

9710000 TRAFFIC MARKING MATERIALS
 COMMENTS FROM INTERNAL/INDUSTRY REVIEW

Paul Vinik
 652-955-6686
Paul.Vinik@dot.state.fl.us

Comments: (1-12-15)

We request that the following changes also be incorporated into this spec change implementing optical measurement of gradation and sphericity. Sorry for the late notice, but we were unaware that modifications were being done to 971. This change will provide more accurate results for these two parameters.

971-2 Glass Spheres.

971-2.1 General Requirements: Glass spheres shall be of a composition designed to be highly resistant to traffic wear and to the effects of weathering for the production of a reflective surface, creating night visibility of the pavement markings without altering day visibility of the marking. The general requirements of 971-1 apply to glass spheres.

971-2.2 Specific Properties: The large (Type 3 or larger) glass spheres used for drop on beads shall have an adhesion coating. Type 1 glass spheres used for drop on beads shall have a dual coating. Beads used in the intermix of materials are not required to be coated.

The following physical requirements apply:

Property	Test Method	Specification
Roundness*	ASTM D1155	Min: 70 % by weight
Roundness**	ASTM D1155	Min: 80% by weight
Refractive Index*	Becke Line Method (25+/-5C)	1.5 minimum
Refractive Index**	Becke Line Method (25+/-5C)	1.9 minimum

* Type 1, 3, 4 and 5 beads
** High Index beads

Sieve Size	Percent by Mass Passing Designated Sieve (ASTM D1214)				
	Grading Designation				
	Type 1 (AASHTO)	Type 3 (FP 96)	Type 4 (FP 96)	Type 5 (FP 96)	High Index
No. 8				100	
No. 10			100	95 - 100	
No. 12		100	95 - 100	80 - 95	
No. 14		95 - 100	80 - 95	10 - 40	
No. 16	100	80 - 95	10 - 40	0 - 5	100
No. 18		10 - 40	0 - 5	0 - 2	
No. 20	95 - 100	0 - 5	0 - 2		95 - 100
No. 25		0 - 2			
No. 30	75 - 95				55 - 85

Response:

Gary Ware
 931-560-4166
gary.ware@swarco.com

Comments: (1-22-15)

Generally speaking, I am in favor of the changes you are advocating, especially in the case of D1155, which I have always thought was quite subjective. As for FP96, the only reason it was ever referenced in the first place was because up until 2008, AASHTO only listed types 1 and 2.

Now that it has been revised and includes type 0,1,2,3,4, & 5, it should be the listed designation, since most of the time it is the governing specification.

I would only add that you may see some differences in roundness percentages between D1155 and PP 74 even when testing the same sample just due to the vast difference in what each one of these tests is measuring. For instance, your specification states: Min 70% by weight. This makes sense with D1155, since you are literally examining the entire sample (e.g. 50 gms). Not true with a Particle Analyzer. It takes a series of pictures as the beads cascade in front of a camera and examines the min/max diameter of each individual particle in the picture and computes a percentage based on the number of particles it examines. Ditto for D1214, number of particles, not weight. To my way of thinking this would better be described as a Percentage by Volume, even though this is just semantics.

Depending on who you are talking to, D1155 and PP 74 correlate well, but I am not convinced just yet. I believe ultimately what will happen over time is that Minimums will be adjusted up or down to reflect the new normal created by the results of a many, many Particle Analyzer tests. Also, take care in the way you set the instrument up when it comes to gradation. Make sure that the sieves size referenced in the test correspond exactly to the sieve sizes referenced by Type.

Just a suggestion; I would go forward with the change, but for some future time, allow D1155 and D1214 to be background referee standards in the case of a dispute. This would allow for some wiggle room during the transition and help you build a database (and intuition) for correlation.

Texas DOT has been using nothing but a Particle Analyzer for gradation and roundness for at least 10 years now. You might want to touch base with Tom Schwerdt (sp.?) or Arturo Perez to see how they made their transition.

