



Effects of Acid Deposition on Wood

Since acid deposition increases the rate of deterioration of unpainted wood, it can also affect the performance of paint applied to this weathered wood. In tests conducted near Madison, Wisconsin, smooth-planed wood was allowed to weather before painting. Exposure for as little as 2 weeks shortened the service life of the subsequently applied paint. The paint bond was weak and the paint eventually peeled. Acid concentration in rain near Madison tends to be much lower than that found in many other areas of the United States. High acid concentration would tend to produce more surface degradation and thus form a weaker paint bond. In any case, wood should be painted as soon as possible after it is installed outdoors.

Researchers at FPL found that sulfur dioxide (one of the precursors to acid deposition) diffuses through paint coatings very rapidly and can be detected in the wood directly under the paint. Consequently, they studied whether acidic conditions could deteriorate the wood under paint, as these conditions affect unpainted wood.

In one test, painted wood was subjected to acidic conditions and exposed outdoors for 3 years. The specimens were dipped in sulfurous, sulfuric, and nitric acids as well as a combination of sulfuric and nitric acids (50/50). During the summer, the specimens were dipped in acid for several hours before sunrise, then exposed at 45° facing south. This dip cycle was repeated daily. During the winter, the specimens were subjected to the same exposure conditions (45° facing south) but were not dipped in acid. Control specimens were dipped in deionized water.

Over the 3 years of exposure, no difference in paint bond strength could be found between the specimens dipped in deionized water and those dipped in acid. However, the acidic conditions did affect the surface of paint that contained a large amount of calcium carbonate. The acid eroded the paint, similar to the erosion of marble building facades and statues in areas with acid rain.

In summary, acid deposition increases the rate of deterioration of unpainted wood. Consequently, wood should be painted as soon as possible after it is installed outdoors. Acid deposition does not affect wood that has been painted before exposure. Paint that contains calcium carbonate filler erodes faster than paint without this filler.

Reference

Williams, R.S. 1990. Effects of acidic deposition on materials. Report 19. Acidic Deposition: State of Science and Technology, Vol. III, National Acid Precipitation Assessment Program. Washington, DC: Superintendent of Documents, Government Printing Office.

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