

CHAPTER 5.1

PAINT APPLICATION

by

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Paint is not a finished product until it has been applied to the substrate. Therefore, proper application of the paint is a critical part of the complete paint system. High performance paint systems are especially sensitive to misapplication and may fail drastically, even more so than conventional paint systems, which are much less sensitive to application variables. Therefore, it is imperative that instructions be followed explicitly, particularly when applying expensive and sensitive high performance paint systems. A detailed specification covering the general requirements of high performance paint application is given in SSPC-PA 1, "Shop, Field and Maintenance Painting", as outlined in Table 1.

Surroundings may prohibit use of spray application because of fire hazards or potential damage from overspray. Parking lots and open storage areas are common examples. Adjacent areas or objects not to be coated must be masked before spraying and the masking material must be removed afterwards. This takes time and, if extensive, may offset the advantages of the rapid area coverage of spraying operations.

Weather conditions are very important for good results. Avoid painting below 45°F or above 95°F, if the relative humidity is above 80%, during rainy weather, when wind velocity is above 15 miles per hour or if freezing will occur before the paint dries. If lacquer coatings, such as those based on vinyl or chlorinated rubber resins, are used, they may be applied at temperatures as low as 35°F.

Brushing is ideal for small areas, edges or corners. Roller coating is most efficient on large, relatively flat surfaces. Spraying is most suitable for large areas but works just as well on irregular shapes such as bridge steelwork.

The surface should be completely dry and between 45°F and 95°F before painting. However, damp (not wet) surfaces may be painted with some water-base or latex paints, and certain other systems as recommended by the coating manufacturer.

Lacquer products, such as vinyls and chlorinated rubber, which dry rapidly, should be applied by spray. Brush or roller application may be extremely difficult, especially in warm weather or outdoors on breezy days.

Each method of application has a different effect on dried coating. Brushing tends to leave brushmarks and rolling may cause stipple marks. Spraying, when done properly, gives the smoothest and most uniform paint film,

TABLE 1
SUMMARY OF SSPC-PA 1 — Shop, Field & Maintenance Painting

1. Scope
2. Definition
3. Pre-application Procedure
 - 3.1 Materials Handling & Use
 - 3.2 Storage of Paint & Thinner
 - 3.3 Surface Preparation
 - 3.4 Pretreatments
 - 3.5 Mixing & Thinning
4. Factors Affecting Application of Paint
 - 4.1 Temperature
 - 4.2 Moisture
 - 4.3 Humidity
 - 4.4 Cover
 - 4.5 Damage
 - 4.6 Striping
 - 4.7 Continuity
 - 4.8 Thickness
 - 4.9 Recoating
 - 4.10 Tinting
 - 4.11 Intercoat Adhesion
 - 4.12 Contact Surfaces
5. Application Methods
 - 5.1 General
 - 5.2 Brush
 - 5.3 Spray — General
 - 5.4 Air Spray
 - 5.5 Airless Spray
 - 5.6 Hot Spray
 - 5.7 Hot Airless Spray
 - 5.8 Roller
6. Shop Painting
(Types, Coats, Contact, Welding, Damage, etc.)
7. Field Painting
(Cleaning, Touch-Up, Procedures, etc.)
8. Maintenance Painting
(Cleaning, Compatibility, Records, etc.)
9. Special Coatings
 - 9.1 Conventional Types
 - 9.2-9.6 Other Generic Types
10. Drying & Handling
11. Inspection
12. Safety

