



U.S. Department
of Transportation

Federal Aviation
Administration

Advisory Circular

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

Date: August 31, 2007

AC No: AC 150/5210-5C

Initiated by: AAS-100

Change:

1. PURPOSE. This advisory circular (AC) provides guidance, specifications, and standards for painting, marking, and lighting of vehicles operating in the airport air operations area (AOA). The approved lights, colors, and markings herein assure the conspicuity of vehicles operating in the AOA from both the ground and the air.

2. CANCELLATION. AC 150/5210-5B, *Painting, Marking, and Lighting of Vehicles Used on an Airport*, dated July 11, 1986, is cancelled.

3. APPLICATION. The FAA recommends the guidelines and standards in this AC for vehicles operating in the airport AOA. In general, this AC is not mandatory and does not constitute a regulation. However, use of these guidelines is mandatory for vehicles funded under Federal grant assistance programs. Mandatory terms such as "shall" or "must" used herein apply only to those who purchase vehicles using Airport Improvement Program (AIP) or Passenger Facility Charge Program (PFC) funds. Airport vehicles that do not meet this standard may be used until the vehicle is repainted or replaced.

4. PRINCIPAL CHANGES.

a. The following reference has been deleted:

(1) ANSI Z535.1. ANSI Z535.1 duplicates reference in KKK-A-1822E, *Federal Specification for the Star-of-Life Ambulance*.

b. The following references have been added:

(1) AC 150/5345-43, *Specification for Obstruction Lighting Equipment*.

(2) ASTM D 5531-05, *Standard Guide for the Preparation, Maintenance, and Distribution of Physical Product Standards for Color and Geometric Appearance of Coatings*.

(3) ASTM D 1164-02, *Standard Practice for Obtaining Spectrometric Data for Object Color Evaluation*.

(4) SAE J578 Revised JUL2002, *Color Specification* in Appendix B.

(5) FAA Engineering Brief #67, *Light Sources Other Than Incandescent or Xenon for Airport and Obstruction Lighting Fixtures*. The engineering brief contains the most current Light Emitting Diode (LED) FAA information.

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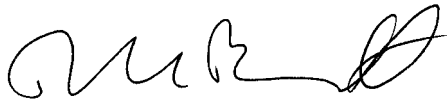
c. Updated test methods in Appendix A.

5. METRIC UNITS. To promote an orderly transition to metric units, this AC includes both English and metric dimensions. The metric conversions may not be exact equivalents, and until there is an official changeover to the metric system, the English dimensions will govern.

6. COMMENTS OR SUGGESTIONS for improvements to this AC should be sent to:

Manager, Airport Engineering Division
Federal Aviation Administration
ATTN: AAS-100
800 Independence Avenue, S.W.
Washington, DC 20591

7. COPIES OF THIS AC. The Office of Airport Safety and Standards is in the process of making ACs available to the public through the Internet. These ACs may be found through the FAA home page (www.faa.gov). A printed copy of this AC and other ACs can be ordered from the U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785.

A handwritten signature in black ink, appearing to read 'DLB', with a stylized flourish at the end.

DAVID L. BENNETT
Director of Airport Safety and Standards

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PAINTING, MARKING, AND LIGHTING OF VEHICLES USED ON AN AIRPORT

1. SOURCES OF APPLICABLE DOCUMENTS.

- a.** American National Standards Institute, Inc. (ANSI), 25 West 43rd St. 4th Floor, New York, NY 10036. Website: www.ansi.org
- b.** American Society for Testing & Materials (ASTM), ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshocken, PA 19428-2959. Website: www.astm.org
- c.** The National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, Massachusetts 02169-7471. Web site www.nfpa.org
- d.** The U. S. General Services Administration (GSA), Centralized Mailing List Services, 501 West Felix Street, Whse 9, South End P.O. Box 6477, Fort Worth, Texas 76115-6477. Website: www.gsa.gov
- e.** The Superintendent of Documents, U.S. Government Printing Office, 732 North Capitol St. NW, Washington, DC 20401.
- f.** Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001. Website: www.sae.org
- g.** FAA Advisory Circulars: U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Ave., Landover, MD 20785. Website: www.faa.gov
- h.** FAA Engineering Briefs: www.faa.gov

