

ABRASIVE BLASTING

Abrasive blast is the most effective method of cleaning steel and masonry surfaces prior to coating. It is mandatory for certain specialized applications such as water immersion and high temperature exposure. Recommended for removal of mill scale, heavy rust scale, and previous coatings from large areas. Careful selection of equipment, nozzles, and abrasives are essential to economical operation and achievement of the desired results. Avoid using coarse abrasives. 18–40 mesh sand or grit will provide the 2 to 2.5 mil 50–62µ) blast profile recommended for use with most coating systems.

For optimum results, follow this sequence:

1. Prior to blast cleaning, remove grease, oil, salt, chemicals, dusts, and similar contaminants by Chemical Cleaning.
2. Prior to blast cleaning, remove all weld spatter.
3. Abrasive blast to one of the grades described below.
4. After blasting, remove all abrasive, dust and grit with a vacuum cleaner, clean and dry compressed air, or a clean brush.
5. Blasted surfaces should be coated on the same day they are blasted before the cleaned surface can become contaminated.

SSPC–SP 5 (NACE 1): WHITE METAL BLAST CLEANING

Completely remove all mill scale, rust, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.

SSPC–SP 6 (NACE 3): COMMERCIAL GRADE BLAST CLEANING

Completely remove all dirt, rust scale, foreign matter, and previous coating, etc., leaving shadows and/or streaks caused by rust stain and mill scale oxides. Random staining shall be limited to no more than 33% of each unit area of surface (a unit of area is defined as 9 square inches).

SSPC–SP 7 (NACE 4): BRUSH-OFF BLAST CLEANING

Remove rust scale, loose mill scale, loose rust, and loose coatings, leaving tightly bonded mill scale, rust, and previous coatings. An ideal method for removing oxides and/or loose and peeling coatings from galvanized metal. Results are comparable to those achieved by through chipping, scraping, and wire brushing.

SSPC–SP 10 (NACE 2): NEAR WHITE METAL BLAST CLEANING

Remove all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale, and small specks of previous coating. Random staining shall be limited to no more than 5% of each area of surface (a unit of area is defined as 9 square inches).

SSPC–SP 14 (NACE 8): INDUSTRIAL BLAST CLEANING

Removal of all visible oil, grease, dust, and dirt. Traces of tightly adherent mill scale, rust, and coating residues are permitted to remain on 10% of each unit area of the surface if they are

evenly distributed (a unit of area is defined as 9 square inches). The traces of mill scale, rust, and coating shall be considered tightly adhered if they cannot be lifted with a dull putty knife. Shadows, streaks, and discoloration caused by stains of rust, stains of mill scale, and stains of previously applied coating may be present on the remainder of the surface.

CONCRETE, MASONRY, PLASTER AND WOOD (FLOORS OR WALLS)

New or Uncoated: Allow new substrate to cure thoroughly before coating. This requires 30 days under normal curing conditions. If there is any doubt about the dryness of the substrate, conduct a test by placing a weighted rubber mat, plastic sheet, or other non-porous material on the substrate for 24 hours. Then, check the underside of the mat and the substrate for signs of moisture. The substrate will be darker if damp. If moisture is found, substrate is too damp to coat with solvent-based coatings. Allow additional drying time of 10 to 14 days. Repeat test. If moisture persists, substrate cannot be coated (ASTM D 4263-83).

Very dense, non-porous, or finished concrete must be acid etched, or abrasive blasted, to assure proper coating penetration. Determine porosity by pouring about one ounce of water onto the substrate. If water soaks in, the concrete is porous enough for coating. If it beads up on the surface, the concrete is not porous enough, and treatment is warranted. All surfaces must be free of grease, oil, wax, salt, dirt, and other contaminants. Remove with one of the chemical cleaning methods. Acid etch with Rust-Oleum 108 Cleaning & Etching Solution (ASTM D 4260-83).

Uncoated Wood: Remove all loose dirt, dust, etc., by sweeping or vacuum cleaning. Remove floor compound or wax by appropriate method. The surface must be thoroughly dry before coating.

