



AIRLESS SPRAY

Airless spray application is one of the most widely used methods for applying architectural and protective coatings on commercial and residential projects. Its popularity stems from its ability to apply coatings quickly while producing uniform coverage across large surfaces. When properly configured, airless spray systems can deliver consistent film build, high transfer efficiency, and excellent finish quality.

However, the performance of an airless spray system depends heavily on proper equipment setup and application technique. Factors such as spray pressure, tip size, spray distance, and equipment condition directly influence atomization, overspray, finish appearance, and ultimately the long-term durability of the coating system. Improper setup can lead to material waste, surface defects, inconsistent film thickness, and costly rework.

Optimizing airless spray application requires understanding the relationship between pressure, tip selection, and film build while maintaining proper equipment maintenance and application technique. The following sections outline key considerations that help contractors achieve consistent and reliable coating performance.

How Airless Spray Systems Atomize Coatings

Airless spray systems atomize coatings by forcing material through a small orifice at high pressure. As the coating exits the spray tip, it expands into a fan-shaped pattern that breaks the liquid into fine droplets, allowing the coating to evenly distribute across the substrate.

The pressure setting must be high enough to achieve full atomization while maintaining a clean, uniform spray pattern. If pressure is too low, the spray fan may show “fingers” or tails at the edges, indicating incomplete atomization. Increasing pressure gradually until the spray pattern becomes smooth and fully developed is the recommended approach.

Running pressure higher than necessary is a common field mistake. Contractors sometimes increase pressure to compensate for worn spray tips, improper hose diameter, or thicker materials. Excessive pressure can create several problems, including increased overspray, reduced transfer efficiency, accelerated tip wear, and surface defects such as dry spray or excessive texture. Maintaining the lowest pressure that still achieves proper atomization helps improve finish quality and reduce material waste.

Spray Tip Size and Selection

Spray tip selection plays a critical role in controlling both the spray pattern and the volume of material delivered to the surface. Tip numbers identify two key characteristics: fan width and orifice size.

For example, a 517 tip produces a 10-inch fan pattern and has a 0.017-inch orifice (Figure 1). Larger orifice sizes allow greater material flow and are commonly used for heavier-bodied coatings such as elastomeric coatings, block fillers, or high-build primers. Smaller tips are typically used for lower-viscosity coatings such as enamels, stains, and clear finishes.



The three digits (517) represent tip size (fan width and orifice size) and indicate the amount of paint that flows through the tip.

The first digit is half of the fan width
 $5 \times 2 = 10$ in fan width

517

The last two digits are the size of the tip orifice in thousandths of an inch

Selecting the correct tip size helps maintain proper pressure levels and ensures consistent film thickness. Using an oversized tip for a thin coating may result in excessive material delivery, leading to sagging, poor leveling, or runs. Conversely, using a tip that is too small may require higher pressure to maintain atomization, increasing equipment wear and reducing finish quality.

Proper Technique

Maintaining proper spray distance and gun orientation is essential for achieving uniform coverage and consistent film build. In most applications, the spray gun should be held approximately 12 inches from the surface and kept perpendicular to the substrate during application. Moving the spray gun in an arc or holding it too close to the surface can cause uneven material distribution (Figure 2). When the gun is too close, the center of the fan pattern becomes overloaded, leading to runs or heavy film build. Holding the gun too far away increases overspray and produces dry spray or rough texture.

Proper technique involves moving the spray gun parallel to the surface while maintaining a consistent distance. Each spray pass should overlap the previous pass by approximately 50 percent to ensure uniform coverage and eliminate striping.

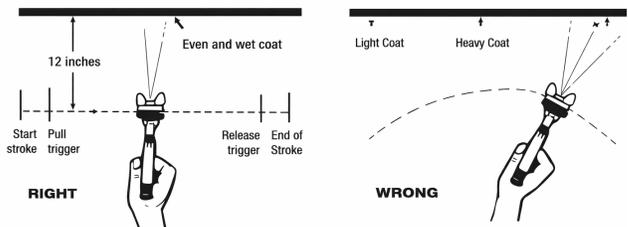
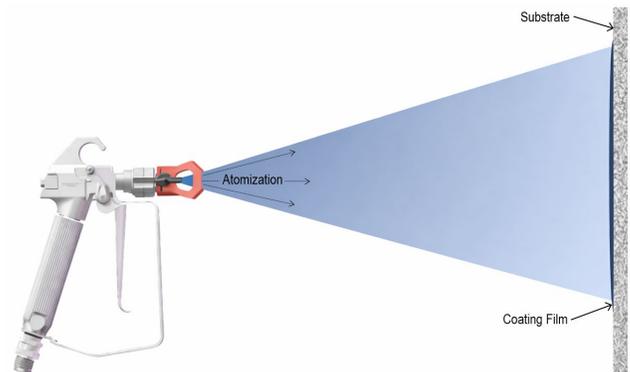


Figure 2

Controlling Film Build and Thickness

Film thickness plays a critical role in coating performance, particularly on commercial projects where specifications and warranties may require minimum dry film thickness (DFT). Achieving the correct film

thickness requires understanding the relationship between wet film thickness (WFT) and the coating's solids by volume.

Contractors should periodically measure wet film thickness during application using a wet film gauge. This helps confirm that the applied coating will achieve the specified dry film thickness once the solvent or water has evaporated.

Applying films that are too thin may reduce durability, weather resistance, and overall service life. Excessively thick films can create their own problems, including extended dry times, mud cracking in high-build coatings, sagging, or solvent entrapment in certain systems. Monitoring film thickness during application helps ensure compliance with specification requirements and improves long-term coating performance.

The condition of spray equipment has a direct impact on finish quality and application consistency. Spray tips gradually wear during use as abrasive pigments pass through the orifice at high pressure. As the tip wears, the orifice enlarges, increasing material output and distorting the spray pattern. A worn tip can result in uneven film build, increased overspray, and higher material consumption. Regular inspection and replacement of spray tips helps maintain consistent application performance. Other equipment components should also be inspected routinely. Clean filters help prevent clogging and pattern distortion, while properly sized hoses maintain stable pressure delivery. Pump packings and seals should also be maintained to ensure consistent material flow.

Material temperature and viscosity can further influence spray performance. Coatings stored in cold conditions may become thicker, requiring slightly higher pressure for proper atomization. Allowing material to reach moderate temperatures before spraying can help improve flow and atomization quality.

Key Takeaways

Airless spray application offers significant productivity advantages, but consistent results depend on proper setup, technique, and equipment maintenance. Optimizing spray pressure, selecting the appropriate tip size, maintaining proper spray distance, and controlling film thickness all contribute to improved finish quality and coating performance.

By carefully balancing these factors, contractors can reduce overspray, improve transfer efficiency, and ensure coatings are applied at the correct film thickness. Proper airless spray optimization not only improves appearance but also helps coatings achieve their intended durability and performance on both residential and commercial projects.

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