



U.S. Department
of Transportation
**Federal Aviation
Administration**

Advisory Circular

**Subject: PAINTING, MARKING, AND LIGHTING
OF VEHICLES USED ON AN AIRPORT**

**Date: 7/11/86
Initiated by: AAS-120**

**AC No: 150/5210-5B
Change:**

1. **PURPOSE.** This advisory circular (AC) provides guidance, specifications, and standards, in the interest of airport personnel safety and operational efficiency, for painting, marking, and lighting of vehicles operating in the airport air operations area.
2. **CANCELLATION.** AC 150/5210-5A, Painting, Marking, and Lighting of Vehicles Used on an Airport, dated January 30, 1985, is cancelled.
3. **APPLICATION.** The specifications, standards, and guidance contained herein are recommended by the Federal Aviation Administration for vehicles operating in the airport air operations area. For vehicles funded under Federal airport grant assistance programs the specifications and standards specified herein are mandatory. These specifications and standards are identified by boldface.
4. **SOURCES OF PUBLICATIONS REFERRED TO IN THIS ADVISORY CIRCULAR.**
 - a. American National Standards Institute, Inc. (ANSI), 1430 Broadway, New York, NY 10018.
 - b. American Society for Testing & Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103.
 - c. The Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
 - d. Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096.
5. **DEFINITIONS.** The following definitions apply for purposes of this AC:
 - a. **Vehicle** - All conveyances, except aircraft, used on the ground to transport or assist persons, cargo, equipment or those required to perform maintenance, construction, service, and security duties.
 - b. **Air Operations Area (AOA)** - An area of the airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft.
 - c. **Airfield Service Vehicles** - Those vehicles routinely used in the AOA for service, maintenance, or construction, such as snowblowers, snowplows, maintenance trucks, tractors, etc.
 - d. **Aircraft Support Vehicles** - Those vehicles routinely used in the AOA to support aircraft operations, such as aircraft tow tugs, baggage/cargo tractors or trucks, air-conditioning trucks, aviation fuel tankers, etc.

e. Other Vehicles. Vehicles not routinely used in the AOA, such as construction vehicles, etc., but exclusive of ambulances, aircraft rescue and firefighting vehicles, and airport security vehicles.

6. VEHICLE PAINTING.

a. Ambulances. White, orange, and blue. Ambulance vehicles are painted in accordance with Federal Specification KKK-A-1822B, Ambulance Emergency Medical Care Surface Vehicle, dated June 1, 1985. The exterior surface including the wheels should be a paint manufacturer's standard gloss white. The ambulance colors orange (stripe or band) and blue (markings) are the specified Orange and Blue in American National Standards Institute (ANSI) Z53.1-1979, Safety Color Code for Marking Physical Hazards.

b. Aircraft Rescue and Firefighting Vehicles. Yellowish-Green is the vehicle color standard. This color provides optimum visibility during all light levels encountered during a 24-hour day and under the variations of light as a result of weather and seasonal changes. Color specifications are in accordance with appendix 1.

c. Airfield Service Vehicles. Chrome Yellow is the vehicle color standard. When vehicles are equipped with bumper bars 8 inches or more in depth, the bars should be painted in alternate stripes 4 inches in width of Chrome Yellow and black inclined 45° to the vertical. Color specifications are in accordance with appendix 1.

d. Aircraft Support and Airport Security Vehicles. Any color or combination of colors other than Yellowish-Green or Chrome Yellow. The bumper bar recommendation in paragraph 6(c) also applies.

e. Other Vehicles. Any color or combination of colors.

