

Acrylic Coatings in Cold Climates

PRODUCTS INTERNATIONAL

TECHNICAL BULLETIN

Acrylic coatings will provide many years of service to a home or building when properly applied and maintained. The service life of acrylic coating can be shortened if the moisture on and in the wall is not controlled, especially in cold weather. In fact, an abundance of moisture in the wall assembly combined with repeated cycles of freezing and thawing is the primary cause of exterior coating damage and failure. Fortunately, there are ways to mitigate the possibility of coating failure in this type of harsh environment.

Moisture control is one of most basic but important requirements of a properly designed and constructed wall assembly. Without moisture control, problems such as degradation of moisture sensitive construction materials, mold growth, poor indoor air quality, and coating failure can result. The basic principle for dealing with this problem is quite simple, but is not necessarily easy to accomplish: control the exterior and interior moisture.

Exterior Moisture Control

Proper construction and maintenance will eliminate most exterior water problems. Proper flashing and sealing is critical to prevent moisture from entering the wall. All potential leak sources such as windows and doors must be properly protected with flashings that divert water to the exterior and away from the walls. Also, penetrations through the wall, such as hose bibs or electrical boxes, should be completely sealed with quality sealant materials, then inspected and maintained throughout the life of the finish. Refer to the sealant manufacture for additional information on installation and maintenance.

External moisture problems often occur when water is held on the surface, such as below roof valleys and corners where rain runoff from the roof wets the side wall excessively, below horizontal roof edges and roof valleys where ice dams develop, or where snow accumulates against the wall. Kick-out flashings should be designed to direct water away from the running down the wall's surface. Ice dams can be reduced or eliminated by adequate insulation in attics and by proper attic ventilation.

Proper exterior maintenance is important to moisture control. The acrylic finish should be regularly cleaned to remove all dirt, oil stains, and water deposits/accumulations on and around the walls. Also, there should be frequent maintenance of roofs and walls to prevent moisture from entering the wall cavity.

Interior Moisture Control

Inside moisture in the form of water vapor can also destroy acrylic coatings on the outside of a building by diffusing into the walls and condensing. Much of the water vapor inside is a result of occupant activity such as cooking, dishwashing, clothes dryers, bathing, and respiration, which cumulatively can produce approximately three gallons of water per day in a typical house. Additional water vapor sources are humidifiers, unvented gas heaters, and moisture moving into the living quarters from crawl spaces and wet basements. If the inside surface of all exterior walls does not have a vapor barrier or if the vapor barrier is improperly installed, water vapor passes into the walls during cold winter weather and condenses to a liquid. Interior water vapor can also move into the attic space where it condenses on the attic side of the roof decking and eventually works it way down the side walls. This moisture can damage the acrylic coating by wetting it from the back side, which can result in blistering and delamination. In very cold weather, the moisture may freeze in the wall and then melt in warm weather. The repeated freezing and thawing can severely damage the finish.



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To deal effectively with interior moisture, the process of condensation must be understood, and ultimately, controlled. Water vapor moves from areas of high vapor pressure to low and from warm to cold temperatures. During winter months in cold climates, warm interior air (high vapor pressure) moves towards drier, colder outdoor air (low vapor pressure). This pressure differential drives moisture into the wall where the water vapor can condense if it comes in contact with a cold enough surface. The temperature at which water vapor in air condenses is called the dew point.

Condensation is rarely a problem in old, drafty buildings because of the high air-exchange rates from air leakage that allows water vapor to travel easily to the outside, so the vapor pressure differentials never develop across the walls. With the advent of modern, airtight, highly insulated buildings, it has become increasingly important to consider water vapor diffusion characteristics and the problem of condensation in the modern house or building. There are several ways to minimize the risk of condensation caused by water vapor diffusion:

- **Provide a vapor retarder on the interior of the wall in cold climates.** This is the traditional method of preventing condensation. The vapor retarder restricts movement of water vapor by diffusion, thereby minimizing the amount of water vapor from the interior that gets into the wall.
- **Lower the interior relative humidity.** Typically, as the relative humidity of the interior air is lowered, the condensation potential of a building diminishes. This can be achieved with dehumidifiers or venting excess humidity through openings. Of course, there is a practical limit to how low the relative humidity can get before the occupants will start to feel uncomfortable.
- **Utilize exterior insulation outside of the sheathing.** Exterior insulation can move the dew point to outside the wall by increasing the temperature of the materials behind the insulation.

Conclusions

The control of moisture entering the wall from the outside and inside is critical to preventing damage to the wall components, including the acrylic finish. The proper design and maintenance of the walls as described in this document will help to keep the finish beautiful for many years.

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