>See "Cracking"</p>
<p>DELAMINATION - loss of adhesion to substrate or between coats (inter-coat adhesion)</p>	<ol style="list-style-type: none"> 1. Dust, dirt, contamination, dry spray. 2. Water migration through porous substrates. 3. Under film, allowed to cure beyond maximum re-coat time. 4. Topcoat incompatible with under film. 	<ol style="list-style-type: none"> 1. Remove coating not tightly bonded, clean surface and re-coat. 2. Correct cause of water migration, remove coating not tightly bonded and re-coat. 3. Remove coating not tightly bonded, abrade surface and re-coat. (See manufacturer's instructions) 4. Completely remove coating and re-coat with compatible system.

DRY SPRAY - rough, sandy surface texture on spray applied coating	Spray particles partially dry before reaching surface	Sand smooth and adjust material, equipment and technique for prevailing temperature and humidity conditions.
FLATTING - loss of gloss	<ol style="list-style-type: none"> 1. Rain, fog, high humidity or damp surfaces. 2. Over thinning or use of wrong solvent 	<ol style="list-style-type: none"> 1. Re-coat when surface is dry and weather conditions are satisfactory. 2. Remove coating if film properties or adhesion are affected and re-coat with properly thinned material.
FRAMING - color texture or hiding variations where roller applied surfaces join work cut in with brush	Uneven film build between roller and brush applied work	Re-coat deficient work, apply heavier wet film or additional coat on new work
POOR HIDING - uneven color or shadowy appearance of topcoat	<ol style="list-style-type: none"> 1. Insufficient number of coats or low film build. 2. Insufficient mixing. 	<ol style="list-style-type: none"> 1. See "Framing" (note: some colors have weak hiding properties and require an additional coat for satisfactory hiding) 2. Stir material thoroughly before use and keep in suspension during application.
HOLIDAYS - skipped or missed areas		Touch-up or re-coat
LAPPING - (lap marks) Colors sheet or texture variations where one freshly painted area overlaps another.	First area painted has set up before overlap was made	<ol style="list-style-type: none"> 1a. Adjust material equipment and technique for weather conditions. 1b. Work smaller areas to reduce lap time.
MUD CRACKING - cross hatched pattern of surface cracking	Excessive film build or hot, dry weather	Remove failed coating and re-coat at recommended film thickness. Add additional solvent or slower solvent to retard drying during hot, dry weather.
ORANGE PEEL - fine pebbles surface texture on spray applied coating	Insufficient atomization	Sand smooth and re-coat after adjusting material, equipment and technique to obtain better flow and leveling.

OVER SPRAY - rough sandy areas on spray applied work	Deflected spray mist that settles on dry or partially dry coated surfaces	Sand smooth and re-coat using proper application technique and lap time. Protect dry film from over spray.
PEELING - see "Delamination"		
PINHOLING - small holes or discontinuities in the film. May be microscopic.	Solvent migration through the film after the film has begun to set (also see - "Bubbling" and "Cracking")	1a. If occasional pinholes are detected, touch-up or re-coat. 1b. If pinholing is a general surface condition, it indicates that coating was applied and cured under adverse environmental conditions. Apply a thin or mist coat to fill surface voids, followed by a full wet coat when environmental conditions are suitable for re-coating.
ROLLER TRACKS - a. V-shaped texture pattern on roller applied surface (chicken tracks) or b. Lines at edge of roller passes.	1. Use of long nap roller cover on smooth surface. 2. Material not properly thinned. 3. Material not rolled properly.	1. Change to shorter nap roller cover. 2. Make solvent adjustment to improve flow and leveling. 3. Use proper applicator technique.
RUNS - heavy V-shaped or pencil shaped vertical build-ups on surface of coating	1. Excessive film build. 2. Over thinning	1. Sand runs smooth and touch-up or re-coat. 2. Sand runs smooth and re-coat with properly thinned material.
SAGS - heavy V-shaped buildups or horizontal lips on the surface of coatings. (Long sags may also be referred to as curtains)	See "Runs"	See "Runs"
SANDY (appearance) - dull, rough appearance of film	Dust and dirt contamination of the wet film	Sand smooth and re-coat. Protect freshly painted area against dust and dirt contamination or suspend painting operations until environmental conditions are satisfactory.
SHADOWING - see "Hiding"		

