

# Color Lock™

## STAINLESS STEEL



- Coating System for Stainless Steel
- Excellent Edge Creep Back Resistance
- The Fluoropolymer Topcoat Resists Fading and Chalking

### Preliminary Data

AK Steel Color Lock™ Stainless Steel is a highly effective architectural material for applications requiring excellent corrosion resistance and color. Potential building construction applications include metal roofing, mansard roofs, fascias, soffits and specialty accent details.

### Color Lock System

The AK Steel Color Lock system is typically applied to AK Steel Type 430 Stainless Steel for architectural applications. The AK Steel Color Lock system consists of a fluoropolymer paint system applied to a clean, pretreated and primed stainless steel surface. The full system is applied in coil form.

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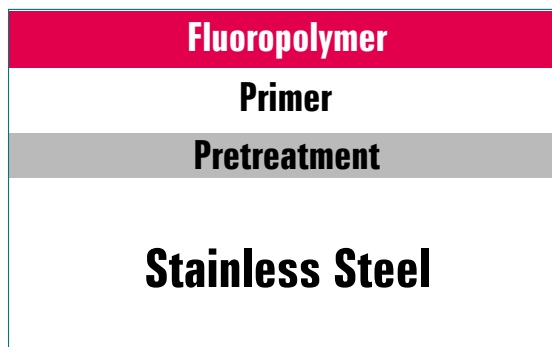
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**Figure 1**  
Color Lock System



## Product Description

AK Steel Color Lock Stainless Steel consists of a fluropolymer paint system applied to a clean, pretreated and primed stainless steel surface in coil form. The fluropolymer top coat is a Duranar® high-performance coating designed for architectural coil coating applications. The coating features excellent color retention and chalk, corrosion, chemical and pollution resistance as well as good flexibility and adhesion. A variety of stainless steel substrates are available, depending upon the requirements of the applications. The stainless steel substrate provides resistance to corrosion, blistering and creep back.

## Key Features

- The Color Lock system is available in a wide range of colors compatible with the Duranar color palette.
- The application of the system in coil form ensures excellent coating uniformity and quality.
- The Color Lock system is resistant to chalking and weathering.
- This new coating system meets cosmetic corrosion specifications and also provides good paint adhesion to the stainless steel substrate.
- No edge creepback as compared to painted Zn-Al coated steel.

## Available Forms

AK Steel supplies coils with the Color Lock System on type 430 and other stainless steel grades on request, and in thicknesses from 0.012" to 0.040" (0.304 to 1.016 mm) and widths up to and including 48" (1219 mm).

# PRODUCT DESCRIPTION

## Accelerated Corrosion Testing

### Figure 2

Cycle Corrosion Test



Color Lock 430



Painted Zn-Al Coated Steel

Scribed panels were exposed to the following six-hour cycles for 12 weeks:

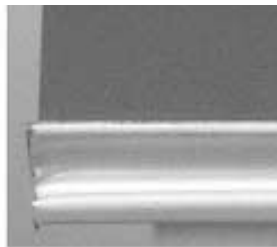
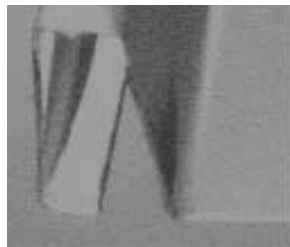
- 15 minute immersion in 5% salt solution
- drying for 20 minutes at 104°F (40°C) and 35% relative humidity
- 5 hours and 25 minutes of 85% relative humidity exposure at 140°F (60°C)

After six-weeks exposure, scribed painted Zn-Al coated steel samples showed extensive blistering up to 7/8" (22.2 mm) from the scribe mark. No paint blistering or delaminations were observed on Color Lock, even after 12 weeks. These photographs show results after six weeks exposure.

## Corrosion, Chemical and Pollution Resistance

### Figure 3

ASTM B117 Salt Spray Test



Standing Seam Color Lock panels were exposed to 5% salt fog for 5000 hours. There was no paint creep back from the edges. Small amounts of edge corrosion were observed on exposed cut edges after 3000 hours. Note, prepainted Zn-Al coated steel panels start showing rust after 1000 hours.