Response:

Don Blackhurst
610-764-3250
don.blackhurst@pottersbeads.com

Comments: (1-23-15)

I think that it is great that Florida is going to Optical Particle Size Analysis. We have found our units (Camsizers) to be extremely repeatable and reproducible.

The only comments that we do have are as follows:

1. It would be good to specify the parameters that are to be used for sizing and rounds. We have found that $X_{C_{min}}$ for size (which correlates better to sieves) and b/l for rounds to be the preferred. If this cannot be done, then we would ask that you work with us so that we can correlate our testing to yours in order to ensure that we are able to continue to reliably provide material that meets your requirements. We have done this with other state DOT labs after their procuring Optical units with great success.

Response:

2. We also do use the Optical Particle Size Analyzer for the high index beads, which I notice is not indicated below.

We would be happy to visit and review testing procedure and parameters with you if this would be of any help – just let us know.

These units are integral to our operation and are used at all of our North American production facilities as well as at our R&D center.

Response:

D5 Construction

Comments: (1-27-15)

1. 971-1.1 How the Department will verify that a given product is in the APL as required by section 971-1.4, if the label does not show the product name?

Response:

2. 971-1.2 states “All material must have a container storage life of one year from the date of manufacture”. How can the date be verified if the proposed spec section 971-1.1 (above) deletes the requirement of the date of manufacture?

Response:

3. 971-1.6 states “Material other than white and yellow shall meet the color requirements...”. I suggest not deleting the color from the label as proposed in section 971-1.1, to avoid opening the container for the sole purpose of verifying the color. For the above comments, I suggest adding “The name of the product” and not deleting “the color and the date of manufacture”. The change would be “The name of the product, the color, and the name and address of the manufacturer, shall be shown on the label”

Response:

Paul Gentry
414-4118
paul.gentry@dot.state.fl.us

Comments: (1-27-15)

1. 971-1.1 Packaging and Labeling: Color, date of manufacture, batch number, and APL number should be listed on the packages.

Response:

2. 971-1.6 Color: The X,Y points in both Initial Daytime Chromaticity and Nighttime Chromaticity Coordinates need to be listed in lower case x, y. This correlates to the proper nomenclature used for x,y graphing.

Response:

3. 971-2.3.2 Sampling: What is the definition and acceptance for “A random 50 pound sample of glass Spheres”? Isn’t this in conflict with 971-1.5 Samples? The Department’s Sampling, Testing and Reporting Guide Schedule is suppose to handle the random sampling of these materials. Glass Spheres are also furnished for traffic marking use in both 2000 lb. totes and 2200 lb. metric ton totes from the glass sphere manufacturers. These need to be referenced in this section also.

Response:

4. 971-2.3.2 Containers: This needs to also reference 2000 lb. totes and 2200 lb. metric ton totes from the glass sphere manufacturers. Pallets of 40-50 lb. bags are not the only way this product is packaged for use.

Response:

5. 971-3.3 Physical Requirements: Why is ASTM D4960 being referenced here? D4960 is Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials. This is standard paint.

Response:

6. 971-3.5 Packaging and labeling: These materials are also produced in 250 – 275 gallon totes for sale to contractors. Please address these container packaging and labeling requirements also.

Response:

7. 971-4.3 Physical Requirements: Why is ASTM D4960 being referenced here? ASTM D4960 is Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials. This is durable paint.

Response:

8. 971-4.5 Packaging and labeling: These materials are also produced in 250 – 275 gallon totes for sale to contractors. Please address these container packaging and labeling requirements also.

Response:

9. 971-5.2 Composition: What is the meaning of “% minimum per manufacturer” for Yellow Components? Is this a minimum percentage to be stated on the label? If not, is this to be a stated minimum to be given for reference by Product Evaluation on approved yellow thermoplastic materials? This should be removed as it does not relate to non-lead thermoplastic materials.

Response:

10. 971-5.4 Sharp Silica Sand: Since this is making reference to sieve sizes, should this not reference some ASTM or ASSHTO test method? It would be easy to quantify a sieve size of 20 having a 100% passing, but how do you determine a sieve size of 50 having a 0 to 10% passing determination. Is this by volume, weight, ect?

