

9710900 TRAFFIC MARKING MATERIALS
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

Karen Byram
414-4353
karen.byram@dot.state.fl.us

Comment: (3-26-10)

Wet Weather S971-10.4.3 Durability does not address flattening of the profile. Since there is an option when an audible bump is required, shouldn't this be included? Reference S971-10.4.1.

Response: Yes. Add the following to 971-10.4.3 "When an audible bump is required, the product durability shall also 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 service life."

Alan Lafferty
562-1937
gulf7@embarqmail.com

Comments: (4-5-10)

Shouldn't Proposed Specification 971-9.4.2 (Retroreflectivity) have an end of service life as required in Proposed Specification 971-10.4.2? This would ensure retained retroreflectivity with the audible and vibratory marking specification.

1. Section 971-9.4.2 Retroreflectivity

Revise add "The retroreflectance of the white and yellow pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m²."

Response: Section 971-9.4.2 already provides this statement. No changes made.

Paul Gentry
414-4118

Comments: (4-8-10)

Spec. 971-10.4.1. states "When the audible bump is required, the set to bear time shall not exceed seven minutes." This gives reference that the bump "may or may not" be required with the Wet Weather Traffic markings. When you look at 702-4.3 Dimensions of Audible Bump, this gives the impression that the audible bump "is required." In asking the question of bump or no bump, the reference is 702-1 Description which states "Apply wet weather markings in accordance with the Contract Documents." which guides the designer. This is confusing, as I have had a couple of manufacturers asking the same question of where does it "specify or not specify" a audible bump requirement. The PPM states in Section 7.2.8.2 that audible and vibratory markings shall be installed on all flush shoulder rural projects "excluding limited access facilities." and that they should only be used on centerline markings of two-lane roadways where there is a history of centerline cross over crashes.

1. Is this going to be the guidance that will be used for the audible requirement for 702?

This is with the understanding that the 702 material is to be used on a roadway that has a documented problem with wet weather nighttime crashes.

2. If so, is there a better way to explain this in the description, or at least make reference as to where the contract documents being written by the designer gets their guidance for “bump or no bump”?

Response: As you point out, the designer determines the need for a bump based on PPM 7.2.8.2. To address the use of wet weather pavement markings, more guidance will be added in the PPM as to when wet weather markings are appropriate. Based on these requirements, designers will determine the applicable pavement marking and designate on the plan sheets and by using the appropriate pay items. The contractor will not make the decision to use a bump or not. No changes made.

Paul Gentry
414-4118

Comments: (4-8-10)

Specification 971-9.2 Composition strikes out the reference to Glass Spheres in the Component column and replaces with Reflective Elements. Under Test Method, it still makes reference to AASHTO T250. The method only references “Glass Beads”, of which a few materials (3M, Visimax, etc.) being used now and on future QPL striping materials do not meet. This test method needs to be removed for Reflective Elements as there is no mention of these in T250, only Glass Beads.

On one hand, according to 971-9.3 Reflective elements, we are leaving it up to the manufacturer to determine the reflective elements to be used in the intermix and this will be listed on the QPL. On the other hand, we are requiring that there will be a minimum of 40% reflective elements in the composition for both white and yellow.

This appears to be a conflicting statement.

Response: You are correct. The table will be revised to indicate “% minimum per manufacturer”. AASHTO T 250 would apply to either type of reflective elements.

Paul Gentry
414-4118

Comments: (4-8-10)

971-9.4.1 Set to Bear Traffic Time states that the thermoplastic shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80 degrees F. or less and in not more than 15 minutes for ambient air temperatures exceeding 80 degrees F 701 Audible Vibratory materials.

1. Should this not reflect 2 minutes or less for the baseline thermoplastic the same as Spec. 971-10.4.1 does for 702 Wet Weather Traffic markings?

The audible bump is what is being addressed here for the 10 and 15 minute time limits.

Response: Yes. The original set to bear did not anticipate a preformed audible bump. The wording in 971-9.4.1 will be revised to read “When applied at the thickness specified, the base line shall set to bear

traffic in not more than two minutes. The audible & vibratory bump shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80°F or less and in not more than 15 minutes for ambient air temperatures exceeding 80°F.”

