

LEAD INDUSTRIES ASSOCIATION, INC.

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PORCELAIN ENAMELED ALUMINUM COMES OF AGE*

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As producers of lead compounds, I believe you will find low temperature porcelain enamels on aluminum interesting, both as a useful construction material and as a rather promising market for lead; incidentally, one which removes lead forever from the scrap market.

It comes closer than any other material to providing the best of two worlds. Being completely inorganic, its colors and film integrity are not affected by ultraviolet light and weathering, yet it enjoys the toughness usually associated with organic coatings. It can be bent, cut or punctured with very little damage.

These low temperature porcelain enamels are essentially lead glass and are one of the most long-lasting materials. Archeologists, sifting for clues to past civilizations or hobbyists digging through old city dumps for antique bottles, attest to the durability of glass.

Porcelain enamel is glass which has been made opaque with titanium dioxide and given color by dispersing through it colored oxides of other metals. Assuming that these additions are well chosen and proportioned, they also contribute toughness. This is because the tiny cracks that grow readily through glass are stopped when they reach these inclusions. They act like the laminations in safety glass.

The ability to stand the abuse you just witnessed results also from the porcelain's remarkable adhesion to the metal and from the relatively thin coating that is necessary.

Because glass is inert, weathering does not progress beyond its surface. Therefore, thick coatings contribute nothing and only detract from flexibility. You can bend a glass fiber or weave it into a fabric -- but not if it is the diameter of a thermometer stem.

In this day of color, the appearance of a large building wall of bare aluminum, or for that matter of most metals, is drab and often variegated in shade. If atmospheric corrosion pits its surface, it becomes still less attractive. If the corrosion products are colored, they stain its surface. Even if they are not colored, as in the case of aluminum, the pits collect soils and become unsightly. Porcelain enamel supplies enduring color together with corrosion resistance.

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Look Ahead with Lead

Dean S. Hubbell

-2-

Porcelain Enameled Aluminum
Cones of Age

In addition to color, architects are currently seeking materials that allow freedom of form. This is a natural for aluminum because it can be extruded in a variety of shapes, cast as bas-relief and, in sheet form, be easily embossed. Thus, porcelain enamel on aluminum offers much as an architectural material.

Many technical difficulties have stood in the way of successful enameling of aluminum. For example, the relatively small difference between the maturing temperature of the enamel and the softening point of the aluminum introduces shape problems. Also, aluminum's vulnerability to alkaline attack has made it difficult to bring about its successful marriage to porcelain slips which are quite alkaline before they are fused to the metal.

Another troublesome problem has been color uniformity. It is quite a different matter to achieve color uniformity in an entire building wall of many thousand square feet than it is to enamel appliances or other objects of small area that are seen individually.

As with many other materials, its early history has not been completely rosy. Some aluminum alloys have proven unreliable for enameling. Early enthusiasts attracted enamellers who did not have adequate equipment or know-how. Some poor jobs have been produced and these have of course become well known among architects. We have run down the details of each of these bad jobs and have found that the faults have resulted from definite and avoidable mistakes. These "dogs" therefore have no implication upon the integrity of the material, except that it should be purchased from reliable sources.

It became clear that several things were necessary -- First; unquestioned proof of its enduring nature and -- Second; means by which purchasers can be certain of definite quality.

To accomplish this, responsible aluminum enamellers plus the aluminum companies, frit producers, and other suppliers organized the Aluminum Council of the Porcelain Enamel Institute. Its first accomplishments have been a weathering program conducted jointly with the Bureau of Standards and a performance specification. Specimens produced by the member enamellers, embracing a range of colors and glass, have been exposed at 5 sites around the country; Kure Beach, N. C., Washington, D. C., Los Angeles, Montreal, New York. They will be inspected and reported in Bureau publications. Incidentally, those specimens, in contrast to those of other materials, were sawed from large pieces to deliberately expose edges and reveal any damage.

It is, I believe, an indication of the sincerity of purpose of the Aluminum Council that these two activities were given first call on our budget and efforts. There has been a small amount of money left over and this residual will be devoted to promotional efforts as grandiose as \$4,000 will carry us!

The exhibits you see around this platform and the color slides of buildings have been solicited from the entire industry. The bulk of those available are of Vitralume, the H. H. Robertson Company's porcelain-on-aluminum. It may be of interest as evidence of the potential market in competent and responsible hands. Starting modestly about 8 years ago, the volume has increased steadily. We have presently produced somewhat over 800 buildings ranging from power plants through airline terminals and schools to shopping centers and manufacturing plants. Our

Dean S. Hubbell

-3-

Porcelain Enameled Aluminum
Comes of Age

complete records of these jobs provide opportunity for frequent checks. Last summer, most of the jobs were revisited by people from the various Sales Offices with checklists of questions inquiring into performance and how well satisfied were the owners. The survey was extremely gratifying!

Perhaps the color pictures of actual buildings or building elements will show what has been done with porcelain on aluminum and suggest other possibilities. As they are projected, I'll identify each and tell who produced it.