Coated Concrete and Wood: Remove loose dirt, dust, etc., by sweeping or vacuum cleaning. Remove grease, oil, floor compound, or wax by Chemical Cleaning. Scrape or sand carefully to remove deteriorated coatings. On concrete, deteriorated paint is best removed by abrading surfaces (ASTM D 4259-83). If remaining coating is glossy or very hard, sand it lightly for good adhesion of subsequent coatings. The surface must be thoroughly dry before coating. 6000 and 6500 Systems can be applied over most existing floor coatings without lifting them. Refer to SSPC 13 (NACE 6) for additional and more complete information regarding the surface preparation of concrete.

Mildewed Surfaces: Surfaces with mold and mildewed areas should be cleaned with an alkaline cleaning solution and rinsed with water. If any mold or mildew remains on the surface, clean further with one quart of household bleach added to a gallon of water. Rinse with clean water. Severely mildewed areas should be cleaned with a chlorinated cleansing powder and thoroughly rinsed with water.

Mixing, Thinning and Application Guide

Most Rust-Oleum products can be applied by brush, roll, or spray. For recommended thinning instructions, film thickness, drying intervals, and other pertinent information, refer to the Technical Data charts, product labels, and separate technical literature.

Drying time of coatings varies with temperature, humidity, and ventilation. When low temperatures, high humidity, or poor ventilation exist, longer drying times should be expected. Drying can be accelerated by heating the surface up to 150°F (66°C) after application. If coatings are stored at low temperatures, allow them to return to application temperatures before thinning or use. Do not apply coatings when ambient or surface temperature is below 32°F (0°C) or above 100°F (38°C). Surface temperature must be at least 5°F above the dew point. Avoid painting when relative humidity is above 85% or during periods of rain, fog, or snow. Exceptions are noted in the Technical Data charts, separate literature and labels. Clean brushes and equipment immediately after use with the solvent or thinner recommended in the Technical Data chart for each system.

Use only thinners recommended in the system literature or by a Rust-Oleum representative. Incompatible thinners may cause gelling, fading, blistering, wrinkling, or solvent entrapment. To store partially used containers, pour a small amount of recommended thinner over the remaining coating. Do not stir. Replace lid securely. Store away from heat or open flame. Mix thoroughly before using. Unused catalyzed products cannot be stored.

MIXING

Thorough mixing makes application easier and assures the lasting qualities for which Rust-Oleum products are formulated. For best and fastest mixing results:

1. Pour off liquid portion into clean container.
2. Thoroughly mix settled portion with a paddle, breaking up any lumps by rubbing them against side of the can. Loosen pigment paste from sides and bottom of container and stir until a smooth paste is achieved. and gradually return poured-off material to original container while stirring.
3. Pour contents back and forth between containers at least 6 times, until completely uniform. This “boxing” procedure saves considerable time over stirring only and provides better results. Stir frequently during use.

Use power-driven agitators to mix 55-gallon drums. Where mechanical agitators are not available, purchase 5- or 1-gallon sizes. Two-component catalyzed systems may require special mixing of base and/or activator components. Refer to separate systems literature and labels for detailed instructions.

APPLICATION

Brush: Best results are obtained when good quality brushes are used. Rust-Oleum products are formulated to proper brushing consistency. If thinning is necessary, carefully follow instructions found on containers or in specific system literature. Cover the surface completely to avoid retouching afterwards. Apply successive coats by crossbrushing to minimize brush marks.

Spray: Most Rust-Oleum products may be easily and economically applied by the various spray methods. Good equipment and skilled operators are essential for successful spray application. Equipment manufacturer instructions should be carefully followed. Special Rust-Oleum publications on spray applications are available on request.

Air Atomized Spray: Useful for many Rust-Oleum coatings. Thinning to proper viscosity is important and usually requires 10% to 15% of the appropriate thinner. See product label for more specific information. Avoid overthinning. Use minimum air pressure necessary for good atomization. Several passes may be needed to achieve recommended film thickness.

Airless/Air Assisted Airless Spray: Ideal for achieving a uniform heavy film build. Thinning is not normally required. If needed, do not exceed 10% of the recommended thinner. For primers, semigloss, or flat finishes, use a spray tip with a .015–.021” orifice, for high gloss finishes use a .011–.017” tip. Metallic coatings (aluminum or Zinc-Sele) may cause clogging and possible abrasive damage to equipment.