2. DEFINITIONS. The following definitions apply in this AC:

- a. Vehicle** - All conveyances, except aircraft, used on the ground to transport persons, cargo, equipment or those required to perform maintenance, construction, service, and security duties.
- b. Air Operations Area (AOA)** - The portion of airport which encompasses the landing, take off, taxiing and parking areas for aircraft.
- c. Airport Operations Vehicles** - Vehicles routinely used by airport operations personnel for airport inspection and duties associated with airfield operations (such as airfield condition reporting, and Incident Command) on the AOA and Movement Area.
- d. Airport Security Vehicles** - Vehicles that are authorized in the AOA for security purposes, as needed (e.g. police cars).
- e. Airfield Service Vehicles** - Vehicles that are routinely used in the AOA for airfield service, maintenance, or construction (e.g. snow blowers, snowplows, maintenance trucks, and tractors).
- f. Aircraft Support Vehicles** - Vehicles that are routinely used in the AOA to support aircraft operations (e.g. aircraft pushback tractors, baggage/cargo tractors or trucks, air

conditioning and aviation fuel trucks). These vehicles are typically owned by airlines, vendors or contractors and are not eligible for Federal funding.

g. Low Visibility - Prevailing visibility is less than one mile (1600 meters) and/or the runway visual range (RVR) is 6,000 feet (1830 meters) or less.

h. Movement Area - The runways, taxiways, and other areas of an airport/heliport which are used for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with an airport traffic control tower (ATCT), specific approval for entry onto the movement area must be obtained from air traffic control (ATC).

i. Other Vehicles - Vehicles that are not routinely authorized in the AOA (i.e. construction vehicles). These vehicles are typically owned by airlines, vendors or contractors and are not eligible for Federal funding.

NOTE: *“Other vehicles” are exclusive of ambulances, aircraft rescue and firefighting vehicles, and airport security vehicles.*

j. Peak Intensity – Peak intensity, for purposes of this document, means the maximum magnitude of luminescence as measured in candela.

3. VEHICLE PAINTING.

NOTE: *Airport vehicle paint and markings are a safety of flight requirement. The approved colors/markings herein assure conspicuity of vehicles operating in the AOA from both the ground and air.*

a. Ambulances. Ambulance vehicles are painted per Federal Specification KKK-A-1822E, *Federal Specification for the Star-of-Life Ambulance*. Ambulances are not considered vehicles routinely operating on the AOA.

b. Aircraft Rescue and Fire Fighting (ARFF) Vehicles. Yellowish-green is the vehicle color standard. Color specifications are per Appendix A.

NOTE: *A yellowish-green color provides optimum visibility during all light levels encountered during a 24-hour day and under variations of light that result from weather and seasonal changes.*

c. Airfield Service Vehicles. Chrome yellow is the vehicle color standard. Color specifications are per Appendix A. When vehicles are equipped with bumper bars 8 inches (205mm) or more in depth, the bars must be painted in alternate stripes 4 inches (100mm) in width of chrome yellow and black inclined 45° to the vertical.

d. Airport Operations Vehicles. Airport Operations Vehicles may be painted in colors designated by the airport operator. The characteristics must be coordinated with the respective Airport Traffic Control Tower and identified in the tower letter of agreement.

e. Aircraft Support Vehicles and Other Vehicles. Any color or combination of colors other than yellowish-green or chrome yellow. The bumper bar markings in paragraph 3c are recommended.

f. Airport Security Vehicles. Comply with specific state or local requirements.

- g. Other Vehicles.** Any color or combination of colors other than solid black or white.

4. VEHICLE MARKING.

- a. Ambulances.** Ambulances are marked per Federal Specification KKK-A-1822E.

- b. ARFF, Airfield Service, and Aircraft Support Vehicles.**

(1) Airport operator owned vehicles must display an identification number on each side and on the roof (the hood should be used if the vehicle has no roof).

(2) Side numbers will be a minimum of 16 inches (405mm) in height and conspicuously located.

(3) Roof numbers will be a minimum of 24 inches (610mm) 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.

(4) In addition to the identification numbers, airport operator owned vehicles must display either the name of the airport and/or the airport insignia.

(5) To further improve night-time recognition of vehicles, a minimum 8 inch (205mm) wide horizontal band of high gloss white paint or white reflective tape (Retroreflective, ASTM-D 4956-05, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Type III & above) must be used around the vehicle's surface. Figures 1, 2, and 3 show suggested locations for the horizontal reflective band.