Response:

11. 971-5.5 Physical Requirements: Why is ASTM D4960 being referenced here? D4960 is Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials. Color would be determined in 971-5.2 Composition.

Response:

12. 971-5.5.2 Retroreflectivity: I believe the change from 150 mcd/lxm² to 300 mcd/lxm² is a typo error. This should remain as 150 mcd/lxm² at the end of the three year period. If it is indeed a true edit, there is no credible data that I am aware of to support this change. There are too many variables (pavement condition, AADT, truck traffic, ect.) that could influence the reduction in retro-reflectivity of the marking(s).

Response:

13. 971-5.7 Package and Labeling: Color, date of manufacture, batch number, and APL number should be listed on the packages, in addition to the material “heating” warning mentioned in the last paragraph.

Response:

14. 971-6.4 Color: Is the definition of “Section” the entire Specification 971? If not, 971.1 addresses the requirements for yellow only. Why do we not have a minimum TIO₂ requirement for this material as thermoplastic has in Specification 971-5.

Response:

15. 971-6.5.1 Retroreflectivity: Edit “pedestrian crosswalks” to show “12” transverse pedestrian crosswalks”. Is this referencing all preformed materials used within a crosswalk, such as emphasis markings? Emphasis markings guidance still calls out not less than 300 mcd/lxm² for retro, not 275 mcd/lxm².

Response:

16. 971-7.5 Durability and Wear Resistance: There is no defined statement for Permanent Tape referenced in the Part B section of FM 5-541 to the statement “The film shall be weather resistant and, through normal wear, shall show no significant tearing, rollback or other signs of poor adhesion”. This statement should be defined only within the materials portion of this section, much the same as 971-7.6 reads for Conformability and Resealing.

Response:

17. 971-7.8 Pigmentation: Why is ASTM D4960 being referenced here as it has nothing to do with testing for pigmentation? ASTM D4960 is Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials. This is permanent tape. The expected life of these materials as tested is 5 years.

Response:

18. 971-7.9 Glass Spheres: What ASTM or ASSHTO test method needs to be referenced for this test?

Response:

19. 971-8.3 Physical Requirements: Why is ASTM D4960 being referenced here? ASTM D4960 is Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials. This is two reactive component materials, not thermoplastic.

Response:

20. 971-9.2 Composition: What is the meaning of “% minimum per manufacturer” for Yellow Components? Is this a minimum percentage to be stated on the label? If not, is this to be a stated minimum to be given for reference by Product Evaluation on approved yellow thermoplastic materials? This should be removed as it does not relate to non-lead thermoplastic materials.

Response:

21. 971-9.3 Retroreflective Elements: This verbiage needs to be changed to “Retroreflective Optics”. I think this was the agreed upon term to describe the various types of retroreflective media used for pavement markings. The verbiage needs to be also addressed in 971-9.2 Composition Component also.

Response:

22. 971-9.4 Physical Requirements: Why is ASTM D4960 being referenced here for sampling? ASTM D4960 is Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials. This is two reactive component materials, not thermoplastic.

Response:

David Villani, Ennis-Flint
678-558-1660
davev@ennisflint.com

Comments: (1-29-15)

1. Ennis-Flint agrees with Gary Ware (Swarco, comments above) and we would further like you to consider: Under the test method for roundness: AASHTO PP 74 using a b/l setting of 0.83 and a coverage area of 0.5 – 0.8%

Response:

2. (2-5-15)

Need to specify that the installer of the pavement marking is responsible for warranty attainment and replacement in sections 971-3.3.3, 971-4.3.3, 971-5.5.2, 971-6.5.1, 971-6.5.2, 971-8.3.3, 971-9.9. Regardless of product or the listed duration, the retained retro during and at the end of the warranty period should be 150 max to account for the high ADT roadways in the State - section 971-5.5.2

Response:

Scott Pantall
904-716-7445
scott.pantall@swarco.com

Comments: (1-29-15)

1. Why does the inflated retroreflectivity requirement only impact the Thermoplastic Spec? The values weren't raised for other durable markings, such as High Build Paint, Two Component Materials, and Profiled Thermoplastic. Are there any concerns regarding these materials?

