

approved construction plans that comply with the previous MUTCD during the two-year adoption period.

(c) *Color specifications.* Color determinations and specifications of sign and pavement marking materials shall conform to requirements of the FHWA Color Tolerance Charts.<sup>1</sup> An alternate method of determining the color of retroreflective sign material is provided in the appendix.

(d) *Compliance—(1) Existing highways.* Each State, in cooperation with its political subdivisions, and Federal agency shall have a program as required by 23 U.S.C. 402(a), which shall include provisions for the systematic upgrading of substandard traffic control devices and for the installation of needed devices to achieve conformity with the MUTCD. The FHWA may establish target dates of achieving compliance with changes to specific devices in the MUTCD.

(2) *New or reconstructed highways.* Federal-aid projects for the construction, reconstruction, resurfacing, restoration, or rehabilitation of streets and highways shall not be opened to the public for unrestricted use until all appropriate traffic control devices, either temporary or permanent, are installed and functioning properly. Both temporary and permanent devices shall conform to the MUTCD.

(3) *Construction area activities.* All traffic control devices installed in construction areas using Federal-aid funds shall conform to the MUTCD. Traffic control plans for handling traffic and pedestrians in construction zones and for protection of workers shall conform to the requirements of 23 CFR part 630, subpart J, Traffic Safety in Highway and Street Work Zones.

[48 FR 46776, Oct. 14, 1983, as amended at 51 FR 16834, May 7, 1986; 68 FR 14139, Mar. 24, 2003; 71 FR 75115, Dec. 14, 2006]

#### § 655.604 Achieving basic uniformity.

(a) *Programs.* Programs for the orderly and systematic upgrading of existing traffic control devices or the installation of needed traffic control de-

<sup>1</sup> Available for inspection from the Office of Traffic Operations, Federal Highway Administration, 400 Seventh Street, SW., Washington, DC 20590.

vices on or off the Federal-aid system should be based on inventories made in accordance with the Highway Safety Program Guideline 21, "Roadway Safety." These inventories provide the information necessary for programming traffic control device upgrading projects.

(b) *Inventory.* An inventory of all traffic control devices is recommended in the Highway Safety Program Guideline 21, "Roadway Safety." Highway planning and research funds and highway related safety grant program funds may be used in statewide or system-wide studies or inventories. Also, metropolitan planning (PL) funds may be used in urbanized areas provided the activity is included in an approved unified work program.

[48 FR 46776, Oct. 14, 1983, as amended at 71 FR 75115, Dec. 14, 2006]

#### § 655.605 Project procedures.

(a) *Federal-aid highways.* Federal-aid projects involving the installation of traffic control devices shall follow procedures as established in 23 CFR part 630, subpart A, Federal-Aid Programs Approval and Project Authorization. Simplified and timesaving procedures are to be used to the extent permitted by existing policy.

(b) *Off-system highways.* Certain federally funded programs are available for installation of traffic control devices on streets and highways that are not on the Federal-aid system. The procedures used in these programs may vary from project to project but, essentially, the guidelines set forth herein should be used.

#### § 655.606 Higher cost materials.

The use of signing, pavement marking, and signal materials (or equipment) having distinctive performance characteristics, but costing more than other materials (or equipment) commonly used may be approved by the FHWA Division Administrator when the specific use proposed is considered to be in the public interest.

#### § 655.607 Funding.

(a) *Federal-aid highways.* (1) Funds apportioned or allocated under 23 U.S.C. 104(b) are eligible to participate in

projects to install traffic control devices in accordance with the MUTCD on newly constructed, reconstructed, resurfaced, restored, or rehabilitated highways, or on existing highways when this work is classified as construction in accordance with 23 U.S.C. 101(a). Federal-aid highway funds for eligible pavement markings and traffic control signalization may amount to 100 percent of the construction cost. Federal-aid highway funds apportioned or allocated under other sections of 23 U.S.C. are eligible for participation in improvements conforming to the MUTCD in accordance with the provisions of applicable program regulations and directives.