2. What is the reason for having different set to bear times for the 701 (stated above) and 702 (not to exceed seven minutes with no air temperature reference) audible bumps?

Response: The set to bear time will be revised to be consistent with the audible & vibratory marking when a bump is required. “When an audible bump is required, the bump shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80°F or less and in not more than 15 minutes for ambient air temperatures exceeding 80°F.”

The verbage of physical requirements seems to read the same in both 701-4.3 Dimensions of Transverse Audible Bumps and 702-4.3 Dimensions of Audible Bumps.

702-4.3 Dimensions of Audible Bumps: Apply the raised bump with a profile such that the leading and trailing edge are sloped at a sufficient angle to create an audible and vibratory warning.

Bumps on shoulder and centerline markings shall have a minimum height of 0.45 inches, including the base line. The height shall be measured above the pavement surface at the edge of the marking, after application of reflective elements. Bumps shall have a minimum dimension of 2.5 inches. Bumps may have a drainage channel, the width of each drainage channel will not exceed 1/4 inch at the bottom of the channel. The longitudinal distance between bumps shall be approximately 30 inches.

701-4.3 Dimensions of Transverse Audible Bumps: Apply the raised transverse bumps with a profile such that the leading and trailing edge are sloped at a sufficient angle to create an audible and vibratory warning.

Bumps on shoulder and centerline markings shall have a minimum height of 0.45 inches, including the base line. The height shall be measured above the pavement surface at the edge of the marking, after application of drop-on reflective elements. Bumps shall have an minimum length of 2.5 inches. The bumps may have a drainage channel, the width of each drainage channel will not exceed 1/4 inch at the bottom of the channel. The longitudinal distance between bumps shall be approximately 30 inches.

Response: Yes, they are intended to be the same. We will revise the title of 701-4.3 to read “Dimensions of Audible Bumps.”

Paul Gentry
414-4118

Comments: (4-8-10)

Specification 971-10.4.3 Durability states that the thermoplastic material line loss must not exceed 5.0% at the end of the 3 year service life for the Specification 702 material.

1. Why does this not also include the verbage on” flattening of the profile or raised portion of the line” from 971-9.4.3 Durability for the Audible Vibratory materials.

Response: Yes, see response to Karen Byram’s comment above.

2. How is this being determined in the field and who is the responsible party for enforcing these requirements?

Response: Construction should be checking both the initial baseline thickness and the bump height. Durability would be checked as part of QPL acceptance.

Jerry Britt
601-757-7008
jerry@ennistraffic.com

Comments: (4-12-10)

971-9.1: General

1. “Reflective”: A more appropriate reference would be retroreflective rather than reflective and would recommend that you replace the word “reflective” with “retroreflective” throughout the document.

Response: The heading in 971-9.3 and -10.3 will be changed to Retroreflective Elements.

2. “Element”: This is a term that in the industry has come to refer to a specific product made by a specific vendor. A more generic term should be used that does not infer a particular manufacturer’s product. I would recommend that you use the term “optic” and replace the word “element” with the word “optic”.

3. I would recommend a statement of definition under this section that defines “Retroreflective Optic”. Possible wording: A particle used in pavement markings to provide night time visibility of the pavement marking by retro reflecting a portion of the light from a vehicles headlights back to the driver. Retroreflective optics includes traditional glass spheres and multi-component retroreflective particles comprised of a pigmented core (typically white or yellow) covered with very small glass beads having a refractive index of between 1.90 and 2.4).

4. Wording in this section: “The pigment, reflective elements, and filler shall be well dispersed in the resin.” I would recommend the following: “The pigment, retroreflective optics and / or glass spheres, and filler shall be well dispersed in the resin.

971-9.2 Composition

5. Change the reference in the table of “Reflective Elements” to “Retroreflective Optics and / or glass spheres”

971-9.3 Reflective Elements

Change

971-9.3 Reflective Elements: The reflective elements in the intermix shall be determined by the manufacturer and identified for the QPL System.”

to

“971-9.3 Retroreflective Optics and / or Glass Spheres: The retroreflective optics and / or glass spheres in the intermix shall be determined by the manufacturer and identified for the QPL System.”