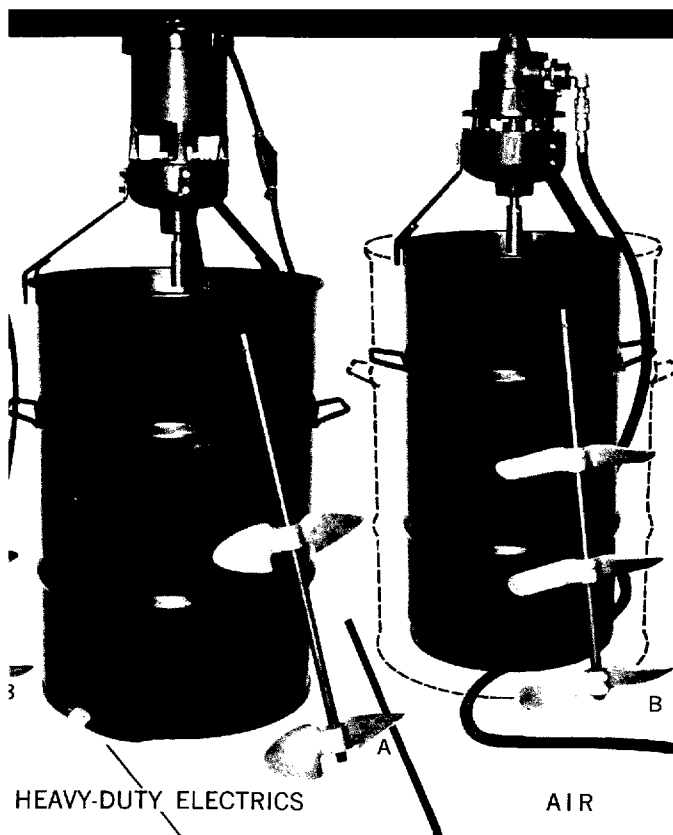
though sagging can occur if too heavy a coat is applied.

The degree of training and experience of the personnel may influence the choice of method of application. Spraying requires the greatest degree of skill. Rolling is the easiest.

I. PAINT PREPARATION

Since paints are pigmented they can become non-uniform during storage. During long periods of storage, the pigment, which is more dense than the vehicle, tends to settle and sometimes cakes at the bottom of the container. The liquid component might separate and form a thin layer at the surface, or it could form a skin, especially in a partially full can.

Mixing is required to make the paint homogeneous and uniform before use by stirring the vehicle, dispersing the settled supernatant liquid, and removing all skins, lumps and other large particles. The paint, if stored at cold or hot temperatures, should be brought to a moderate temperature for application. Two and three component paints must be carefully mixed just prior to use.



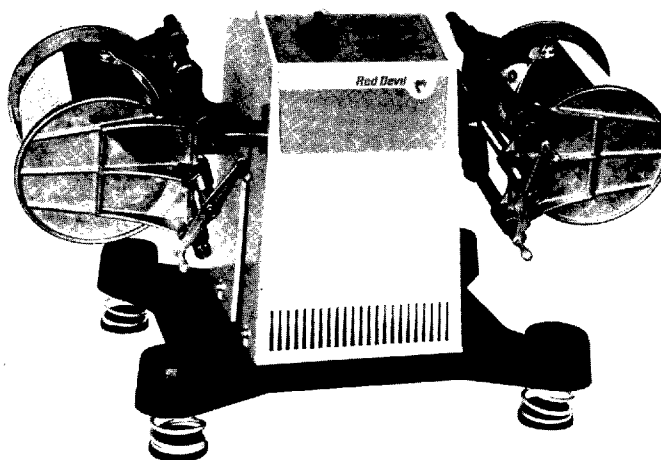
Drum Paint Agitator

FIGURE 1

Courtesy of Quick Spray, Inc.

The paint also may be tinted with some added color, such as for use as an intermediate coat.

Paint should be stored at a moderate temperature. Rotate stock and use older material first. Also, reverse



Paint Shaker

FIGURE 2

Courtesy of Red Devil — Union, Inc.

containers at intervals to prevent settling. Check seals to be sure there is no leakage. Check dated products and replace outdated materials.

A. MIXING

A mechanical mixer is preferred because it is faster and produces a uniform mixture. If manual mixing is necessary, don't use cans larger than two gallons.

If there is a skin on the surface of the paint, carefully remove before mixing to avoid the formation of lumps or gelled particles.