Hot Spray: May be used with many Rust-Oleum products. Not recommended with epoxy coatings or fast drying systems. Do not exceed 180°F (82°C). Thin sparingly, only if needed.

Electrostatic Spray: Works well with most products, except metallics.

Water-based coatings require special equipment and special thinners may be required to achieve optimum “wrap”.

Roller Application: For smooth surfaces, use med. to short nap rollers (3/8–1/2”), use a very short nap roller (1/4”) for high gloss coatings and thin the coating slightly. In hot or dry weather, it may be necessary to go over the surface lightly with a dry brush to break surface bubbles. Avoid sags and ridges. Thin according to instructions found on labels of individual products. Fast dry coatings are not recommended for application by roller or brush. Use squeegee and short nap (1/4–3/8”) lint free roller (Item No. 6696024) for the 100% Epoxy Floor Coating. Use a no nap roller (Item No. 6697005) for applications of Anti-Slip Coatings.

Note: Some products have specific mixing requirements. Always read label requirements prior to mixing and application.



Coatings Math & Surface Area Formula Guide



COATING MATH AND SURFACE AREA FORMULAS

Coverage Rate

This formula will calculate the coverage rate in square feet per gallon.

$$CR = \frac{(1604) \times (\% \text{ Volume Solids})}{\text{Dry Film Thickness (mils)}}$$

Practical coverage rate generally allows for a 15% material loss, so multiply the above result by 0.85

$$\text{Practical CR} = (CR) \times (0.85)$$

Wet Film Thickness

This formula will calculate the needed wet film thickness (WFT) required to achieve the desired or specified dry film thickness (DFT).

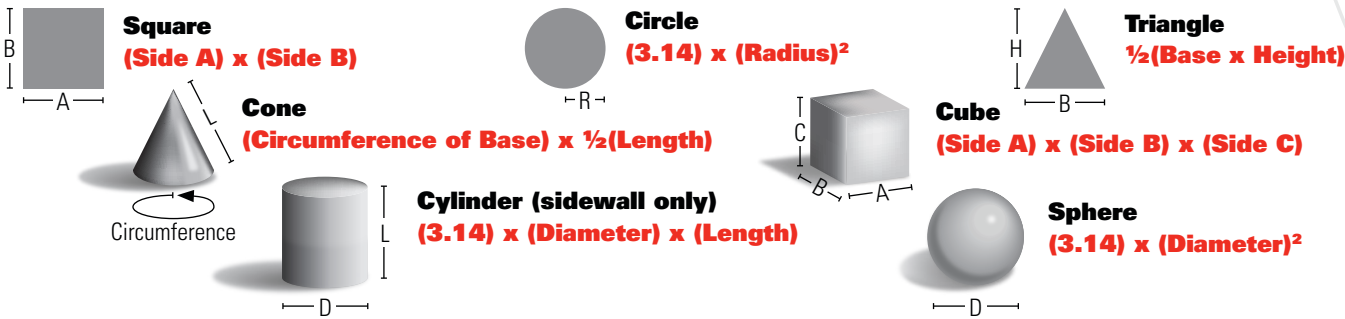
$$WFT = \frac{\text{Specified Dry Film Thickness}}{\% \text{ Volume Solids}}$$

If the coating has been thinned, then use the following formula.

$$WFT = \frac{(\text{Specified DFT}) \times (1 + \% \text{ Thinner Used})}{\% \text{ Volume Solids}}$$

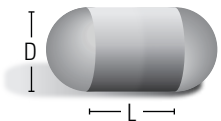
Note: the amount of thinner is the percentage by volume.

Surface Area Formulas



When estimating the total surface area of a structure, break the structure down to manageable components for the available formulas. Calculate surface area of each component, then add them all together for a total area estimate.

Propane storage tank with hemispherical heads



Surface area of side wall, use cylinder formula.

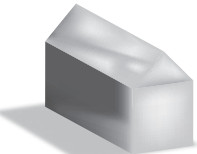
$$[(3.14) \times (D) \times (L)]$$

Then add:

Surface area of heads, use sphere formula.

$$(3.14) \times (\text{Diameter})^2$$

Storage facility with windows



Surface area of rectangular walls, use square/rectangle formula. Surface area of triangle walls, use triangle formula. Add all of the areas together, then subtract the total area of window and door openings.