971-9.4 Physical Requirements

7. Indentation Resistance: There is no maximum hardness specified. If formulated to meet the specified set up time with no maximum hardness that has to be met the material can be excessively hard and brittle resulting in excessive cracking and bond loss when exposed to lower temperatures such as in the winter season. **A maximum hardness should be in the specification. Also recommend a load of 2.2 lbs for the test as a heavier load exceeds the capability of the testing instrument. The sample and the durometer should be conditioned at 115oF rather than 90oF as this is a more realistic condition for an asphalt roadway in the summer and is a more referenced conditioning temperature for this test in the industry.**

Response: This comment is on an article not being revised. No changes made. We require a maximum value of 75 for our standard thermoplastic, but we have left out a maximum for products that require profiling or audible bumps. The manufacturer should establish a product that is not excessively brittle without us establishing a maximum. We can discuss further if needed for possible changes in the future.

8. 971-9.4.1 Set To Bear Traffic Time

“The thermoplastic shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80°F or less and in not more than 15 minutes for ambient air temperatures exceeding 80°F.”

This particular section as written presents a major problem. The set times spelled out is not reasonable for an application done in the daytime under very high ambient and surface temperatures. This requirement should be dropped from the spec and the contractor should bear the responsibility of insuring that the product is sufficiently set before allowing traffic on the markings. This can be done by applying at night when the air and surface temperatures are as low as possible or by using water to cool the markings immediately after application. There is only so much that can be done from a formulation approach to minimize the set up time required. If you adjust the formulation to meet these requirements at the highest possible road and ambient temperature condition the resulting material will be too brittle in low temperature (winter time) conditions. This can result in excessive cracking and bond loss.

Response: This comment is on an article not being revised. Articles 701-6 and 702-6 require the Contractor to keep traffic off of the marking until it is sufficiently dry. Also, see responses above for clarifications to the set to bear times for the baseline and audible bumps. No changes made.

971-10.1: General

9. “Reflective”: A more appropriate reference would be retroreflective rather than reflective and would recommend that you replace the word “reflective” with “retroreflective” throughout the document.

10. “Element”: This is a term that in the industry has come to refer to a specific product made by a specific vendor. A more generic term should be used that does not infer a particular manufacturer’s product. I would recommend that you use the term “optic” and replace the word “element” with the word “optic”.

11. I would recommend a statement of definition under this section that defines “Retroreflective Optic”. Possible wording: A particle used in pavement markings to provide night time visibility of the pavement marking by retro reflecting a portion of the light from a vehicles headlights back to the driver. Retroreflective optics includes traditional glass spheres and multi-component retroreflective particles comprised of a pigmented core (typically white or yellow) covered with very small glass beads having a refractive index of between 1.90 and 2.4).

12. Wording in this section:

“The pigment, reflective elements, and filler shall be well dispersed in the resin.”

I would recommend the following:

“The pigment, retroreflective optics and / or glass spheres, and filler shall be well dispersed in the resin.

13. 971-10.2 Composition

Change the reference in the table of “Reflective Elements” to “Retroreflective Optics and / or glass spheres”

14. 971-10.3 Reflective Elements

Change

”971-10.3 Reflective Elements: The reflective elements in the intermix shall be determined by the manufacturer and identified for the QPL System.”

to

“971-10.3 Retroreflective Optics and / or Glass Spheres: The retroreflective optics and / or glass spheres in the intermix shall be determined by the manufacturer and identified for the QPL System.”

Response to Comments 2 – 5 and 9 - 14: The Department’s definition of elements is generic and intended to include glass spheres and any other reflective media, engineered optics or engineered particles created for retroreflectivity in pavement markings. No changes made.

15. 971-10.4 Physical Requirements

Indentation Resistance: There is no maximum hardness specified. If formulated to meet the specified set up time with no maximum hardness that has to be met the material can be excessively hard and brittle resulting in excessive cracking and bond loss when exposed to lower temperatures such as in the winter season. A maximum hardness should be in the specification.

Also recommend a load of 2.2 lbs for the test as a heavier load exceeds the capability of the testing instrument. The sample and the durometer should be conditioned at 115oF rather than 90oF as this is a more realistic condition for an asphalt roadway in the summer and is a more referenced conditioning temperature for this test in the industry.