SOLVENT TRAP - residual solvents remaining within film	1. Excessive film build. 2. Low temperature curing.	1. Try to drive solvents out of film by force drying. (See manufacturer's data) Test for hardness and adhesion. If film will not adhere or cure properly, remove and re-coat. 2. Same as "1"
STREAKING - areas having a rough texture on spray surface	1. Equipment malfunction or use of wrong equipment. 2. Spray passes not properly lapped.	1. Sand smooth and re-coat after correcting equipment malfunction or change to recommended equipment if wrong equipment was being used. 2. Sand smooth and re-coat using proper applicator technique.
WATER SPOTTING - see "Flatting"		
WRINKLING - formation of wrinkle pattern on top of film	1. Excessive film build. 2. Slow drying conditions.	1. Sand smooth and re-coat at proper film thickness. 2. Sand smooth and re-coat when drying conditions are satisfactory.

CURING & APPLICATION CONDITIONS

Curing time should actually describe a number of conditions. It should be defined in connection with the interval which must elapse before a film can be touched, handled or re-coated and fully cured.

MEASUREMENT OF DRYING TIME (ASTM D1640)

1. **SET-TO-TOUCH TIME** - to determine set-to-touch time, lightly touch the test film with the tip of a clean finger and immediately place the finger tip against a piece of clean, clear glass. Observe if any of the coating is transferred to the glass. For the purpose of this test, the pressure of the fingertip against the coating shall not be greater than the required to transfer a spot of the coating from 1/8 to 3/16 inch. (3 to 5 mm) in cross section. The film is set-to-touch when it still shows a tacky condition, but none of it adheres to the finger.

2. **DRY-HARD TIME** - with the end of the thumb resting on the test film and the forefinger supporting the test panel, exert a maximum downward pressure (without twisting) of the thumb on the film. Lightly polish the contacted area with a soft cloth. The film is considered dry-hard when any mark left by the thumb is completely removed by the polishing operation.

3. **DRY-THROUGH (or Dry-to-Handle) TIME** - Place the test panel in a horizontal position at a height such that when the thumb is placed on the film, the arm of the operator is in a vertical line from the wrist to the shoulder. Bear down on the film with the thumb, exerting the maximum pressure of the arm, at the same time turning the thumb through an angle of 90° in the plane of the film. The film is considered dry-

through or dry-to-handle when there is no loosening, detachment, wrinkling, or other evidence of distortion of the film.

4. **DRY-TO-RE-COAT** - A film is considered dry to re-coating when a second coat or specified topcoat can be applied without the development of any film irregularities such as lifting or loss of adhesion of the first coat, and the dry time of the second coat does not exceed the maximum specified (if any) for the first coat.

The coating manufacturer will give the time it normally takes to reach these various phases in the curing cycle at ambient temperature (50% relative humidity and 75°F). Variations in temperature, humidity and air movement during the curing cycle will affect the actual length of time of each of these phases. Therefore, the time factor alone cannot be relied upon completely for determining when a coating is sufficiently cured to handle, to touch, to re-coat or when it reaches full cure and is ready to place in service.

Confined areas such as tank interiors should be given special attention by utilizing forced ventilation to induce solvent evaporation, permitting the coating to achieve full strength and cure before being placed into service.

In the case of two-component coatings such as epoxies which cure by polymerization, curing time is directly related to temperature and humidity. These coatings can ordinarily be re-coated in a matter of hours when temperature ranges are 70°F to 90°F and humidity ranges from 35% to 85%, and will be extended several times over when temperature conditions fall below 60°F.

In general, most coating authorities agree that it is good practice to apply most coatings when atmospheric temperatures are higher than 45°F, relative humidity is below 85%, and the surface temperature is 5°F above the dew point. (To calculate this temperature refer to dew point conversion chart page 24). When temperatures are dropping, it is unwise to apply coatings. In such cases condensation can form on the surface, and if low enough, ice crystallization will take place and defeat the purpose of providing a continuous protective film.

High performance chemical resistant coatings have a maximum re-coat time and must be top coated within this time for proper intercoat adhesion and maximum performance properties. Always consult the technical data sheet for correct minimum re-coat time. If this time is exceeded, the manufacturer should be consulted before proceeding to prevent possible problems or costly failures.