(2) Traffic control devices are eligible, in keeping with paragraph (a)(1) of this section, provided that the work is classified as construction in accordance with 23 U.S.C. 101(a) and the State or local agency has a policy acceptable to the FHWA Division Administrator for selecting traffic control devices material or equipment based on items such as cost, traffic volumes, safety, and expected service life. The State's policy should provide for cost-effective selection of materials which will provide for substantial service life taking into account expected and necessary routine maintenance. For these purposes, effectiveness would normally be measured in terms of durability, service life and/or performance of the material. Specific projects including material or equipment selection shall be developed in accordance with this policy. Proposed work may be approved on a project-by-project basis when the work is (i) clearly warranted, (ii) on a Federal-aid system, (iii) clearly identified by site, (iv) substantial in nature, and (v) of sufficient magnitude at any given location to warrant Federal-aid participation as a construction item.

(3) The method of accomplishing the work will be in accordance with 23 CFR part 635, subpart A, Contract Procedures.

(b) *Off-system highways.* Certain Federal-aid highway funds are eligible to participate in traffic control device improvement projects on off-system highways. In addition, Federal-aid highway funds apportioned or allocated in 23 U.S.C. are eligible for the installation

of traffic control devices on any public road not on the Federal-aid system when the installation is directly related to a traffic improvement project on a Federal-aid system route.

APPENDIX TO SUBPART F OF PART 655—  
ALTERNATE METHOD OF DETERMINING THE COLOR OF RETROREFLECTIVE SIGN MATERIALS AND PAVEMENT MARKING MATERIALS

1. Although the FHWA Color Tolerance Charts depreciate the use of spectrophotometers or accurate tristimulus colorimeters for measuring the daytime color of retroreflective materials, recent testing has determined that 0/45 or 45/0 spectroradiometers and tristimulus colorimeters have proved that the measurements can be considered reliable and may be used.

2. The daytime color of non-fluorescent retroreflective materials may be measured in accordance with ASTM Test Method E1349, "Standard Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry" or ASTM Test Method E 1347 (Replaces E97), "Standard Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry." The latter test method specified bidirectional geometry for the measurement of retroreflective materials. The geometric conditions to be used in both test methods are 0/45 or 45/0 circumferential illumination or viewing. Uniplanar geometry is not recommended for material types IV or higher (designated microprismatic). The CIE standard illuminant used in computing the colorimetric coordinates shall be D<sub>65</sub> and the 2 Degree Standard CIE observer shall be used.

3. For fluorescent retroreflective materials ASTM E991 may be used to determine the chromaticity provided that the D<sub>65</sub> illumination meets the requirements of E 991. This practice, however, allows only the total luminous factor to be measured. The fluorescent luminous factor must be determined using bispectral fluorescent colorimetry. Commercial instruments are available which allow such determination. Some testing laboratories are also equipped to perform these measurements.

4. For nighttime measurements CIE Standard Illuminant A shall be used in computing the colorimetric coordinates and the 2 Degree Standard CIE Observer shall be used.

5. Average performance sheeting is identified as Types I and II sheeting and high performance sheeting is identified as Type III. Super-high intensity sheeting is identified as Types V, VI, and VII in ASTM D 4956.

6. The following nine tables depict the 1931 CIE Chromaticity Diagram x and y coordinates for the corner points defining the recommended color boxes in the diagram and the daytime luminance factors for those colors. Lines drawn between these corner points specify the limits of the chromaticity al-

lowed in the 1931 Chromaticity Diagram. Color coordinates of samples that lie within these lines are acceptable. For blue and green colors the spectrum locus is the defining limit between the corner points located on the spectrum locus:

TABLE 1 TO APPENDIX TO PART 655, SUBPART F—DAYTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.

Color	Chromaticity Coordinates							
	1		2		3		4	
	x	y	x	y	y	x	x	y
White .....	0.303	0.300	0.368	0.366	0.340	0.393	0.274	0.329
Red .....	0.648	0.351	0.735	0.265	0.629	0.281	0.565	0.346
Orange .....	0.558	0.352	0.636	0.364	0.570	0.429	0.506	0.404
Brown .....	0.430	0.340	0.430	0.390	0.518	0.434	0.570	0.382
Yellow .....	0.498	0.412	0.557	0.442	0.479	0.520	0.438	0.472
Green .....	0.026	0.399	0.166	0.364	0.286	0.446	0.207	0.771
Blue .....	0.078	0.171	0.150	0.220	0.210	0.160	0.137	0.038
Light Blue .....	0.180	0.260	0.240	0.300	0.270	0.260	0.230	0.200
Purple .....	0.300	0.064	0.320	0.200	0.550	0.300	0.600	0.202

TABLE 1A TO APPENDIX TO PART 655, SUBPART F—DAYTIME LUMINANCE FACTORS (%) FOR RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.