Response: See response to your comment above.

16. 971-10.4.1 Set To Bear Traffic Time

“When applied at the temperatures and thickness specified by Section 702, the striping material shall set to bear traffic in not more than two minutes. -When the audible bump is required, the set to bear time shall not exceed seven minutes.”

This particular section as written presents a major problem. Section 702 says “Apply traffic stripes and markings only to dry surfaces and when the ambient air and surface temperature is at least 50oF and rising for asphalt surfaces and 60oF and rising for concrete surfaces.” This addresses only minimum temperatures and does not address the possible high end temperature range that the application could be done under. The set times spelled out is not reasonable for an application done in the daytime under very high ambient and surface temperatures. This requirement should be dropped from the spec and the contractor should bear the responsibility of insuring that the product is sufficiently set before allowing traffic on the markings. This can be done by applying at night when the air and surface temperatures are as low as possible or by using water to cool the markings immediately after application. There is only so much that can be done from a formulation approach to minimize the set up time required. If you adjust the formulation to meet these requirements at the highest possible road and ambient temperature condition the resulting material will be too brittle in low temperature (winter time) conditions. This can result in excessive cracking and bond loss.

Response: See response to your comment above.

971-10.4.2 Retroreflectivity:

17. How were the criteria for minimum wet retroreflectivity performance established? The minimum requirements for Europe are considerably lower (50 – 75 mcd wet). The higher values may eliminate products that perform well at more competitive costs to the department.

Response: The wet recovery values come from historical requirements in the previous wet weather specifications. Since this is already a wet recovery method we would not reduce the requirements. No changes made.

18. All applicable Sections: Comments: • “reflective elements”: Change the term “reflective elements” in all relevant sections to “retroreflective optics”

Response: See above response.

Matthew Schindler
813-649-1336
matthew@cloverleafcorp.com

Comments: (4-19-10)

1. Section 971-9.3: “Reflective Elements” are not defined in any other specification for pavement markings or in the 971 specification. Other material specifications say “glass spheres” and give specific qualities of the spheres that are required. Suggest going back to “glass spheres” as used in all the other pavement marking material specifications
2. Section 971-10.3: “Reflective Elements” are not defined in any other specification for pavement markings or in the 971 specification. Other material specifications say “glass spheres” and give specific qualities of the spheres that are required. Suggest going back to “glass spheres” as used in all the other pavement marking material specifications

Response: See response to Jerry Britt’s comments above.

Mark Bjorklund
Mbjorklund@peeksafety.com

Comments: (4-20-10)

1. The use of the term “reflective elements” in this industry is commonly linked to one manufacturer in particular, and I recommend that an even broader term be used such as “reflective media” to minimize the confusion that this may create.

Response: See response to Jerry Britt’s comments above.

Tom Wood
443-253-9036
tmwood@sherwin.com

Comments: (4-21-10)

1. Both 971-9.3 and 971-10.3 make no reference to the specification that the "reflective elements" that can be used - only that they must be identified as part of the system. I believe this is in place to allow the use of enhanced performance reflective media, but just want to make sure that it is understood that the opposite may also occur. FLDOT make receive lower quality reflective elements than intended.

Response: The intent is to allow options, however, the system (thermoplastic and reflective elements) when applied must provide the retroreflectivity requirements.

2. Relative to a previous comment, the term "Reflective Element" is now open to interpretation. There is no definition to what this actually means so properties such as glass bead milkiness, roundness, etc are no longer meaningful. I am not sure that this is necessarily a bad thing since the emphasis is now more focused on the ability of the product to perform in the field.

Response: See response to Jerry Britt’s comments above.

Grier Kirkpatrick
ggkirkpatrick@mmm.com

Comments: (4-22-10)

3M Reflective Elements, along with any other reflective optic/media, should be allowed for all categories in 971. Setting the desired levels of performance is the easiest way to enable industry to supply the best solutions at the best price. One way or another, we all find a way.....

Response: This comment is outside of the proposed revisions. Sections 701, 702, and 709 allow the use of reflective elements. We can discuss further for possible future changes.
