TechTip R1 Cold-Weather Roof Coating

The application of elastomeric protective coatings applied by roller application or by high pressure airless spray requires basic personal protection equipment for the installer and hose tender. This equipment should include; disposable coveralls, fabric gloves fully coated with butyl, PVC, or neoprene, NIOSH-approved air purifying respirator with combination organic vapor/particulate cartridges, and chemical safety goggles. It is important that the installers be trained in the safe use of airless high-pressure spray equipment and first aid procedures associated with this equipment. Pumps, delivery hose, and gun/tips require start-up, shut-down, and storage procedures like foam application equipment to prevent damage to these components and operators.

The definition of "cold weather" with regard to applying elastomeric coatings is 55°F and dropping. This condition is not dreadfully cold but when applying elastomeric coatings, it can be a starting point where it becomes difficult to apply and optimum results can be sacrificed.
This discussion will group the three most popular coatings, acrylic, silicone, and polyurethane, as all coatings have similarities when being applied in cold weather conditions.
When applying coatings, the goal is to provide a continuous, uniform, fully cured dry film or membrane which is free of voids, pinholes, surface blisters and membrane cellularity with good adhesion to the substrate.

The above can only be achieved when the coating material is applied to a clean and dry surface. Furthermore, the temperatures of the substrate, air and coating material must be high enough to provide the heat necessary to evaporate volatiles (solvent or water) and/or effect the appropriate curing action (coalescence, moisture activation or reaction) before the coating membrane is affected by dew, rain or other detrimental conditions.

Viscosity and Temperature
A viscosity range of 98 Ku to 110 Ku (Krebs units) (1500 to 2250 centipoise) is a good sprayable range. As the temperature drops the coating viscosity increases disproportionately.
Increasing pump pressure, output capacity and hose diameter are generally required to compensate for higher viscosity. For every 18°F decrease in material temperature, the viscosity of coatings may double.

Material Storage and Handling
Job site storage of coating materials can become critical during cold weather. Ensure that coatings are ordered, delivered and stored on the jobsite in insulated or heated trailers. Frozen coatings may not be useable even when heated. Some coatings can experience phase separation, develop crystals or freeze at cooler temperatures. Consult the manufacturer should these conditions develop.

Pumping and Spraying
Viscosity and Atomization: Regardless of the type coating being used it must be pumped with sufficient pressure to be atomized and sprayed. When working under cold conditions, the viscosity of the coating materials will increase and the create losses in pressure and spray pattern. The spray equipment must be sized to accommodate these conditions.

Supply: As temperature drops and viscosity increases it is very important that a constant supply of material be fed to the coating pump. A siphon hose and pipe which generally works in warmer weather conditions will not adequately feed high output coating pumps in cooler weather. It is recommended that a 5:1feeder pump with minimum ¾-inch hose be used to supply the coating pump.

Coating Pumps: In general terms, high output coating pumps are defined by maximum pressure (psi) and gallons pumped per minute (gpm). The higher the output and pressure of the equipment the easier it will be to pump coatings in cooler weather.

- 30:1 ratio, maximum pressure with 100 psi pressure is 3000 psi
- 45:1 ratio, maximum pressure with 100 psi pressure is 4500 psi
- 56:1 ratio, maximum pressure with 100 psi pressure is 5600 psi

The above noted air driven pumps are also supplied in hydraulic driven motors with the same ratios, pressure, and material delivery systems.

High Pressure Hose: Coating hose diameter and length affect the pressure at the spray gun: long, narrow hoses may not provide sufficient pressure (especially when material temperature is cold, and viscosity is high) to properly atomize the coating. When purchasing coating hose ensure that the hose is rated for the maximum capacity of the coating pump. Higher solids coating materials like silicone and some moisture cure polyurethane coatings, even during warm periods, require minimum ½-inch hose and, with smaller ratio pumps (30:1), may be limited to 200-foot hose length. It is not uncommon to run ¾-inch hose for 100 feet or more when hose requirements exceed 300 feet. A 3/8-inch whip hose 3 to 4 feet in length may still be used just before the gun. As a rule, using 3/8-inch coating hose during cold weather will not work.

Hoses should be handled and stored to prevent kinking. It is recommended that when coating work is complete that 50% - 70% of the static pressure be bled-off. The residual pressure left in the hose reduces the chance of kinking the hose when rolling it up. Damaged or kinked hose sections should be replaced immediately. When using flammable solvent-based coatings it is imperative that the coating equipment be grounded to prevent any static electricity ignition sources.

Spray Gun and Tips: High pressure spray guns designed for high output are basic requirements during warm or cold weather. Make sure the coating gun is designed for the maximum pressure capacity of the coating pump. Tip size can be changed to adapt to more viscous materials along with the coating pump's pressure settings. When the coating becomes more viscous a smaller tip size may be required to atomize and break the coating up into sprayable particles.

Application Techniques
Coatings installed in cold temperatures may result in uncured or poorly cured coating, blisters, cellular film (cottage cheese), and pinholes. During cold weather and shorter daylight times, apply coatings in thinner coats which have faster cure times. Additionally, use darker colors for the base coat applications as this will help them cure more quickly in cooler temperatures as well as providing a warmer surface which aids in curing sub-sequent coats. A white topcoat may be especially slow to cure in cold temperatures; stop production early in the day to allow 3 to 4 hours of sunlight on the white-coated surface to skin or dry.

In the most severe cold conditions, acrylic coatings, if not allowed sufficient time to allow water to evaporate and the surface to skin may freeze at night leaving a glazed cracked surface and sometimes ruining the entire film. Other detrimental effects can be partial or total wash-offs caused by heavy dew or rain if the coating has not skinned. In colder climates the threat of wash-offs may persist for several days. Several manufacturers make "fast setting" coatings and these should be considered when using acrylic coatings in cold climates. The-se coatings, depending upon temperature and humidity may dry several hours faster than regular coating formulations but will still have trouble setting up under 50°F. Contact your coating manufacturer for specific drying times of their coatings.

Coating heaters are available but check with the coating and equipment manufacturer before using on specific coating products. In many areas of the country, natural gas and propane fired heating systems may be in the attic space. These gas heating appliances draw in combustion air from and release combustion byproducts to the outdoors.

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