Depending on the size of the container, mixers are available, from attachments for hand drills to large portable units, which can be used to mix 55-gallon drums of paint. Most of these attachments are propellers with the following typical dimensions:

Shaft Length	— 11" to 36"
Propeller diameter	— 2" to 8"
Horsepower	— Up to ½ H.P.

These mixers may be powered by electric, air or portable drills. Multiple propellers, (two or more stacked on the shaft) are also used in larger containers, such as drums, to achieve uniform mixing (Figure 1). Some propellers are of expanding type so that they can be inserted through the bung opening of the drum. During mixing they open to a diameter of 8 inches. When mixing stops, the blades collapse allowing removal through the bung opening of the drum.

Paint shakers can be used to remix containers of five gallons or less without opening the cans (Figure 2). They operate by an eccentric cam which shakes the can vigorously. Most paint distributors have these units.

Avoid shaking partly full cans of latex paint. It can cause foaming. Avoid splashing. Speed should be set as low as possible to create movement of the paint with only a slight vortex, or central depression, at the surface. A large vortex should be avoided, especially with latex paints, since this will result in drawing in air and foaming.

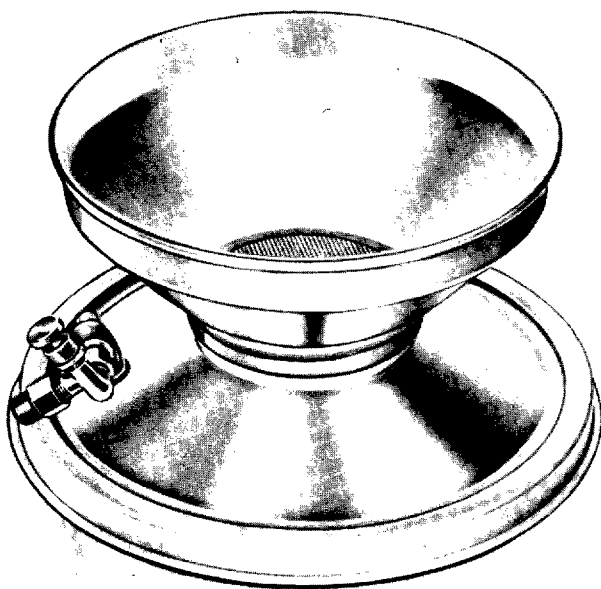


FIGURE 3

Rapid Paint Strainer

Courtesy of The DeVilbiss Co.

Foam is extremely difficult to eliminate and will result in bubbles or craters in the applied paint film.

Scrape the bottom and lower sides of the container to disperse all settled pigment. When mixed, the paint should look uniform from top to bottom, showing no striations or color streaks on its surface.

If manual mixing is necessary, pour some of the paint into another clean container. The balance of the paint can then be readily mixed, after which the removed paint can be poured back and mixed in. Follow the same precautions as in mechanical mixing with regard to the bottom and sides of the container.

When mixing two-component paints, check and remix each component individually. Then blend the two components at low speed until the mixture is completely uniform in color. Often, the two components are supplied in different colors so that a good mix can be readily determined. Do not mix more than a few gallons at a time since the exotherm caused by the mixture may be so high as to make the paint solidify in the can. Be sure to use the paint within the pot life recommended by the manufacturer.

Discard all paint beyond that time. When one component is a powder, e.g., zinc, aluminum or bronze, be sure that the liquid component is completely uniform before proceeding. Follow manufacturer's instructions as to whether pigment is added to the liquid component or the liquid component is added to the pigment. Add very slowly while mixing continuously until the paint is smooth. Avoid the formation of lumps, which may cause clogging of spray equipment.