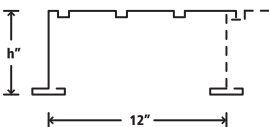
Surface Area Estimations

Corrugated Sheet Metal

$$2\frac{1}{2}'' : (\text{Width}) \times (\text{Length}) \times (1.08) \quad \text{and} \quad 1\frac{1}{4}'' : (\text{Width}) \times (\text{Length}) \times (1.11)$$

Roof Decking

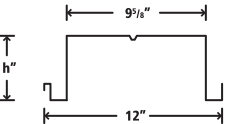
First calculate the square foot area of the roof sheeting, then multiply by the area factor shown for the most similar shape. This will provide a total surface area estimate. Double the area if coating both sides.



If h = 4 ½", area factor = 1.63

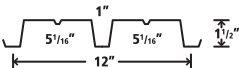
If h = 6", area factor = 1.75

If h = 8", area factor = 1.92

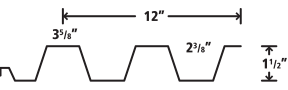


If h = 3", area factor = 1.5

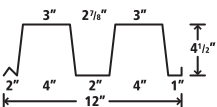
If h = 4 ½", area factor = 1.75



Area factor 1.42



Area factor 1.50



Area factor 2.42

Steel Shapes

Wide Flange Beams

Dimensions and weight per foot	4 x 4 (13)	5 x 5 (16)	6 x 6 (20)	8 x 8 (48)	10 x 10 (72)	12 x 12 (87)
Surface area per linear foot (in sq. ft.)	2.0	2.4	3.0	4.1	5.1	6.9

Angle Iron

Dimensions and thickness	1 x 1 x 1/8	1 1/2 x 1 1/2 x 1/4	2 x 2 x 3/8	3 x 3 x 3/8	4 x 4 x 1/2	6 x 6 x 5/8
Surface area per linear foot (in sq. ft.)	0.3	0.5	0.7	1.0	1.3	2.0

Channel

Dimensions and weight per foot	3 x 1 1/2 (6)	4 x 1 3/8 (7.2)	5 x 1 3/4 (9.2)	6 x 2 (8.2)	7 x 2 1/8 (9.8)	8 x 2 1/4 (11.5)	9 x 2 1/2 (13.4)	10 x 2 5/8 (15.3)	12 x 3 (20.7)
Surface area per linear foot (in sq. ft.)	0.9	1.2	1.4	1.6	1.8	2.0	2.2	2.5	3.0

I-Beams

Size in inches	3	4	5	6	7	8	10	12	15	18	20	24
Surface area per linear foot (in sq. ft.)	1.3	1.6	1.9	2.1	2.4	2.7	3.3	3.7	4.5	5.0	5.6	6.5

Pipe

Outside diameter in inches	1	2	3	4	6	8	12	18	24	30	36	42	48	60
Surface area per linear foot (in sq. ft.)	0.3	0.5	0.8	1.0	1.6	2.1	3.1	4.7	6.3	7.8	9.4	11.0	12.6	15.7

Tonnage

Thickness of steel in inches	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1	1 1/2	2
Surface area per ton (in sq. ft.)	800	533	400	320	267	200	160	133	114	100	67	50

Surface Preparation Guide

MINIMAL PREPARATION

For coatings requiring only minimal surface preparation, the surface needs to be prepared in accordance to SSPC-SP 1 and SSPC-SP 2 or SSPC-SP 3. Tightly adhered rust, mill scale or previous coating can remain provided it cannot be removed by lifting with a dull putty knife using moderate pressure. Use SSPC-SP 7 (NACE 4) to expedite the preparation of large areas.

CHEMICAL

SSPC-SP 1: CHEMICAL CLEANING

This method involves the removal of dirt, oil, grease and other foreign materials with organic solvents, detergents or commercial cleaners using one of several cleaning methods such as wiping, steam cleaning, or vapor degreasing. Use one or more of the following techniques:

Pure Strength Concentrated Cleaner/Degreaser: Removes grease, oil, dirt, and similar contaminants quickly and easily. Apply directly on the surface to be cleaned and rub with cloth, sponge, or stiff bristled brush, and then rinse thoroughly with fresh water. Use full strength on heavily soiled surface or dilute for general purpose cleaning. The surface must be completely dry before the application of coating.

Pure Strength Cleaner/Degreaser: Removes dirt, grease, oil, adhesives, road tar, and more. Agitate for one minute before use. Apply directly on the surface, rub with a brush or cloth, and rinse thoroughly with clean water or wipe with a damp cloth. For large jobs dilute Cleaner/Degreaser with water. All surfaces must be dry before coating is applied.

Steam Cleaning: Recommended for removing grease, oil, salt, acid, alkali, and similar chemical residue from large areas. For maximum effectiveness, steam cleaning should be used in combination with alkaline cleaning. The surface must be thoroughly dry and free of residue before it is coated.

Alkaline Cleaning: For removal of dust, dirt, wax, grease, oil, fat, salt, acid residue, etc., scrub surface with a strong commercial detergent solution such as trisodium phosphate (TSP), then flush thoroughly with fresh water. Surface must be completely dry and free of any residue before it is coated.

Volatile Solvent Cleaning: Make certain the area is well ventilated. Apply solvent to the surface with cloths, sponges, or brushes and scrub to remove grease and oil. Several successive wipings are usually necessary, using clean cloths and solvent each time. For optimum results follow with Alkaline Cleaning.

HAND AND POWER TOOL

SSPC-SP 2: HAND TOOL CLEANING

SSPC-SP 3: POWER TOOL CLEANING

Loose rust, loose mill scale and deteriorated coatings can be removed by effective use of hand and power tools. Brush-Off Grade Blasting (SSPC-SP 7) may be used as an alternative

to scraping and wire brushing. Prior to scraping and wire brushing, remove grease, oil, salt, chemical dust, and other contaminants by Chemical Cleaning. Removal of heavy rust scale, light mill scale, or previous coatings over extensive areas usually requires Commercial Grade Blast Cleaning (SSPC-SP 6).

Chip, scrape, or wire brush rusted surfaces thoroughly to produce a tightly adhered surface that is clean and free of foreign matter to assure good coating adhesion. Care must be taken with power tools to avoid polishing a metal surface or abrading it too deeply.

Tightly adhered coatings which are very hard or glossy should be sanded to remove gloss and slightly roughen the surface. This will contribute to maximum adhesion of the new coating. Examine existing coatings carefully for signs of rust beneath the coating. If present, remove coatings in these areas.

SSPC-SP 11: POWER TOOL CLEANING TO BARE METAL

Power tool cleaning to produce a bare metal surface and to retain or produce a surface profile. This cleaning specification exceeds SSPC-SP 3 Power Tool Cleaning in that it requires complete removal of all visible oil, grease, dirt, mill scale, rust, paint, oxide, corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. If the surface is to be roughened, the surface profile produced shall be not less than 1 mil (25µ) and shall be to a degree suitable for the specified paint system.

SSPC-SP 15: Commercial Grade POWER TOOL CLEANING

Power tool cleaning to produce a bare metal surface. Remove all visible oil, grease, dirt, mill scale, rust, paint, oxide, corrosion products, and other foreign material. Random staining is allowed provided it is limited to no more than 33% per unit area of surface. A surface profile of 1 mil (25µ) shall be produced.

PRESSURIZED WATER

SSPC-SP 12 (NACE 5): HIGH AND ULTRA-HIGH PRESSURE WATER JETTING

This standard provides requirements for the use of high and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream. This standard defines four levels of working pressure:

Low-Pressure Water Cleaning (LPWC): Less than 34 MPa (5,000 psi).

High-Pressure Water Cleaning (HPWC): 34–70 MPa (5,000–10,000 psi).

High-Pressure Water Jetting (HPWJ): 70–210 MPa (10,000–30,000 psi).

Ultra High-Pressure Water Jetting (UHPWJ): Above 210 MPa (30,000 psi).

This cleaning standard defines 4 levels of cleanliness for visible contamination by water jetting and 3 levels for non-visible contamination, such as chlorides and other soluble salts. See the full standard for complete definitions on the level of cleanliness.