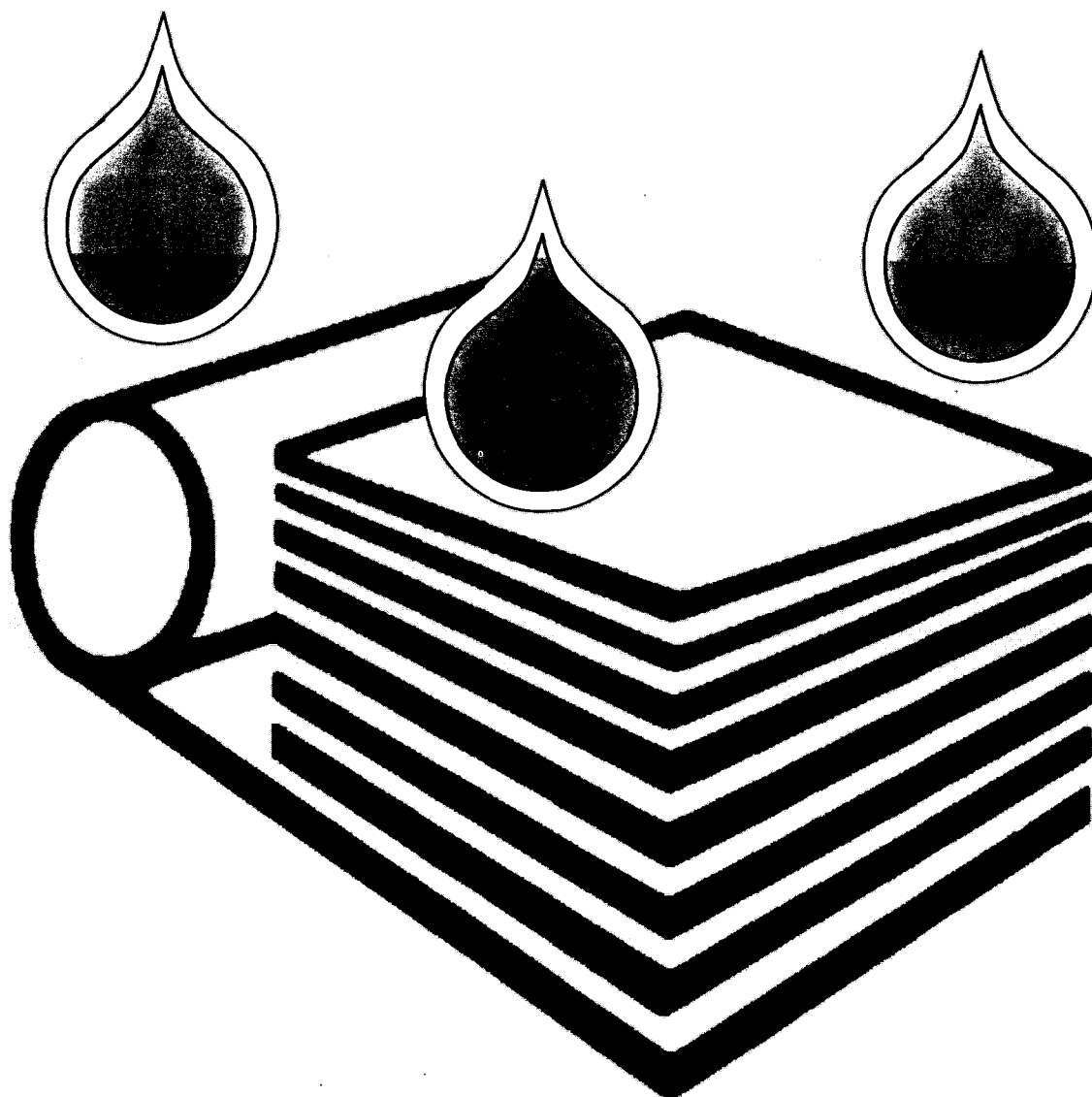


Guidelines for Minimizing Water Staining of Aluminum

The Aluminum Association
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Guidelines for Minimizing
Water Staining of Aluminum



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The Aluminum Association, based in Washington, DC with offices in Detroit, MI, represents U.S. and foreign-based primary producers of aluminum, aluminum recyclers and producers of semi-fabricated products as well as suppliers to the industry. Member companies operate almost 200 plants in North America and many conduct business worldwide.

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1. Introduction

Aluminum is naturally attractive and resistant to corrosion. Unlike most other metals, it takes care of itself. When exposed to dry or moist air it combines with oxygen to form a tough, transparent, protective oxide coating. In the presence of moisture, aluminum will not rust as will steel, but under certain conditions aluminum will stain. Such stains are usually found objectionable for esthetic reasons; they have no significant effect on strength

but may cause processing problems where additional surface finishing or fabrication is to be performed. Virtually all staining problems occur during shipping, handling, or storage. Some of the incorrect practices that result in water staining and ways to minimize or avoid the staining are discussed in this pamphlet. A summary of the measures to minimize water staining is provided in Appendix 1 and is reproduced as a handy wall chart, which is included with this pamphlet. Copies of the chart may be obtained separately from The Aluminum Association.

2. Causes of Water Stain

Aluminum and other metals can stain when water is trapped between wraps, sheets or other mating surfaces. If there is no air flow to remove the water, prolonged contact between the water and the metal causes a reaction between the two which results in water stain. Figures 1 and 2 show examples of water staining on aluminum coiled and flat sheet, respectively. There are two main sources of this water:

A. External Sources

Obvious sources are rain, snow and water leaks. Water coming in contact with the surface of the aluminum from sources such as a leaking tarp on a truck or a leaking roof in a storage area has the potential for causing water stain.

B. Moisture Condensation

This is the more complex of the two sources and therefore harder to understand and control. Air normally contains moisture in the form of invisible

water vapor. Relative humidity, expressed as a percentage, provides a measure of the amount of water vapor actually in the air compared to the total amount of water vapor that the air can hold. As the temperature of air increases, its capacity to hold water vapor increases.

Dew point is the temperature at which water vapor from the air begins to condense and is affected by the relative humidity and temperature of the air. The dew point can be determined from a chart (see Table 1), based on simple measurements of air temperature and relative humidity. The type of instrument used to measure (and log) temperature and relative humidity is shown in Figure 3. The older style of thermometers containing mercury should not be used because mercury from broken thermometers can corrode aluminum and other metals. Some suppliers of these instruments are listed in Appendix 2.A.



Figure 1 – Water Stain on Coil

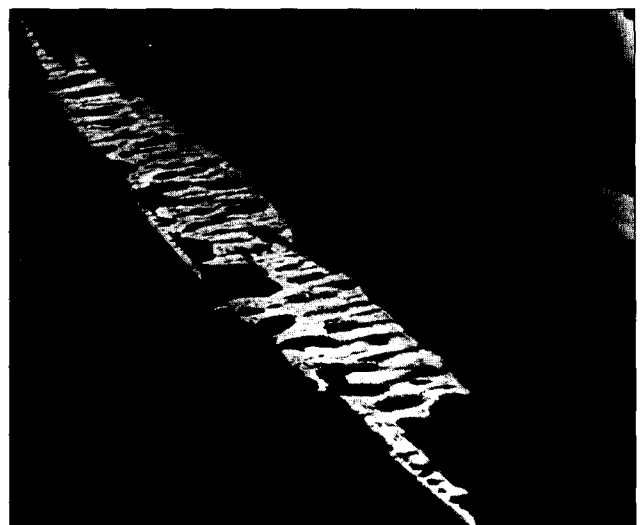


Figure 2 – Water Stain on Sheet