Color	Daytime Luminance Factor (Y %) by ASTM Type					
	Types I, II, III and VI		Types IV, VII, and VIII		Type V	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
White .....	27	.....	40	.....	15	.....
Red .....	2.5	12	3.0	15	2.5	11
Orange .....	14	30	12	30	7.0	25
Brown .....	4.0	9.0	1.0	6.0	1.0	9.0
Yellow .....	15	45	24	45	12	30
Green .....	3.0	9.0	3.0	12	2.5	11
Blue .....	1.0	10	1.0	10	1.0	10
Light Blue .....	12	40	18	40	8.0	25
Purple .....	2.0	10	2.0	10	2.0	10

TABLE 2 TO APPENDIX TO PART 655, SUBPART F—NIGHTTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND OBSERVATION ANGLE OF 0.33°, ENTRANCE ANGLE OF +5° AND CIE STANDARD ILLUMINANT A.

Color	Chromaticity Coordinates							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White .....	0.475	0.452	0.360	0.415	0.392	0.370	0.515	0.409
Red .....	0.650	0.348	0.620	0.348	0.712	0.2550	0.735	0.265
Orange .....	0.595	0.405	0.565	0.405	0.613	0.355	0.643	0.355
Brown .....	0.595	0.405	0.540	0.405	0.570	0.365	0.643	0.355
Yellow .....	0.513	0.487	0.500	0.4700	0.545	0.425	0.572	0.425
Green .....	0.007	0.570	0.200	0.500	0.322	0.590	0.193	0.782
Blue .....	0.033	0.370	0.180	0.370	0.230	0.240	0.091	0.133
Light Blue .....	Chromaticity coordinates are yet to be determined.							
Purple .....	Chromaticity coordinates are yet to be determined.							

NOTE: Materials used as High-Conspicuity, Retroreflective Traffic Signage Materials shall meet the requirements for Daytime Color Specification Limits, Daytime Luminance Factors and Nighttime Color Specification Limits for Fluorescent Retroreflective Material, as described in Tables 3, 3a, and 4, throughout the service life of the sign.

TABLE 3 TO APPENDIX TO PART 655, SUBPART F—DAYTIME COLOR SPECIFICATION LIMITS FOR FLUORESCENT RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.

Color	Chromaticity Coordinates							
	1		2		3		4	
	x	y	x	y	x	y	x	y
Fluorescent Orange .....	0.583	0.416	0.535	0.400	0.595	0.351	0.645	0.355
Fluorescent Yellow .....	0.479	0.520	0.446	0.483	0.512	0.421	0.557	0.442
Fluorescent Yellow-Green .....	0.387	0.610	0.369	.546	.428	.496	0.460	0.540
Fluorescent Green .....	0.210	0.770	0.232	0.656	0.320	0.590	0.320	0.675
Fluorescent Pink .....	0.450	0.270	0.590	0.350	0.644	0.290	0.536	0.230

TABLE 3A TO APPENDIX TO PART 655, SUBPART F—DAYTIME LUMINANCE FACTORS (%) FOR FLUORESCENT RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.

Color	Luminance Factor Limits (Y)		
	Min	Max	Y <sub>F</sub> *
Fluorescent Orange .....	25	None	15
Fluorescent Yellow .....	45	None	20
Fluorescent Yellow-Green .....	60	None	20
Fluorescent Green .....	20	30	12
Fluorescent Pink .....	25	None	15

\*Fluorescence luminance factors (Y<sub>F</sub>) are typical values, and are provided for quality assurance purposes only. Y<sub>F</sub> shall not be used as a measure of performance during service.

TABLE 4 TO APPENDIX TO PART 655, SUBPART F—NIGHTTIME COLOR SPECIFICATION LIMITS FOR FLUORESCENT RETROREFLECTIVE MATERIAL WITH CIE 2° STANDARD OBSERVER AND OBSERVATION ANGLE OF 0.33°, ENTRANCE ANGLE OF +5° AND CIE STANDARD ILLUMINANT A.