Response:

2. Will there be separate contracts to take readings on Thermoplastic over the 3 year period to ensure the requirement has been met?

Response:

3. If there is a deficiency, who is the responsible party? Will the contractor be required to remove and replace or will the manufacturer be responsible for removal and replacement? I believe the current spec, with the 180 observation period, is sufficient enough to determine whether or not the material has been properly applied and the material has been properly manufactured.

Response:

K. C. Jose
772-429-4936
Kandarappallil.Jose@dot.state.fl.us

Comments: (2-3-14)

1. **971-1.7.** The reference to MSDS may be modified as, - Provide supporting independent analytical data or product safety data sheets (SDSs) identifying any ----(this is proposed because of the recent changes- <http://www.hazcommpliance.com/ghs-sds-and-employers-information-you-need-to-know/>)

Response:

2. **971-2.1.** The last sentence may be modified as – The general requirements of 971 apply to glass spheres.

Response:

3. **971-3.3.2** Abrasion Resistance: may be modified as - Test four samples using a Taber Abrader. The paint shall be applied to specimen plates using a drawdown blade having a clearance of 20 mils. Air dry each sample until fully cured based on the manufacturers product recommendation .Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with a combined load of 500 grams – metric units (arm plus auxiliary weight) on each arm and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 75 mg per plate.

Response:

4. **971-4.1.** Line 3 may be modified as – The manufacturer shall have the option of formulating the paint according to their specifications. (The third person plural is recommended for Section 971-5.1, 971-6.1, 971-8.1, and 971-9.1)

Response:

5. **971-4.3.2** Abrasion Resistance: Replace the section with -Tests to be performed in lines with section as specified in 971-3.3.2

Response:

6. **971-5.7.** Add one more line as – Approved APL number to be shown on the label.

Response:

7. **971-9.6.** . Add one more line as – Approved APL number to be shown on the label.

Response:

Kevin Micocci
954-777-4266
Kevin.micocci@dot.state.fl.us

Comments: (2-3-15)

I have a few questions regarding the inspection, enforcement, and repairs for this specification, which were brought up because of the proposed changes below.

1. Who is intended to test the retroreflectance/durability of the markings? Is this the contractor’s responsibility or the Department? If it is the Department’s, I don’t believe that we have the proper equipment or training for our warranty coordinators to be able to do all the testing that is required.

Response:

2. Upon discovering a deficiency, is this pursued as a warranty issue? There is an implied warranty on these markings based on this language, but no clear language regarding how to pursue the warranty, resolve conflicts, required time periods for response by the contractor, etc.

Response:

3. Is there a standard repair procedure for each type of marking, or is it simply replacement of the markings? If full replacement is required, do old markings need to be removed? For reference, here are the sections which imply a warranty period for each type of marking:

971-3.3.3 – Standard Paint The retroreflectance of the white and yellow pavement markings at the end of the six month period shall not be less than 150 mcd/lx•m2

971-4.3.3 – Durable Paint The retroreflectance of the white and yellow pavement markings at the end of the six 18 month period shall not be less than 150 mcd/lx•m2

971-5.5.2 – Standard Thermoplastic Material The retroreflectance of the white and yellow pavement markings at the end of the three year period shall not be less than 150 300 mcd/lx•m2

971-6.5.1 – Preformed Thermoplastic Material The retroreflectance of the white pavement markings at the end of the three year period shall not be less than 150 mcd/lx•m2

971-7.10 – Permanent Tape Materials The pavement markings shall retain a minimum retroreflectance for two years of not less than 300 mcd/lx•m2 for white markings and not less than 250 mcd/lx•m2 for yellow markings. The retroreflectance of the white, yellow and contrast pavement markings at the end of the five year period shall not be less than 150 mcd/lx•m2

971-8.3.3 – Two Reactive Component Material The retroreflectance of the white and yellow pavement markings at the end of the three year period shall not be less than 150 mcd/lx•m2

971-9.4.2.3 – Profiled Thermoplastic Material The retroreflectance of the white and yellow pavement markings at the end of the three year period shall not be less than 150 mcd/lx•m2 Durability shall include flattening of the profile or raised portions of the line. The flattening of the profile or raised portion of the line shall not exceed 25% at the end of the three year period.

