TTAP TENNESSEE TRANSPORTATION ASSISTANCE PROGRAM

ROADTALK

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FHWA Revises Color Specifications for Retroreflective Signing Materials

by David Martin, Federal Highway Administration

To reflect the many technological advances which have taken place in the manufacturing of signing and marking materials and the measurement of color over the past 35 years, the Federal Highway Administration (FHWA) has revised its color specifications for retroreflective signing materials and has added daytime and nighttime specifications for retroreflective pavement marking materials. The pavement marking materials are required to meet certain color standards throughout its service life. The new and revised color specifications are included on pages 4 and 5.

This revision includes daytime color specification limits, daytime luminance factors and nighttime color specification limits. These limits and factors are for retroreflective materials, fluorescent retroreflective materials and for retroreflective pavement marking materials. Both assigned and unassigned colors found in the Manual on Uniform Traffic Control Devices are included.

For retroreflective materials the color specifications for white, orange and purple have been changed and the color specifications for coral, black and yellow-green have been removed.

The nighttime color specifications of retroreflective material for the color orange have been reordered and the two missing coordinates for the color red have been added.

For fluorescent retroreflective materials color specifications for fluorescent yellow-green have been added to reflect FHWA's approval for use with pedestrian, school, and bicycle crossing signs. The color

cont'd on page 4

PLEASE HELP US.

To keep our database current we need to know of any changes in your title, organization, address, phone or fax numbers, and email address.

In addition, if you wish to be removed from our mailing list or know of someone who should be added, please contact us:

Tennessee Transportation Assistance Program (TTAP)
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IN THIS ISSUE

ROADTALK

is a publication of the Tennessee Transportation Assistance Program (TTAP). TTAP is part of a nationwide effort financed jointly by the Federal Highway Administration (FHWA) and Tennessee Department of Transportation (TDOT). Its purpose is to translate into understandable terms the latest state-of-the-art technologies in the areas of roads, bridges, and public transportation to local highway and transportation personnel.

The views, opinions, and recommendations contained within this newsletter are those of the authors and do not necessarily reflect the views of FHWA and TDOT.

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From the Team

In this issue of *Roadtalk*, be sure to check out all of the latest information from TTAP. In our lead-off article, David Martin from the Federal Highway Administration's Tennessee Division office brings us the latest on new color specifications for traffic signs. These standards are applicable to all signs found in the *Manual on Uniform Traffic Control Devices*. If you still haven't heard, the *MUTCD* is available online at http://mutcd.fhwa.dot.gov. If you cannot access the Internet, or if you have problems opening the files containing the MUTCD, please give us a call at 1-800-252-ROAD and we'll be glad to help you access the manual.

Be sure to check out the article on portable "speed bumps" designed to slow vehicles as they approach a work zone. Finally, we take a look at TDOT's new SCITE software, which will help county highway superintendents to maintain road inventories and track maintenance activities.

Also in this issue is our new training schedule. A complete listing of courses, from now until May of next year, is provided. As always, be sure to watch your mailbox and check our website for updates.

Finally, remember that TTAP is also available to provide technical assistance on transportation-related issues to cities and counties across the state. From assistance in locating publications and other reference materials to making on-site visits, we will be glad to lend a helping hand. TTAP also has turning movement and tube-type traffic counters available for loan to local agencies. Please do not hesitate to give us a call if there is anything that we can do to assist your efforts.

TRB'S RiP Web Site
http://rip.trb.org

The Transportation Research (TRB) has a new Research in Progress (RiP) Web site. The RiP website contains the RiP Database (over 6,600 new and recently completed project statements) and a data-entry system to allow authorized users in Departments of Transportation to add, modify and delete information on their current research projects. The purpose of RiP website is to facilitate the exchange of information on current transportation research projects.

The new RiP website allows users to:

- Search the entire Research in Progress file by key word or various fields
- Link and perform a RiP search in the TRIS Online Database
- Browse project records by subject
- Use a look up to locate projects by individuals and organizations
- Subscribe to receive email notification of new RiP records in specific subject areas
- Submit current research projects to TRB for entry into the system

If you have any questions, comments, or suggestions on the RiP website please feel free to contact Barbara Post, Manager, Information Services, Transportation Research Board Tel: (202) 334-2990 Fax: (202) 334-2527 Email: bpost@nas.edu

Portable Speed Bump Keeps a Safe Work Zone Around Flaggers

Reprinted from Research & Technology Transporter, February 2002

In most cases, motorists entering a work zone decrease the speed of their vehicles and drive more carefully; however, some drivers become frustrated or impatient with traffic delay, making flaggers susceptible to potential injury. In New York, alone, there were five flaggers struck in work zones last year.

Taking part in a program cosponsored by the Federal Highway Administration (FHWA) and the California Department of Transportation (CALTRANS), a Mexican engineer participating in the FHWA-funded CALTRANS-Baja California Personnel Exchange Program, created an imaginative new solution for making work, crash, and incident zones safer—portable speed bumps.