## Cyclic Salt Fog/UV Exposure Testing

Samples were exposed by an independent lab to alternating periods of one week in a fluorescent/condensation chamber and one week in a cyclic salt fog/dry chamber. The cycle consisted of the following:

- Fluorescent UV/condensation chamber
  - Four hours in UV at 140°F (60°C) using UVA 340 lamps.
  - 4 hours condensation at 122°F (50°C).
  - Repeat for one week.
- Transfer to cyclic salt fog/dry chamber.
  - One hour fog at ambient temperature (fog electrolyte 0.05% sodium chloride and 0.35% ammonium sulfate).
  - One hour dry off at 95°F (35°F).
  - Repeat for one week.
  - Return to fluorescent UV/condensation chamber and repeat. Total exposure time was three months.

Results showed no undercutting (blistering) or significant corrosion after three months. Similarly tested painted Zn-Al coated steel showed 0.047" (1.2 mm) undercutting at the scribe mark.

## Humidity and Water Soak Test

Painted panels (6" x 4") {152 x 102 mm} were cross-hatched and then exposed for 3000 hours to condensing humidity at 100°F (38°C). There was no paint removal on Color Lock 430 Stainless panels. Painted panels were soaked in water at 176°F (80°C) 3000 hours. No paint removal was observed.

## Acid Pollutants and Acid Rain Test

Color Lock Stainless Steel is resistant to acid pollutants tested as per ASTM D-1308 (in 10% muriatic acid for 15 minutes, in 20% sulfuric acid for 18 hours) and Kesternich (ASTM G87- sulfur dioxide cycle) test.

## Marine Atmospheric Exposure

### Tests at Kure Beach

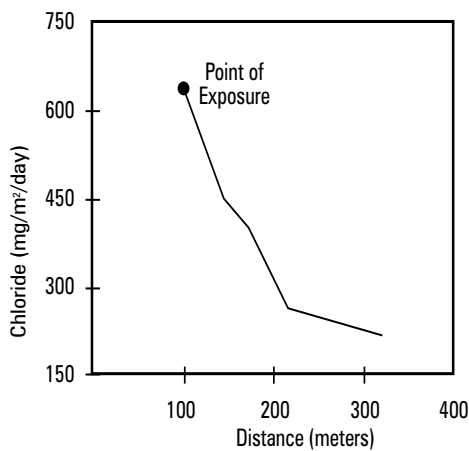
Samples of Color Lock 430 were exposed at Kure Beach, North Carolina, at the 25-meter lot for three months, six months and nine months. No blistering or corrosion was observed after nine months.



Figure 4 shows drop in the chloride levels as a function of distance from the ocean. Past data have shown that six-month exposure at the 25-meter lot is the same as 24-month exposure at the 250-meter lot.

**Figure 4**

Chloride Level Change as a Function of Distance from the Ocean in Kure Beach, NC.



**Figure 5**

One Year Severe Marine Exposure  
Creep Back



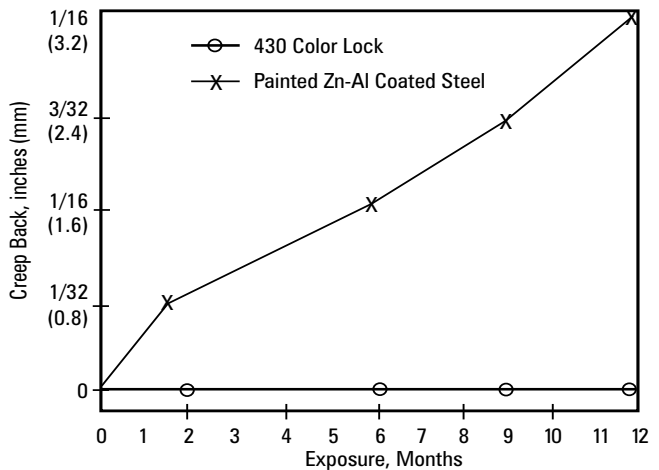
**Painted Zn-Al**



**Color Lock**

After exposure for twelve months at Kure Beach, NC (25 m lot), Color Lock 430 (bottom) exhibited no significant edge creep back. Painted Zn-Al coated steel (top) exhibited significant edge creep back. Figure 6 shows creep back as a function of months of exposure.

**Figure 6**

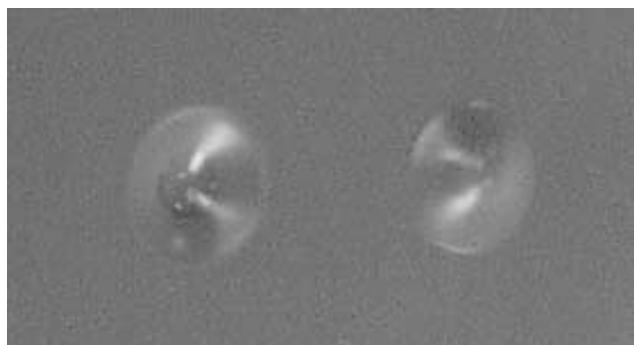


## Adhesion and Flexibility

Color Lock 430 samples (1.5" {38 mm} wide) were tested as per ASTM D-414-83 (also called the "T-Bend). No cracking or tape removal of film was observed up to a 1-T bend for a 0.020" (0.508 mm) thick substrate.

**Figure 7**

Impact and Reverse Impact Test



Panels were tested as per ASTM D-2794-93 using a two-pound load. Both the reverse and direct impacts were done at 60 in-lb (shown above), 80 in-lb, and 160 in-lb. No paint removal was observed.

## Mechanical Properties

**Table 1**

Typical Mechanical Properties – Substrate Material

Property	Type 430
UTS, ksi (MPa)	70 (483)
0.2% YS, ksi (MPa)	45 (310)
Elongation, % in 2" (50.8 mm)	25
Hardness, Rockwell	B85

## Physical Properties

**Table 2**

Typical Physical Properties – Substrate Material

Property	Type 430
Density, lbs/in <sup>3</sup> (g/cm <sup>3</sup> )	0.28 (7.74)
Thermal Conductivity at 212°F (100°C) BTU/hr/ft <sup>2</sup> /ft/°F (W/m•K)	15.1 (26.1)
Coefficient of Thermal Expansion in/in/°F (µm/m•K)*	5.8 x 10 <sup>-6</sup> (10.4)
Modulus of Elasticity ksi (MPa)	29 x 10 <sup>3</sup> (200 x 10 <sup>3</sup> )

\* Note: the coefficient of thermal expansion of ferritic stainless steels is similar to the coefficient of thermal expansion of carbon steel which is typically 6.3 x 10<sup>-6</sup> in/in/°F (11.3 µm/m•K)

## Chemistry

**Table 3**

Composition – Substrate Material ASTM A240

Element	Type 430
Carbon	0.12 max.
Manganese	1.00 max.
Phosphorus	0.040 max.
Sulfur	0.030 max.
Silicon	1.00 max.
Chromium	16.0 - 18.0
Nickel	0.75 max.
Iron	Balance

# AK STEEL COLOR LOCK STAINLESS STEEL

## Color Lock Test Summary

	Color Lock Applied to AK Steel Type 430 Stainless Steel	Painted Zn-Al Coated Steel	Painted G90 Hot Dip Galvanized Steel
Cyclic Salt Corrosion Test	No blistering or delamination.	Extensive blistering up to 7/8" (22.2 mm) from scribe mark.	Not Available
ASTM B117 Salt Spray Test	No paint edge creep back after 5000 hours. Slight corrosion on cut edges after 3000 hours.	Rust appears after 1000 hours.	Passed 1000 hours (less than 1/8" (3.2 mm)) creepage from scribe) (from published data)
Cyclic Salt Fog/UV Exposure – ASTM D5894-96.	No blistering or significant corrosion after 3 months.	0.047" (1.2 mm) undercutting at scribe mark. (from published data)	0.051" (1.3 mm) undercutting at scribe mark. (from published data)
Humidity Test	Passed 3000 hours.	Not Available	Passed 1500 hours. (from published data)
Flexibility T-Bend	Passed 1T	Passed 2T (from published data)	Passed 2T (from published data)
Marine Atmospheric Exposure	12-months exposure – no blistering or corrosion observed. No paint edge creep back.	12-months exposure 1/8" (3.2 mm) creep back.	Typically 2 mm creep back in 18 months.



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