Response:

David Entrekin
Future Labs, Inc.
601-842-3004
david@futurelabsllc.com

Comments: (2-5-15)

971-6.4 Color: Materials shall meet the performance requirements specified in this Section and the following additional requirements. The initial luminance factor, Cap Y, shall not be less than 55.

Since FDOT requires Yellow color similar to ASTM D6628 (as a beaded color) then why require a Cap Y of > 55? A Cap Y of 55 is hard to obtain on some types of beaded White and unbeaded Yellow. Do you really have customers that can meet this requirement and stay in the color boxes?

The ASTM D6628 for beaded markings only has a Cap Y of 25 for beaded markings.

TABLE 3 Luminance Factor, Y^A

Color	With Glass Beads	
	Y	Y
	Minimum	Maximum
White	35	...
Yellow	25	...
Red	6	15
Blue	5	14

^A The following in-service daytime luminance factor limits (tristimulus value Y expressed as a percent) apply when measured with 45/0 (0/45) geometry and illuminant D65 using the 1931 CIE 2° standard observer.

Response:

MaryJo Lewis
651-736-2211
mklewis1@mmm.com

Comments: (2-5-15)

1. 971-5.5.2: We support the improved safety for the motoring public represented by this change.

Response:

2. 971-7.11: Labels are dictated by information generally required by the plurality of customers. Adding information specific to the State of Florida (specifically as requested: material thickness and APL number) would require unique Florida-only labels. This would limit the ability to generally supply material from stock, resulting in longer lead times and higher costs. Certificates of conformance which correspond to every order/batch already reference the APL number, so having this information on the box is redundant. We believe listing thickness and APL number on the box labels is unnecessary. We would further point out that similar information is not being required for labeling all products, specifically standard thermoplastic materials. Current labels for permanent tape include the following information: Name and address of manufacturer Product Name/Number/SKU Product Color Size of the roll (width and length) Number of units in the package Date of manufacture Lot/batch number

Response:

3. 971-8.5: Requiring all such materials to be supplied only in 55 gallon drums is a detriment to contractors who are able to use 250 gallon totes in preference to drums. We recommend that this restriction be removed. Labels are dictated by the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements and information generally required by the plurality of customers. Adding information specific to the State of Florida (specifically as

requested: density, generic type and APL number) would require unique Florida-only labels. This would limit the ability to generally supply material from stock, resulting in longer lead times and higher costs. Certificates of conformance which correspond to every order/batch already reference the APL number, so having this information on the container is redundant. The value of having the density and generic type of the material listed on the container is also unclear. We believe these items are unnecessary. We would further point out that similar information is not being required for labeling all products, specifically standard thermoplastic materials. Current labels for two part reactive materials include the following information: Name and address of manufacturer Product Name/Number/SKU Product Color Number of Gallons Required composition information and health and safety precautions Date of manufacture Lot/batch number

Response:

Debbie Toole
414-4114
deborah.toole@dot.state.fl.us

Comments: (2-6-15)

For clarity and non-duplication of language, I suggest the highlighted edits.