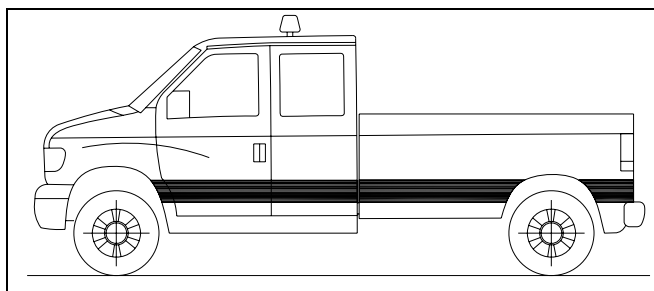


Figure 1: Suggested location for the horizontal reflective band, Option 1

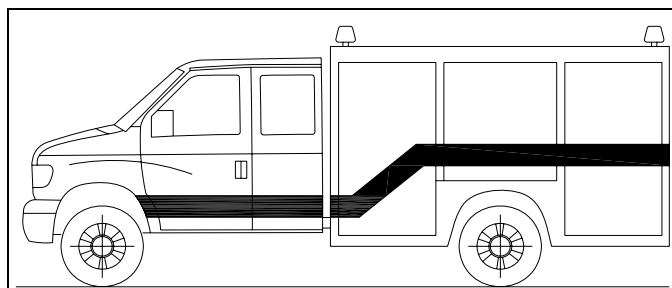


Figure 2: Suggested location for the horizontal reflective band, Option 2

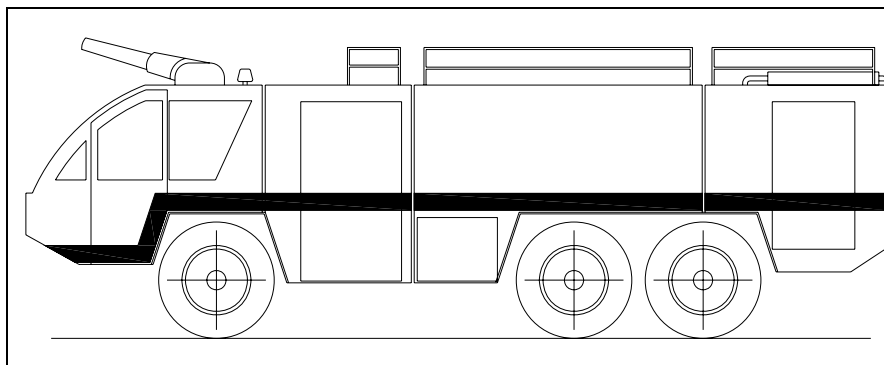


Figure 3: Suggested location for the horizontal reflective band, Option 3

c. Airport Operations Vehicles. Airport Operations Vehicles may be marked as designated by the airport operator. Marking must be coordinated with the respective Airport Traffic Control Tower and identified in the tower letter of agreement.

d. Other Vehicles.

(1) Vehicles other than those that routinely traverse any portion of the AOA under ATC, which are not escorted by a vehicle in constant two-way radio communication with ATC and properly equipped and authorized to operate in the AOA, must be provided with a flag on a staff attached to the vehicle so that the flag will be readily visible.

(2) At airports without air traffic control facilities, flags must be provided on all vehicles.

(3) The flag must be at least a 3-foot by 3-foot (0.91 meter by 0.91 meter) square having a checkered pattern of international orange and white squares at least 1 foot (305mm) on each side (see Appendix A for the fabric color specification).

5. VEHICLE LIGHTING.

a. The standard for identification lighting for vehicles routinely operating in the AOA Movement Area is a yellow flashing light that is mounted on the uppermost part of the vehicle structure. A steady yellow light designates vehicles limited to non-movement areas.

b. The light must be visible from any direction, day and night, including from the air.

c. Color specifications for vehicle identification lights are per Appendix B.

d. Vehicles not routinely operating on the AOA which are not escorted by a properly lighted vehicle must be identified during periods of low visibility by a light.

e. Characteristics of Flashing Lights:

(1) Ambulance lights must meet the Federal Specification KKK-A-1822E, and ARFF vehicles must meet NFPA, state and local requirements.

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- (2) Lights must have peak intensity within the range of 40 to 400 candelas (effective) from 0° (horizontal) up to 10° above the horizontal and for 360° horizontally. The upper limit of 400 candelas (effective) is necessary to avoid damage to night vision.
- (3) From 10° to 15° above the horizontal plane, the light output must be 1/10th of peak intensity or between 4 and 40 candelas (effective).
- (4) Lights must flash at 75 ± 15 flashes per minute.

NOTES:

1. *The effective intensity of a flashing light is equal to the intensity of a steady-burning (fixed) light of the same color which produces the same visual range under identical conditions of observation.*
2. *If xenon flashtubes are used, refer to AC 150/5345-43, Specification for Obstruction Lighting Equipment, for guidance concerning methods of calculating effective intensity.*

f. Light Colors.

- (1) Ambulances. Per Federal Specification KKK-A-1822E.
- (2) ARFF Vehicles. Red or a combination of red-and-white flashing lights per the chromaticity requirements in Appendix B.
- (3) Airport Operations, Airfield Service Vehicles, Aircraft Support Vehicles and Other Vehicles. Yellow flashing light per the chromaticity requirements in Appendix B.
- (4) Airport Security Vehicles. Signal blue or a combination of red and signal blue flashing light per the chromaticity requirements in Appendix B.

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Appendix A**APPENDIX A. COLOR SPECIFICATIONS**

A-1. SPECIFICATIONS. Colors specified in Table A-1 are per the Commission Internationale de l'Eclairage (CIE) $L^*a^*b^*$ system of color specification. For a description of this system, refer to American Society for Testing & Materials (ASTM) D 2244, *Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates*.

Table A-1. Specification for vehicle and flag colors

| Standard Illuminant D65 Usage | Chrome Yellow | | | Yellowish-Green | | | International Orange | | |
|----------------------------------|---------------|------|------|-----------------|-------|------|----------------------|------|------|
| | 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 | 53.5 | 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 | | |

A-2. COLOR TESTS. Acceptable colors are those that meet the gloss rating test and either a visual or an instrumental color test as follows:

NOTE: *Flag fabric colors must meet either the instrumental tests in Table A-1 or the visual method described in paragraph A-2b(1).*

a. Gloss Rating Test. This test is performed per ASTM D 523, *Standard Test Method for Specular Gloss*, 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. Prepare a master specimen of the color (per Table A-1) and gloss (per paragraph A-2a). This specimen will be the master color and be used as the basis of comparison per ASTM D 5531-05, *Standard Guide for the Preparation, Maintenance, and Distribution of Physical Product Standards for Color and Geometric Appearance of Coatings*. To verify the paint color of a vehicle visually, vehicle paint samples must be prepared and viewed per ASTM D 1729-96 (Reapproved 2003), *Standard Practice for*

Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials.

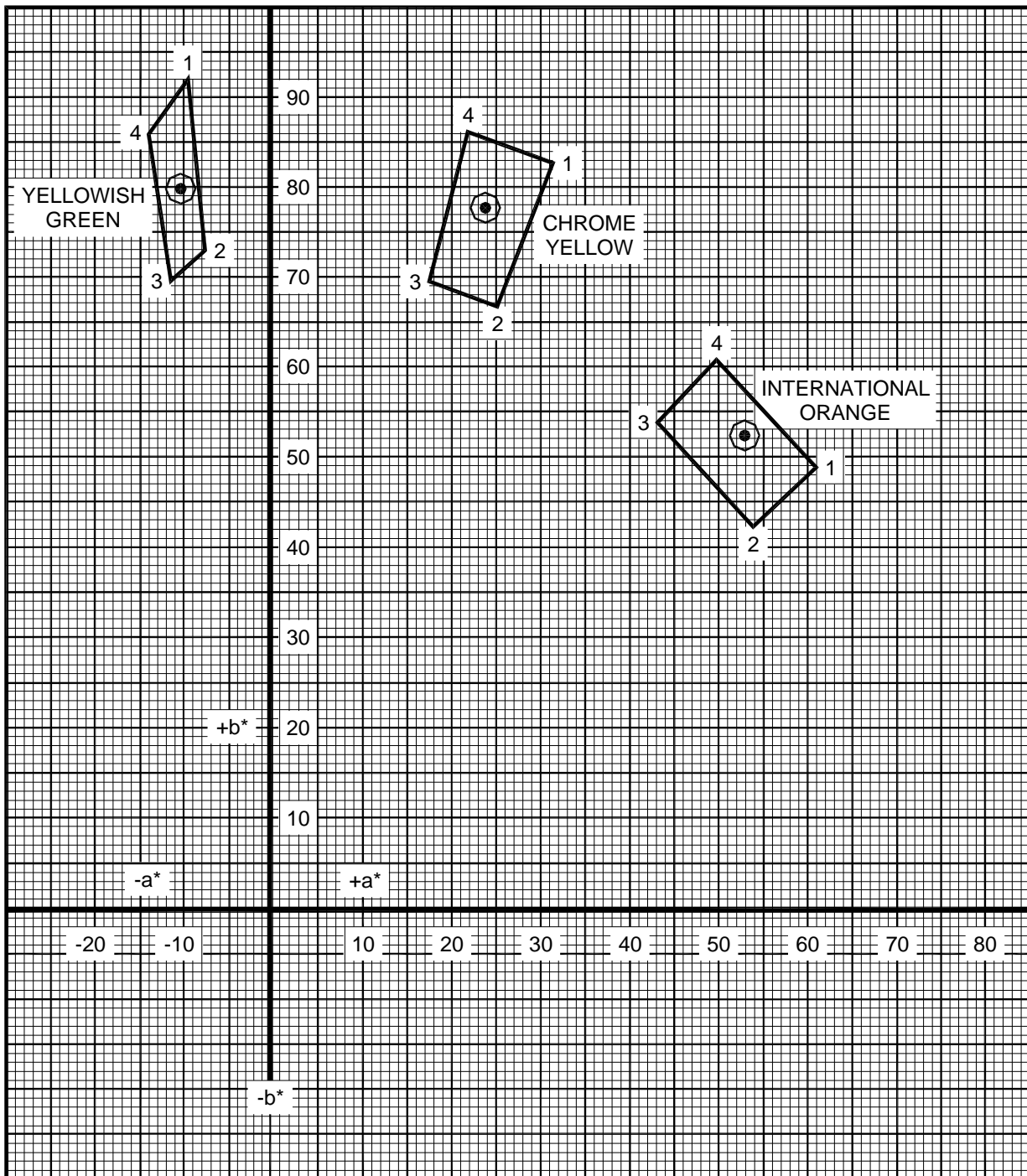
(2) Instrumental. This test requires a test specimen sample and reference to Table A-1. All test specimen measurements should be conducted per ASTM E 1164-02 *Standard Practice for Obtaining Spectrometric Data for Object-Color Evaluation*. Test specimen tolerances must be per Table A-1 per the following:

- (a) Plot the centroid color using the a^* and b^* CIELAB coordinate data from Table A-1 on graph paper or by entry of the coordinate data into a computer program. 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 A-1 for plots of all three color specifications in Table A-1.
- (b) Perform color sample measurements per ASTM E 1164-02. If necessary, convert measurements to CIELAB L^* , a^* , and b^* color space. See ASTM E 308-01, *Standard Practice for Computing the Colors of Objects by Using the CIE System* for color space conversion formulae.
- (c) An acceptable color is one that meets:
 - (i) the chromaticity requirements of the color samples a^* and b^* CIELAB coordinate data by falling within the quadrilateral;
 - (ii) the L^* data lightness requirement by falling within the range defined by the light and dark data of Table A-1;
 - (iii) the total color difference (ΔE) by not exceeding the limits in Table A-1 when the CIELAB data are computed in the following formula:

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

where ΔL^* , Δa^* , and Δb^* values are the differences between those values for the centroid color in Table A-1 and those of the color sample measurements.

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Appendix A**Figure A-1. Plot of selected color paint specifications**

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Appendix B**APPENDIX B. COLOR SPECIFICATIONS FOR VEHICLE IDENTIFICATION LIGHTS**

B-1. SPECIFICATIONS. The Society of Automotive Engineers (SAE) Standard J578 Revised JUL2002, *Color Specification*, defines the acceptable color boundary limits and measurement of emitted red, white, signal blue, and yellow light for vehicle lights. 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 color of emitted light must fall within the color boundaries per SAE J578 Revised JUL2002 (color boundary equations are in the standard) using color measurement methods detailed in the standard. See FAA Engineering Brief #67, *Light Sources Other Than Incandescent or Xenon for Airport and Obstruction Lighting Fixtures*, for additional information and Alternative Lighting Devices.

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