

## **Rigorous Testing**

The American Society for Testing and Materials (ASTM Board) in collaboration with the Colored Pencil Society of America (CPSA) developed the ASTM D6901 standard for colored pencil lightfastness. Since November 2003, this standard has become the industry guideline that employs the most stringent measures for testing and rating the performance of lightfast colored pencils. Prismacolor Premier Lightfast Colored Pencils have been carefully formulated to meet this standard. Each color has been tested, qualified and assigned an ASTM rating that is prominently located on the barrel of every pencil for easy reference. In accordance with the ASTM D6901 standard, all Prismacolor Premier Lightfast Colored Pencils have a lightfast rating of either I or II.

## **ASTM Testing Methodology**

### **Testing Requirements**

**Substrate:** White, uncoated, neutral pH, buffered paper or board. Substrates with optical brighteners were excluded.

### **Methodology – Test Preparation**

Ten specimens of each color were prepared for testing. Each color was applied to a square of substrate measuring 1-1/8" x 1-1/8". Using constant pressure, firm even strokes of color were applied to each of the ten specimens. Three specimens of each color were exposed in each of the two test specimens following exposure. Three additional specimens were retained for use for a third exposure, if required. A cotton ball was used to remove any bloom that accumulated on the surface of the test specimen drawdowns. A spectrophotometer was then used to measure the color of each specimen. Three of the ten specimens were then set aside for Test Method A and three specimens were selected for Test Method B. Prior to exposure, all specimens were measure to ensure that the color differences among each set specimens were 4 or less CIELAB units.

### **Methodology – Testing Method A**

The first three test specimens were exposed to natural daylight filtered through glass. The specimens were sent to the Arizona Test site for exposure between September and May, as required by the ASTM D6901 standard. The specimens were placed in a window glass-covered Black Box containing a small fan to circulate the air. They were then exposed to natural daylight at a 45° angle to the horizontal. All specimens remained in the following test conditions until the total global solar (290 to 2500nm) radiation dose of 1260 MJ/m<sup>2</sup> incident on the glass was reached. Following the exposure, but prior to measurement, each specimen was gently wiped with cotton to remove any bloom.

### **Methodology – Testing Method B**

In the second test, three additional test specimens were exposed to 100% light from a xenon apparatus equipped with filters to simulate daylight through window glass in accordance with Practices G151 and G155 to each a radiant exposure of 510kJ/(m<sup>2</sup>.nm) measure at 340nm. The total spectral radiant energy of the xenon arc received by a test specimen is equivalent to 1260MJ/ m<sup>2</sup> of total spectral energy of glass-filtered daylight when the xenon arc radiant energy, measured at 340 nm, is 510kJ/(m<sup>2</sup>.nm). Following the exposure, but prior to measurement, each specimen was gently wiped with cotton to remove any bloom.

### **Analysis of Test Results**

The color differences between both set of specimens were evaluated before and after light exposure. The measurements were documented in accordance with Test Method D2244 which states the color change in total color difference units,  $\Delta E^* ab$ . The exposed and retained samples are evaluated per ASTM D6901.

### **ASTM Lightfast Rating Assignment**

In accordance with the ASTM D6901 guidelines, only colored pencils with a lightfast rating of I or II were deemed compliant with the standard.

Lightfast I – Colored Pencils that exhibit a mean color change of  $\Delta E^*_{ab} \leq 4$ .

Lightfast II – Colored Pencils that exhibit a mean color change of  $\Delta E^*_{ab}$  greater than 4 and  $\leq 8$ .