Called the Advance Traffic Warning System (ATWS), the speed bumps are actually an 11' x 3'6" (3.35 x 1.07 meter) mat made of a flexible, yet sturdy, rubber with a polyurethane backing, built around woven fiberglass. The mat thickness, reflective material, and reflective circular ceramic tiles act as rumble strips (like those often seen in crosswalks), and provide a compelling reason for drivers to decrease vehicle speed when approaching a flagger. Best of all, it's so portable, lightweight, and easy to handle that it can be quickly folded up and moved along work zones within minutes.

Other benefits of the portable speed bumps include resistance to water, grease, and oil. The composit material remains flexible, even in freezing temperatures, and resists rips, tears, and cuts. The ATWS will sustain any direct pressure on it, and its highly reflective stripes and reflective coating enable workers to use the speed bumps at night.

Construction worker shows how easily the portable speed bump can be folded for movement from location to location or storage

Portable speed bump acts like a rumble strip to slow the speed of a car driving over it.

Although not approved by CALTRANS, if proven effective, this ATWS speed bump invention could become one of many success stories from the U.S.-Mexico Border Technology Exchange Program (BTEP), created and funded by the FHWA Office of International Programs. The BTEP is a binational program headed by the FHWA and Mexico's counterpart, the Secretariat of Communications and Transportation (SCT), and it includes all 10 Departments of Transportation sharing the southwestern international border with Mexico.

Begun just before the North American Free Trade Agreement was passed, the BTEP program encourages a cross-cultural, multinational sharing of ideas and technology among Mexican municipal, State, and Federal transportation agencies. In the case of California, the BTEP includes Metropolitan planning organizations, and universities from California and Baja. The fundamental philosophy of the BTEP is to train individuals from both countries to develop safer roads and to facilitate better coordination of Mexican and U.S. transportation-related projects.

For more information, contact:

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specification for fluorescent red was not included in the tables for fluorescent retroreflective material. This color will be addressed in the future and will give the public the opportunity to provide comments.

The nighttime color specification limits for retroreflective payment marking materials will make it easier to recognize the colors white and yellow at night.

For additional information, please refer to pages 49569-49575 of the July 31, 2002 Federal Register or contact David Martin, Safety and Traffic Operations Engineer, Federal Highway Administration at DavidD.Martin@fhwa.dot.gov or 615-781-5757.

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_{65}.

	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_{65}.

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.

	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	0.33	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_{65}.

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	0.575

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_{65}.

Color	Luminance Factor Limits (Y)		
	Min	Max	Y_F*
Fluorescent Orange	25	None	15
Fluorescent Yellow	45	None	20
Fluorescent Yellow-Green	60	None	20
Fluorescent Green	20	30	12

*Fluorescence luminance factors (YF) are typical values, and are provided for quality assurance purposes only. YF 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.

	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	0.589	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_{65}.

	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	0.290	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_{65}.

Color	Luminance Factor (Y%)	
	Minimum	Maximum
White	35	
Yellow	25	
Red	6	15
Blue	5	14

TABLE 6 TO APPENDIX TO PART 655, SUBPART F—NIGHTTIME 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.

Education and training opportunities are available through the University of Tennessee Center for Transportation Research (CTR), Southeast Transportation Center (STC), and Tennessee Transportation Assistance Program (TTAP). This listing of courses currently available includes both TTAP and TATE courses that are offered in conjunction with the University of Tennessee Department of Civil and Environmental Engineering and the Tennessee Section of the Institute of Transportation Engineers. Local roadway departments can benefit from all of the workshops. Because of this, we ask that you please share this listing with others who might be interested in our workshops. The Center for Transportation Research is always eager to meet your research and training needs. If you have a special course in mind or would like a course held on site especially for your employees, please contact Jean Spangler at 1-800-252-ROAD

*CEU and PDH credit hours available.

COURSE TITLE	MTH	DAY	LOCATION	INSTRUCTOR
Basics of a Good Road	October	2-3	Chattanooga	Hearn
MUTCD (Other dates and locations to be announced)	October	3	Knoxville	Brunelle/Martin
Traffic Engineering 1	October	9-11	Nashville	Chatterjee/Han/Wegmann
Planning & Engineering for New Highways	October	16-17	Chattanooga	Beckwith/Wallace
Fundamentals of Erosion Prevention & Sediment Control	October	21	Jackson	Buchanan
Geotechnical Engineering Concepts 1	October	23	Nashville	Drumm
Emergency Evacuation Planning & Management	October	24	Jackson	Franzese/Han
Emergency Evacuation Planning & Management	October	25	Nashville	Franzese/Han
Roadway Enhancements with Geosynthetics	October	29	Knoxville	Marienfeld
Roadway Enhancements with Geosynthetics	October	30	Chattanooga	Marienfeld
Roadway Enhancements with Geosynthetics	November	4	Jackson	Marienfeld
Roadway Enhancements with Geosynthetics	November	6	Nashville	Marienfeld
Basic Roadway Surveying	November	8	Nashville	Kervin
Roadside Design Guide	November	13	Jackson	Brunelle
Roadside Design Guide	November	14	Nashville	Brunelle
Basic Roadway Surveying	November	15	Chattanooga	Kervin
Basic Roadway Surveying	November	19	Jackson	Kervin
Basic Roadway Surveying	November	21	Knoxville	Kervin
Advanced Roadway Surveying	December	3-4	Knoxville	Kervin
Roadside Design Guide	December	10	Knoxville	Brunelle
Work Zone Traffic Control/Flagging	December	11	Chattanooga	Kervin
Roadside Design Guide	December	12	Chattanooga	Brunelle
Work Zone Traffic Control/Flagging	December	13	Knoxville	Kervin
Urban Transportation Planning	December	16-17	Nashville	Chatterjee/Wegmann
Work Zone Traffic Control/Flagging	**January**	**21**	**Jackson**	**Kervin**
Work Zone Traffic Control/Flagging	**January**	**22**	**Nashville**	**Kervin**
Advanced Roadway Surveying	**February**	**5-6**	**Jackson**	**Kervin**
Advanced Roadway Surveying	**February**	**11-12**	**Nashville**	**Kervin**
Geotechnical Engineering Concepts 2	**February**	**19**	**Nashville**	**Drumm**
Fundamentals of Soil Erosion Prevention & Sediment Control	**February**	**27**	**Knoxville**	**Tschantz**

Training Opportunities 2003, *continued from page 6*

*(Courses for 2003 are in bold.)

COURSE TITLE	MTH	DAY	LOCATION	INSTRUCTOR
Work Zone Traffic Control/Flagging	**March**	**4**	**Jackson**	**Kervin**
Work Zone Traffic Control/Flagging	**March**	**5**	**Nashville**	**Kervin**
Asphalt Pavement Maintenance	**March**	**10**	**Knoxville**	**Hearn**
Asphalt Pavement Maintenance	**March**	**11**	**Chattanooga**	**Hearn**
Asphalt Pavement Maintenance	**March**	**12**	**Nashville**	**Hearn**
Asphalt Pavement Maintenance	**March**	**13**	**Jackson**	**Hearn**
Traffic Engineering 2	**March**	**17-19**	**Nashville**	**Chatterjee/Han/Wegmann**
Work Zone Traffic Control/Flagging	**March**	**20**	**Chattanooga**	**Kervin**
Work Zone Traffic Control/Flagging	**March**	**21**	**Chattanooga**	**Kervin**
Site Impact Analysis	**March**	**25-26**	**Nashville**	**Ismart**
Plans Interpretation	**April**	**8**	**Nashville**	**Beckwith**
Advanced Roadway Surveying	**April**	**23-24**	**Chattanooga**	**Kervin**
Storm Water Drainage	**May**	**7**	**Jackson**	**Kervin**
Storm Water Drainage	**May**	**8**	**Nashville**	**Kervin**
Advanced Roadway Surveying	**May**	**20-21**	**Knoxville**	**Kervin**

TALK TO TTAP

We are always looking for your comments, ideas and suggestions to help make the TTAP program more useful to you.

1. Please send me more information on the following articles mentioned in this newsletter.

_____
_____
_____

2. Please list any additional training workshops you would be interested in attending.

_____
_____
_____

3. Please list topics for videos you would like TTAP to obtain.

_____
_____
_____

4. Please list any other ideas or suggestions on how TTAP could assist you.

_____
_____
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ROUTING SLIP

New Software Bridges Communication In Tennessee Counties

Reprinted from TDOT Research Capsule, Volume 1, Issue 1

The Tennessee Department of Transportation in conjunction with KBM Information Systems, an independent software consulting company is nearing the completion of Phase I of the SCITE (State and County Information Technology Exchange). KBM has developed software that will assist the County Road Superintendents in maintaining their county road lists and other daily activities, such as maintaining inventory, tracking employee projects as well as ongoing road projects.

This data will be used to update the State's TRIMS (Tennessee Roadway Information Management Systems) database, which maintains a current database of roadways for the state of Tennessee. This will benefit county officials and local governments by allowing them to utilize the software's job costing components and accounting features that will track the miles, length and width of roadways, surface composition, as well as receive updates and data on routes and roads from the state. For example, new subdivision info can be inventoried and mapped much sooner with this software. Previously, each county was inventoried and mapped every five or six years on a rotating basis since TDOT had to personally collect this data by visiting all 95 counties. With this software, the state will be able to access this important information via the Internet or statewide Intranet regularly.

Another benefit to this software is that it allows government entities to advance the concepts and practices of asset management. This is especially important with the implementation of GASB-34. GASB-34 mandates that government entities track and report the value of infrastructure assets and their condition over time. This software will make it easier to achieve the goals of GASB-34.

The system will require little training, thus making it an asset as soon as it is installed. Paul Boyd, section project manager from TDOT'S Mapping and Statistics Department, says, "SCITE will help improve our efficiency, as well as set a new standard for communication and cooperation between government entities."