7. VEHICLE MARKING.

a. Ambulances. Ambulances are marked in accordance with Federal Specification KKK-A-1822B.

b. Aircraft Rescue and Firefighting, Airfield Service Vehicles, Aircraft Support, and Airport Security Vehicles. Sponsor-owned vehicles should display on each side and on the roof (the hood should be used if the vehicle has no roof) an identification number. Side numbers will be a minimum of 16 inches in height and conspicuously located. Roof numbers will be a minimum of 24 inches in height and affixed with their bases toward the front of the vehicle. The identification numbers should provide sharp color contrast to the vehicle color. To further improve night-time recognition of vehicles, a minimum 8 inch wide horizontal band of high gloss white paint or reflective material may be used across the vehicle's surface. In addition to the identification numbers, sponsor-owned vehicles should display either the name of the airport or, if one is available, the airport insignia.

c. Other Vehicles. Vehicles other than those that routinely traverse any portion of the AOA under air traffic control (ATC) should be provided with a flag on a staff attached to the vehicle so that the flag will be readily visible. The flag should be at least a 3 foot square having a checkered pattern of International

Orange and white squares at least 1 foot on each side (see appendix 1 for the fabric color specification). In lieu of a flag, such vehicles may either be escorted by a vehicle properly equipped to operate in the AOA or be in constant two-way radio communication with ATC. At airports without air traffic control facilities, flags should be provided on these vehicles.

8. VEHICLE LIGHTING. The standard for identification lighting of vehicles routinely operating in the AOA is an appropriately sized flashing or steady burning beacon, mounted on the uppermost part of the vehicle such that it is conspicuous from any direction including from the air. Color specifications for vehicle identification beacons are in accordance with appendix 2. Vehicles not routinely operating on the AOA should be identified during periods of low visibility by a beacon, or be escorted by a properly lighted vehicle.

a. Characteristics. Flashing and steady burning beacons will have:

(1) low-intensity lighting with an upper limit of 400 candelas (effective) to avoid damage to night vision. The minimum effective intensity range in the horizontal plane should be at least 40 candelas, but not more than 400 candelas;

(2) 360° azimuth (horizontal) coverage;

(3) peak intensity from 0° to 10° above the horizontal and reduced intensity to 1/10 of peak intensity from 10° to 15° above the horizontal; and

(4) for flashing beacons, a flash rate of 75 ± 15 flashes per minute.

b. Color.

(1) Ambulances. In accordance with Federal Specification KKK-A-1822B.

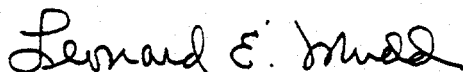
(2) Aircraft Rescue and Firefighting Vehicles. Red or a combination of red-and-white flashing beacons.

(3) Airfield Service Vehicles. Yellow flashing beacons.

(4) Aircraft Support Vehicles. Yellow or red steady burning beacons. Steady burning beacons are a means of distinguishing apron and aircraft support vehicles from airfield service vehicles.

(5) Airport Security Vehicles. Signal Blue or a combination of red-and-Signal Blue flashing beacons.

(6) Other Vehicles. Yellow flashing beacons.



LEONARD E. MUDD
Director, Office of Airport Standards

APPENDIX 1. COLOR SPECIFICATIONS

1. SPECIFICATIONS. Colors specified in table 1 are in terms of the CIELAB international system of color specification. For a description of this system, see American Society for Testing & Materials (ASTM) D 2244.

	Chrome Yellow			Yellowish-Green			International Orange		
Usage	Vehicle Paint			Vehicle Paint			Flag Fabric		
CIELAB DATA	L*	a*	b*	L*	a*	b*	L*	a*	b*
Centroid Color	72.8	24.4	77.6	78.3	-10.2	80.4	45.0	53.5	52.0
Point 1	72.8	31.8	82.9	78.3	-9.0	92.0	45.0	61.4	47.8
Point 2	72.8	25.5	66.7	78.3	-7.6	73.2	45.0	53.9	41.4
Point 3	72.8	18.0	69.3	78.3	-11.0	69.3	45.0	43.5	53.4
Point 4	72.8	22.4	86.0	78.3	-13.4	86.2	45.0	49.7	60.4
Light Limit	77.8			83.3			49.9		
Dark Limit	67.8			73.3			41.6		
Max ΔE	11.1			11.7			10.7		

Table 1. Specification for vehicle and flag colors

2. COLOR TESTS. Acceptable colors are those that meet the gloss rating test and either a visual or an instrumental color test. A description of these tests follows.

a. Gloss Rating Test. This test is performed in accordance with ASTM D 523 on a paint sample of the color to be applied on the vehicle. An acceptable color sample is high gloss with a minimum gloss rating of 70 units, for 60° geometry.

b. Color Test Methods.