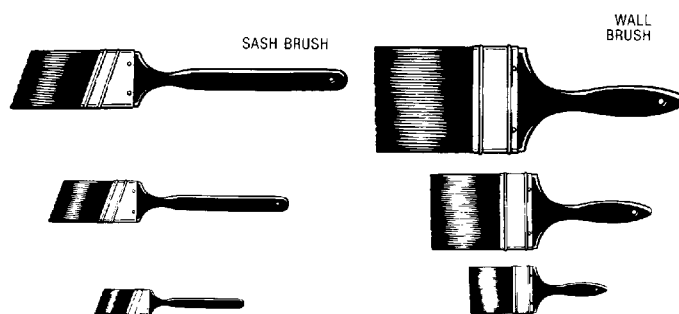
B. THINNING

Do not thin the paint unless recommended by the supplier or needed for spray application. If the paint is cold, do not add thinner to make application easier. Instead, bring the paint to 50-90 °F. When thinning the paint, *first* be sure that it is well mixed before adding the thinner. Then continue mixing until the paint is uniform in consistency. Be sure to use a thinner that is recommended for the product. Paint heaters can be used to reduce viscosity for spray application, thus avoiding the addition of thinners. Observe safety precautions. Do not apply warm paint to cold steel. Results are best if both are similar in temperature.

C. TINTING

Do not tint paint unless recommended by the supplier or tinting is necessary to change the color for an intermediate coat. If tinting is done, first premix the paint. Make sure the tinting color is compatible before adding. The type and maximum amount should be determined by the paint manufacturer. Mix mechanically and continue until the paint is uniform in color with no streaks on its surface.

Tinting colors may be recommended to achieve desired topcoat colors. Follow the paint manufacturer's directions explicitly since colorants may not be compatible with all types of coatings despite the designation "Universal". Do not use more than the maximum recommended by the manufacturer.



Typical Paint Brushes

FIGURE 4

Courtesy of E Z Painter Corporation

Try to use the same batch number of topcoat in any one area since there can be a slight color difference between batches. If different batches are needed, combine batches as much as possible to avoid the possibility of

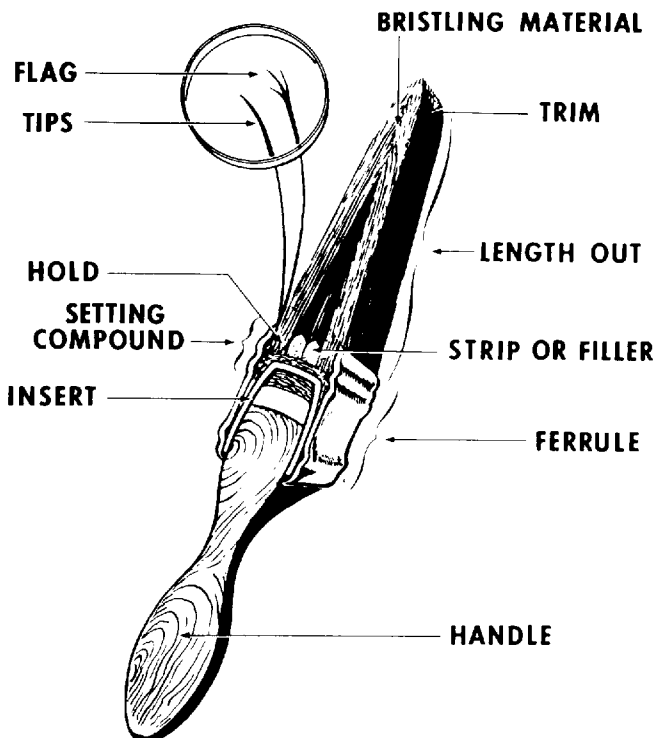


FIGURE 5

Paint Brush Construction.

Courtesy of American Brush Manufacturers Association

color differences. Alternatively, if colors of the topcoat are found to be slightly different from one batch to another, finish using one batch at the edge or corner so that batch-to-batch color differences will not be as noticeable.

D. STRAINING

Paints should be strained after mixing if there is any evidence of skins, lumps, color particles or foreign materials. Straining is especially recommended if paint has been previously used and allowed to stand for any length of time or if the paint is going to be sprayed. Strain after completing all mixing, thinning, tinting or boxing. Strain through a fine sieve (80 mesh) or a commercial paint strainer (Figure 3).

