White Paint for Farm Buildings

characteristics of white paint prevent excessive heating of metal farm structures by radiation from sun, sky, environs

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Part of a galvanized steel storage building in the Imperial Valley was painted during the summer of 1955—to study the influence of white paint on the thermal environment within a steel building and under metal animal shades—as part of a research project concerning the modification of the environment to improve animal gains.

The long dimension of the storage building was oriented north and south. The exterior of the south end—and the south 20’ section—were painted with standard white house paint. The center 20’ section was painted with bone-white paint. The north section and north wall were left unpainted.

Temperatures of the different sections were measured with thermocouples attached to the inside surfaces. The temperatures of the painted surfaces were greatly reduced. At 1:00 p.m., when outdoor air temperature was 100°F, and the temperature inside the building was 102.5°F, surface temperature reductions were: 25.0°F, west wall; 42.6°F, west roof; and 41.0°F, east roof. There was little difference in the temperatures of the unpainted north end and the painted south end even though the south end was in the sun all day. In effect, the white paint put the south end in the shade. There was little difference in the effect of the two types of white paint.

With only one building available for study, it was not possible to compare directly the air temperatures in painted and unpainted buildings. However, it was possible to calculate from the test data what the air temperatures within two such unventilated buildings would be, based upon actual surface temperatures of the painted and unpainted sections. These calculations were made for three different sets of data. The air temperature in the white painted building

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Calculated Temperature Differences Within Unpainted and White Painted Galvanized Steel Buildings Based on Actual Surface Temperature Measurements of Painted and Unpainted Sections.

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<th>Date</th>
<th>Time</th>
<th>Inside air temperatures, °F</th>
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<td>6-26</td>
<td>2:00</td>
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Above—24-hour comparison of surface temperatures of painted and unpainted sections of steel storage building.

Below—Steel storage building 60' x 32' with sections painted white to test the effect of the paint on the thermal environment inside.
White paint was tested as a means of reducing the temperature of metal shades to reduce the heat load on animals under them.

Three flat, portable shade frames 8' x 8' x 4' high were covered with corrugated embossed aluminum roofing. One shade was left unpainted. White paint was applied to the top surface of the remaining two and the bottom of one of these was painted with black paint. The radiation characteristics of both surfaces of the shade material influence the radiation heat load on the animal. The characteristics of the top surface have a major influence on the temperature of the shade material; the emissivity of the bottom surface greatly affects the quantity of energy that will be emitted to the animal. In addition, the reflectivity of the bottom surface determines the quantity of incident energy from the ground that will be reflected back down to the animal.

Portable 8' x 8' x 4' high test shades. Black globe thermometers indicated the effect of paint in reducing the radiation heat load under the shades.

The third shade with the white top and black underside remained at about the same temperature as the shade with only the white top surface. However, because the black underside did not reflect energy from the ground back down to the animal, the radiant heat load under the white and black was lower than under the white shade and as much as 18 Btu per hour per square foot lower than under the unpainted shade.

The same advantages were found in painting galvanized steel shades—the surface temperature was reduced as much as 50°F by painting the upper surface white. In the tests, white painted galvanized steel shades showed an advantage over the unpainted aluminum shades.

These investigations are being continued with other building materials in order to evaluate their usefulness in protecting livestock and farm products from heat.