(1) Visual. This test is performed on a paint sample of the color to be applied on the vehicle and compares it to the appropriate color tolerance chart for the recommended color. The color tolerance charts that show the recommended central color and the three tolerance limits of hue, value, and chroma as shown in figure 1 are available 1/. The color sample needs to match as close as possible

1/ Color tolerance charts for Chrome Yellow, Yellowish-Green, and International Orange, have been made available for FAA regional airport inspectors and key potential users in the aviation safety equipment industry. Color tolerance charts for Ambulance Orange and Ambulance Blue are available from the Research and Special Programs Administration, Materials Transportation Bureau, Information Service Division (DMT-43), 400 7th Street, SW., Washington, DC. 20590.

7/11/86

the recommended central color and still be within the three tolerance limits. Verification requires placing the color sample on a horizontal surface with the color tolerance chart over it so that the color sample appears through the color tolerance chart apertures. The sample has to be lighted by either a north window (light direction) or an appropriate artificial light source. Complete testing directions are printed on the color tolerance chart. Refer to ASTM D 1729.

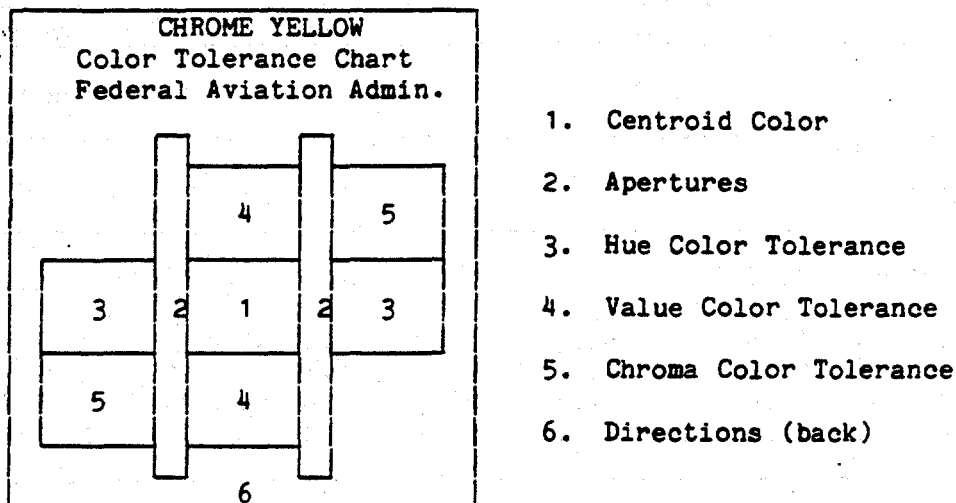


Figure 1. Typical color tolerance chart

(2) Instrumental. This test requires a color sample, table 1, and either a colorimeter or spectrophotometer which provides color sample measurement readouts in CIELAB L^* , a^* , and b^* data. Data in table 1 are for the appearance of the colors under CIE Illuminant D 65. Visual observations made under paragraph 2(b)(2)(i) should be made using a similar illuminant, and instrumental measurements made according to paragraph 2(b)(2)(ii) should have data computed for this illuminant, per ASTM D 1729 and ASTM D 523. The test method follows.

(i) Plot the Centroid Color using the a^* and b^* CIELAB coordinate data from table 1 on graph paper. Plot and connect points 1 thru 4 from the same table to form a quadrilateral; noting that the Centroid Color is within this figure. See figure 2 for the plot of all three color specifications.

(ii) Perform color sample measurements by using a colorimeter or spectrophotometer to obtain CIELAB L^* , a^* , and b^* data measurements.

(iii) An acceptable color is one that meets: the chromaticity requirements of the color sample's a^* and b^* CIELAB coordinate data by falling within the quadrilateral; the L^* data lightness requirement by falling within the range defined by the Light and Dark data of table 1; and the total color difference (ΔE) by not exceeding the limits in table 1 when the CIELAB data are computed in the following formula:

$$\Delta E = (\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2})^{1/2}$$

where ΔL^* , Δa^* , and Δb^* values are the differences between those values for the Centroid Color in table 1 and those of the color sample measurements.

7/11/86

AC 150/5210-5B
Appendix 1

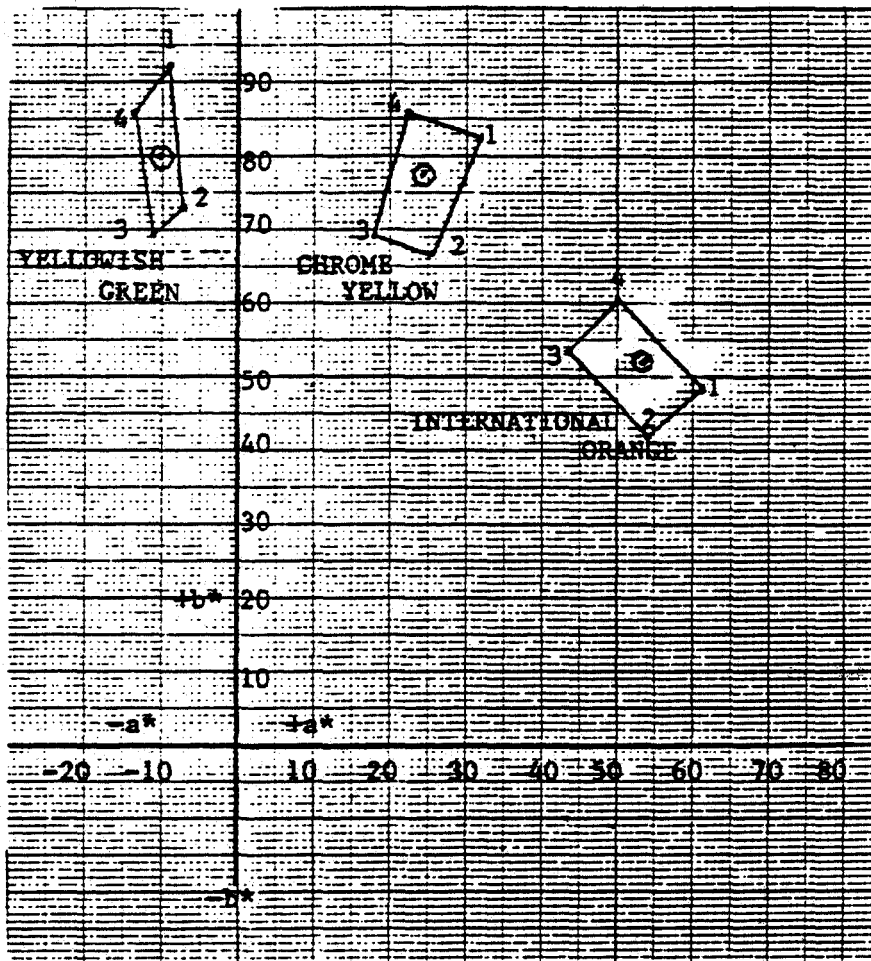


Figure 2. Plot of all color paint specifications

APPENDIX 2. COLOR SPECIFICATIONS FOR VEHICLE IDENTIFICATION BEACONS

1. SPECIFICATIONS. The latest edition of Society of Automotive Engineers (SAE) Standard J578, Color Specification for Electric Signal Lighting Devices, defines the acceptable color boundary limits of emitted red, white, Signal Blue, and yellow light. This standard applies to the overall emitted color of light from the device in lieu of emitted light from any small area of the lens. The given boundaries are expressed in terms of the standard observer and coordinate system adopted by the Commission of Illumination (CIE). The color of emitted light should fall within the following CIE Boundary Equations (see figure 1):

a. Red.Purple boundary $y = 0.98 - x$ Yellow boundary $y = 0.33$ b. White (Achromatic).Yellow boundary $x = 0.50$ Blue boundary $x = 0.31$ Green boundary $y = 0.44$ and $y = 0.15 + 0.64x$ Purple boundary $y = 0.38$ and $y = 0.05 + 0.75x$ c. Signal Blue.Green boundary $y = 0.32$ White boundary $x = 0.16$ and $x = 0.40 - y$ Violet boundary $x = 0.13 + 0.60y$ d. Yellow (Amber).Red boundary $y = 0.39$ White boundary $y = 0.79 - 0.67x$ Green boundary $y = x - 0.12$

7/11/86

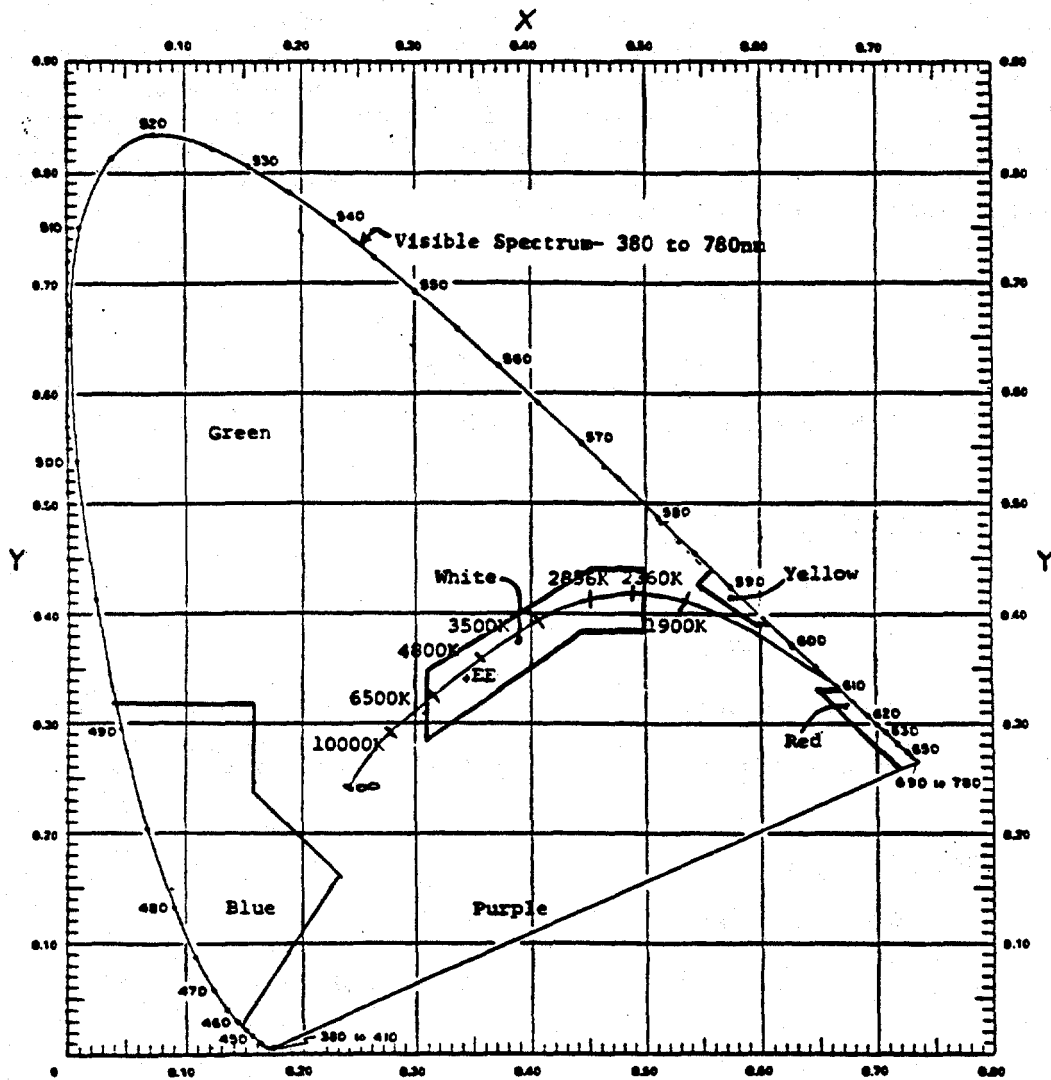


Figure 1. CIE (x,y) chromaticity diagram showing visible spectrum and color boundaries for vehicle identification lights