Color	Chromaticity Coordinates							
	1		2		3		4	
	x	y	x	y	x	y	x	y
Fluorescent Orange .....	0.625	0.375	0.589	0.376	0.636	0.330	0.669	0.331
Fluorescent Yellow .....	0.554	0.445	0.526	0.437	0.569	0.394	0.610	0.390
Fluorescent Yellow-Green .....	0.480	0.520	0.473	0.490	0.523	0.440	0.550	0.449
Fluorescent Green .....	0.007	0.570	0.200	0.500	0.322	0.590	0.193	0.782

TABLE 5 TO APPENDIX TO PART 655, SUBPART F—DAYTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.

Color	Chromaticity Coordinates							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White .....	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375
Yellow .....	0.560	0.440	0.490	0.510	0.420	0.440	0.460	0.400
Red .....	0.480	0.300	0.690	0.315	0.620	0.380	0.480	0.360
Blue .....	0.105	0.100	0.220	0.180	0.200	0.260	0.060	0.220

TABLE 5A TO PART 655, SUBPART F—DAYTIME LUMINANCE FACTORS (%) FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.

Color	Luminance Factor (Y%)	
	Minimum	Maximum
White .....	35	
Yellow .....	25	

TABLE 5A TO PART 655, SUBPART F—DAYTIME LUMINANCE FACTORS (%) FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER AND 45/0 (0/45) GEOMETRY AND CIE STANDARD ILLUMINANT D<sub>65</sub>.—Continued

Color	Luminance Factor (Y%)	
	Minimum	Maximum
Red .....	6	15
Blue .....	5	14

TABLE 6 TO APPENDIX TO PART 655, SUBPART F—NIGHTIME COLOR SPECIFICATION LIMITS FOR RETROREFLECTIVE PAVEMENT MARKING MATERIAL WITH CIE 2° STANDARD OBSERVER, OBSERVATION ANGLE OF 1.05°, ENTRANCE ANGLE OF +88.76° AND CIE STANDARD ILLUMINANT A.

Color	Chromaticity Coordinates							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White .....	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0.435
Yellow .....	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

NOTE: Luminance factors for retroreflective pavement marking materials are for materials as they are intended to be used. For paint products, that means inclusion of glass beads and/or other retroreflective components.

[67 FR 49572, July 31, 2002, as amended at 67 FR 70163, Nov. 21, 2002; 68 FR 65582, 65583, Nov. 20, 2003]

reduce pollution, and reduce traffic congestion.

**Subpart G [Reserved]**

**PART 656—CARPOOL AND VANPOOL PROJECTS**

- Sec.
- 656.1 Purpose.
- 656.3 Policy.
- 656.5 Eligibility.
- 656.7 Determination of an exception.

AUTHORITY: 23 U.S.C. 146 and 315; sec. 126 of the Surface Transportation Assistance Act of 1978, Pub. L. 95-599, 92 Stat. 2689; 49 CFR 1.48(b).

SOURCE: 47 FR 43024, Sept. 30, 1982, unless otherwise noted.

**§ 656.1 Purpose.**

The purpose of this regulation is to prescribe policies and general procedures for administering a program of ridesharing projects using Federal-aid primary, secondary, and urban system funds.

**§ 656.3 Policy.**

Section 126(d) of the Surface Transportation Assistance Act of 1978 declares that special effort should be made to promote commuter modes of transportation which conserve energy,

**§ 656.5 Eligibility.**

(a) Projects which promote ride-sharing programs need not be located on but must serve a Federal-aid system to be eligible for Federal-aid primary, secondary, or urban system funds depending on the system served. The Federal share payable will be in accordance with the provisions of 23 U.S.C. 120. Except for paragraph (c)(3) of this section, for all purposes of this regulation the term *carpool* includes *vanpool*.

(b) Projects shall not be approved under this regulation if they will have an adverse effect on any mass transportation system.

(c) The following types of projects and work are considered eligible under this program:

(1) Systems, whether manual or computerized, for locating potential participants in carpools and informing them of the opportunities for participation. Eligible costs for such systems may include costs of use or rental of computer hardware, costs of software, and installation costs (including both labor and other related items).

(2) Specialized procedures to provide carpooling opportunities to elderly or handicapped persons.

(3) The costs of acquiring vanpool vehicles and actual financial losses that