E. TEMPERATURE

Temperature of paint may be excessively high or low depending on storage or shipping conditions. If so, warm or cool the paint to a temperature of 50-90 °F before mixing and use.

II. APPLICATION METHODS

There are five methods of paint application: brush, paint pads, roller, mitt and spray.

The choice of method to be used depends on the type of coating being applied, adjacent areas that might be damaged by overspray and degree of skill of the personnel.

Whatever method is used, tools should be of first quality and should be maintained in top condition.

A. BRUSH APPLICATION

Brush application requires the least amount of preparation before use and cleanup afterwards. Only the brush has to be cleaned. However, brushing is slower than other methods and should be used mainly for small areas and for cutting in corners or edges. Brushing is also useful to improve wetting of primers on difficult-to-paint surfaces.

There are two general designs of brushes which may be used in painting steel: conventional and flat brush.

The most common brush used on steel structures is the conventional "wall" brush, varying in width from 3" to 6" and with bristling varying in length from 4" to 7". Small areas require narrower "sash" brushes, 2" to 3" wide. Irregular surfaces are best painted with oval brushes up to 2" in diameter (Figure 4).

The brush is constructed by cementing the bristling ends in a setting compound then adding a handle. The setting compound and flat end of the handle are fastened together with a metal ferrule. Strips or fillers are inserted inside and at the bottom of the bristling. This forms a cavity that holds more of the paint and also reduces the total volume of bristling, making it easier to spread paint and reducing cost (Figure 5).

Bristling is controlled in length so the longest bristles are in the center and their length is tapered toward the outer bristles. This makes painting easier.

The flat brush is made up of short nylon or polyester filaments, 1¼" long, attached to a flat base, about 4" x 7". This allows for wider contact with the surface being painted. A metal grip is attached to the other side of the base. This brush holds about twice as much paint as a con-

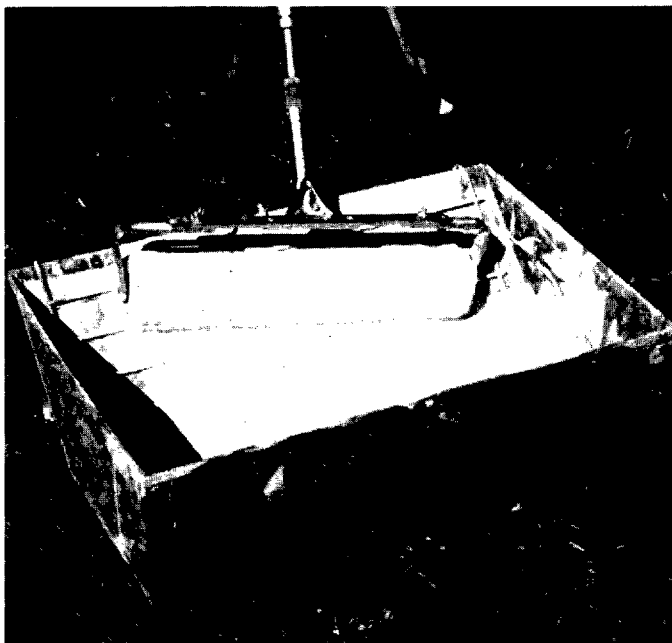


FIGURE 6

Industrial Paint Roller and Tray

Courtesy of Arasco Paint Rollers, Inc.



FIGURE 7

Use of Roller Extension Poles on Water Tank
 Courtesy of the National Paint & Lacquer Association & E Z Painter Corporation

ventional brush and applies paint more rapidly. It is especially effective in forcing paint into crevices and around projections. It also can be used with an extension pole. Flat brushes require roller tray, are ineffective inside angles, and are more difficult to clean. A flat brush also drips more, adding to clean-up problems.

Two general types of bristling are used: natural bristles and synthetic filaments.

Traditional paint brush bristles come from Chinese hogs. These produce excellent paint bristles since the ends of the bristles are "flagged", or naturally split so they hold a considerable amount of paint. Unfortunately, hog bristles are very expensive and are not practical for hot water-thinned paints. Other animal bristles, such as horsehair, have been used but generally are inferior to hog bristles.

The oldest synthetic filament is nylon. Flagged ends are produced by artificially splitting the filament tips. Nylon is much more water-resistant than natural bristles and works better with water-thinned (latex) paints since nylon bristles do not soften excessively after prolonged use. Nylon loses stiffness in lacquer solvent and alcohol and should not be used with paints containing those solvents.

Polyester filaments are widely available. They appear more water resistant than nylon and soften less after prolonged use. They also are less affected by lacquer solvents.

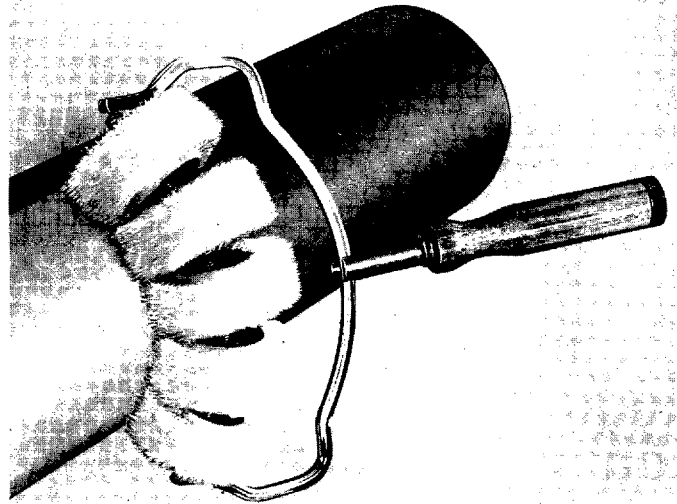


FIGURE 8

Pipe Paint Roller

Courtesy of E Z Painter Corp.

Many brushes are made of blends of natural, nylon and/or polyester to combine the application qualities of bristle, the wear resistance of nylon and the resistance of polyester to water and high humidity.

It is important to use high quality brushes and keep them in top shape. Avoid brushes with horsehair or with filaments that are not flagged. Conventional brushes should be tapered from side to center. The brush should feel solid with a good quantity of bristles and still be flexible. All bristles should be firmly set with no loose bristles.

Dip the brush into the paint to about half the bristle length, then withdraw at the edge of the container in a partial wiping motion or shake to remove excess paint. Hold the (conventional) brush at an angle of about 75° to the work. Make several light strokes to transfer paint to the surface. Spread the paint evenly and uniformly. Do not press down on the brush. Pressing can create excessive brushmarks or cause wiping off some of the paint. Paint the adjacent area, completing the brush strokes into the edge of the previously painted area. This prevents excessive pileup of paint in the lapped areas, which can result in lap marks. Finally, cross-brush lightly to eliminate any sag or brush marks.

Avoid poking the brush into corners and crevices. Instead, use the end of the brush and twist it slightly to get the bristles into hard-to-reach areas.

Flat and oval brushes are used in a similar manner but are held so bristle ends directly face the work.

B. PAINT PADS

Paint pads hold more paint and are faster than brushes. They are almost as versatile for covering small areas but require a tray and are more difficult to clean. Because of their relatively low cost, they can be discarded

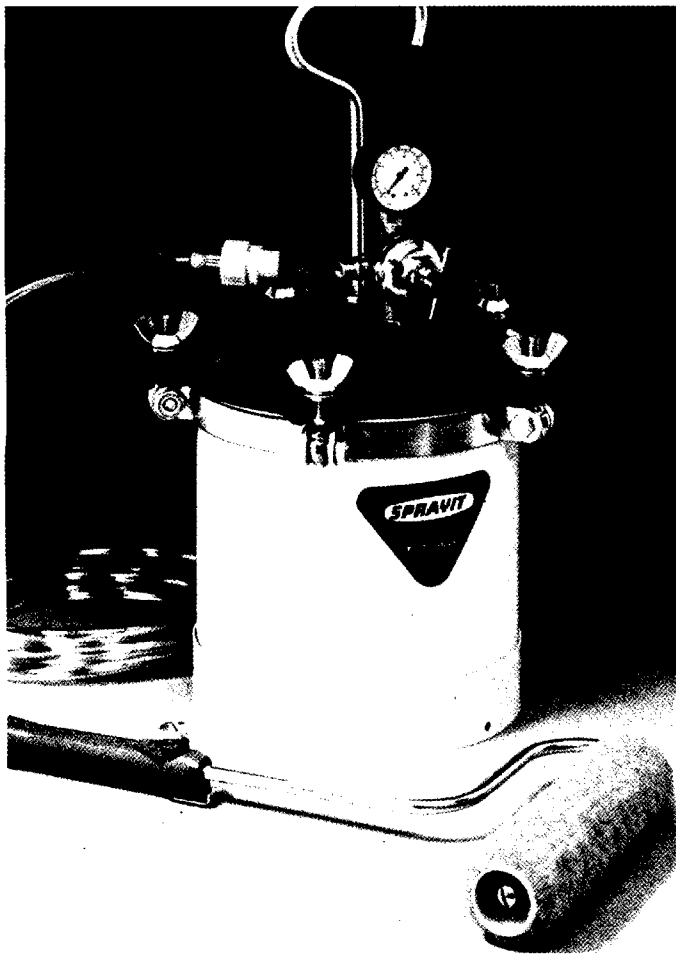


FIGURE 9

Pressure Paint Roller

Courtesy of Thomas Industries

after use. Their use on structural steel is limited. They consist of roller-type synthetic fabric attached to a foam backed flat pad about 4" x 7" in size. The fiber length is about $\frac{3}{16}$ ". A spring-loaded handle keeps the pad parallel to the work. The handle is threaded to accept extension poles.

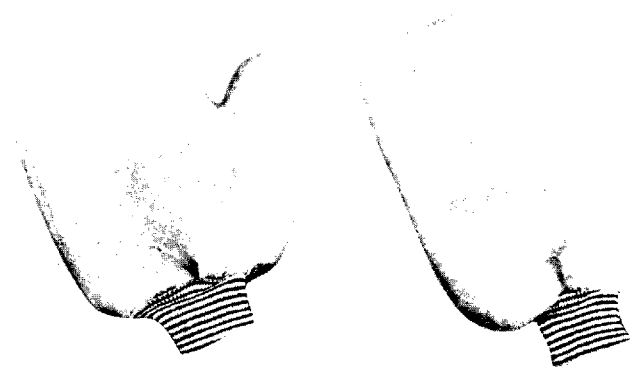


FIGURE 10

Paint Mitts

Courtesy of Bestt Roller, Inc.



FIGURE 11

Paint Mitt in Use

Courtesy of Bestt Roller, Inc.

C. ROLLER APPLICATION

Paint rollers are excellent for large flat areas and do not require the skill of spray application. They hold much more paint than a brush and are two to four times faster.

They require the use of trays (or grids in large containers), are more difficult to clean and are not as effective in applying paint evenly and with good wetting on difficult-to-wet surfaces, e.g., hand cleaned, rusted or pitted steel. Roller cleaning is not critical since they are economical enough to be discarded. Paint rollers consist of three major units: roller cover, roller handle and paint tray or grid.

1. Roller Covers

Roller covers vary in diameter, length, type of fabric and fiber length (Table 2).

- Diameter: Roller cover diameters may be 1½" or 2¼". The 1½" diameter is most common.
- Length: This may vary from 1" to 18". The 9" length is most common. A 2" x 9" roller will hold twice as much paint as a 1½" x 7" roller and a 2¼"