<p>971-1 General Requirements</p> <p>→ → → 971-1.1 Packaging and Labeling: All traffic pavement marking materials shall be shipped in strong containers plainly marked with the weight in pounds per gallon, the volume of traffic pavement marking materials content in gallons, the color, user information, date of manufacture, batch and DOT code number. Each batch manufactured shall have a unique number. A true statement of the percentage composition of the pigment, the proportion of pigment to vehicle, and <i>Materials shall be packaged in accordance with the specific requirements of this Section for each product.</i></p> <p>→ → → Clearly mark all containers with <i>The name and address of the manufacturer, also and the batch or lot number shall be shown on the label.</i></p> <p>→ → → The label for standard paint, durable paint, and two-reactive component materials shall also include the weight in pounds per gallon, the volume of materials in units of gallons and the APL number. Labels for two-reactive component materials shall also include the type of product (e.g. epoxy, polyurea).</p> <p>→ → → The label for preformed thermoplastic and permanent tape materials shall also include the thickness of the preformed material in units of inches and the APL number.</p> <p>→ → → The label for standard thermoplastic and profiled thermoplastic materials shall warn the user that the material shall be heated in the range as recommended by the manufacturer.</p> <p>→ → → The label shall warn the user of any special handling or precautions of the material, as recommended by the manufacturer. Any packaging <i>ing and labeling</i> not so marked will not be accepted for use under these specifications.</p> <p>→ → → Preformed thermoplastic materials and permanent tape products shall be marked with content, color, date of manufacture and batch number.</p>
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▪ **971-2 Glass Spheres.** ¶

→ → **971-2.3.2 Containers Packaging:** The spheres shall be furnished in new 50 pound moisture-proof bags. All containers shall meet *Interstate Commerce Commission* requirements for strength and type and be marked in accordance with AASHTO 247 Part 5. ¶

¶

▪ **971-3 Standard Waterborne Fast-Dry Traffic Paint** ¶

→ → **971-3.4.5 Packaging and Labeling:** The traffic paint shall be placed in 55 gallon open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gallons of material paint shall be placed in any drum to allow for expansion during transport and storage. *Clearly mark the containers with the weight in pounds per gallon, the volume of materials in units of gallons, the color, date of manufacture, batch number, and APL number.* ¶

¶

▪ **971-4 Durable High-Build Paint** ¶

→ **971-4.5 Packaging and Labeling:** The traffic paint shall be placed in 55 gallon open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gallons of material paint shall be placed in any drum to allow for expansion during transport and storage. *Clearly mark the containers with the weight in pounds per gallon, the volume of materials in units of gallons, the color, date of manufacture, batch number and APL number.* ¶

¶

▪ **971-5 Standard Thermoplastic Materials for Traffic Stripes** ¶

→ **971-5.7 Packaging and Labeling:** The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 pounds. *The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.* ¶

¶

▪ **971-6 Preformed Thermoplastic Materials for Traffic Stripes** ¶

→ **971-6.7 Packaging and Labeling:** The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. *Clearly mark each container with the thickness of the preformed material in units of inches, the color, date of manufacture, batch number and APL number.* ¶

¶

▪ **971-7 Permanent Tape Materials for Traffic Stripes and Markings** ¶

→ **971-7.11 Packaging and Labeling:** *Ship all permanent tape materials in containers which will not adhere to the product during shipment and storage. Clearly mark each container with the thickness of the preformed material in units of inches, the color, date of manufacture, batch number and APL number.* ¶

¶

971-8 Two-Component Materials For Traffic Stripes And Markings.

→ **971-8.5 Packaging and Labeling:** The two reactive component material shall be placed in 55 gallon open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gallons of material shall be placed in any drum to allow for expansion during transport and storage. *Clearly mark the containers with the weight in pounds per gallon, the volume of materials in units of gallons, the color, generic type (e.g. epoxy), date of manufacture, batch number and APL number.* Other containers will be used for applicable products. Each container shall designate the color, generic type (e.g. epoxy), user information, manufacturer's name and address, batch number and date of manufacture. Each batch manufactured shall have a unique number. The label shall warn the user of hazards associated with handling or using the material.

971-9 Profiled Thermoplastic Material for Audible and Vibratory Traffic Stripes.

→ **971-9.6 Packaging and Labeling:** The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 ~~lb~~ pounds. *The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.*

Response:
