Florida Department of Transportation

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STEPHANIE KOPELOUSOS
SECRETARY

April 29, 2010

Monica Gourdine
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section 701
Proposed Specification: **7010000 Audible and Vibratory Pavement Markings**

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

These changes were proposed by Chester Henson of the State Roadway Design Office to change audible and vibratory markings to a Qualified Projects List (QPL) System with reflective elements instead of glass spheres and to specify a maximum amount of missing or broken bumps. We anticipate implementing these changes with August 2010 lettings.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to ST986RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4280.

Sincerely,

Rudy Powell, Jr., P.E.
State Specifications Engineer

RP/dt
Attachment
cc: Gregory Jones, Chief Civil Litigation
Florida Transportation Builders' Assoc.
State Construction Engineer

AUDIBLE AND VIBRATORY PAVEMENT MARKINGS.
(REV *4*~~3~~-*28*~~*3542119*~~-10)

SECTION 701 (Pages 787 – 790) is deleted and the following substituted:

SECTION 701
AUDIBLE AND VIBRATORY PAVEMENT MARKINGS

701-1 Description.

Apply audible and vibratory pavement markings in accordance with the Contract Documents.

701-2 Materials.

701-2.1 Thermoplastic: Use thermoplastic material meeting the requirements of 971-1 and 971-9 and listed on the Qualified Products List (QPL) *as an approved system*. The Engineer will take random samples of the materials in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

701-2.2 *Retroreflective Elements*~~Glass Spheres~~: Use *reflective elements recommended by the manufacturer that meet the requirements of 971-1.7 and are part of the system listed on the QPL.*~~glass spheres meeting the requirements of 971-1 and 971-2 and listed on the QPL. The Engineer will take random samples of glass spheres in accordance with ASTM D 1214 and the Department's Sampling, Testing and Reporting Guide schedule.~~

701-3 Equipment.

Use equipment capable of providing continuous, uniform heating of the striping material to temperatures exceeding 390ºF, mixing and agitating the material in the reservoir to provide a homogenous mixture without segregation. Use equipment that will maintain the striping material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which is capable of producing a consistent pattern of transverse b*umps*~~ars~~ positioned at regular and predetermined intervals. Use equipment which meets the following requirements:

(a) capable of traveling at a uniform rate of speed, both uphill and downhill, to produce a uniform application of striping material and capable of following straight lines and making normal curves in a true arc.

(b) capable of applying *reflective elements*~~glass spheres~~ to the surface of the completed stripe by automatic ~~sphere~~ dispensers attached to the striping machine such that the *reflective elements*~~glass spheres~~ are dispensed closely behind the installed line. Use *reflective element*~~a glass sphere~~ dispensers equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the *reflective elements*~~glass spheres~~ uniformly on the entire traffic stripe surface with 50 to 60% embedment.

(c) equipped with a special kettle for uniformly heating and melting the striping material. The kettle must be equipped with an automatic temperature control device and material thermometer for positive temperature control and to prevent overheating or scorching of the thermoplastic material.

(d) meets the requirements of the National Fire Protection Association, state and local authorities.

701-4 Application.

701-4.1 General: Before applying traffic stripes and markings, remove any material that would adversely affect the bond of the traffic stripes by a method approved by the Engineer.

Before applying traffic stripes to any Portland cement surface, apply a primer, sealer or surface preparation adhesive of the type recommended by the manufacturer. Offset longitudinal lines at least 2 inches from construction joints of Portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 50ºF and rising for asphalt surfaces and 60°F and rising for concrete surface.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and marking over existing markings, ensure that not more *than* 2 inches on either end and not more th~~at~~*an* 1 inch on either side of the existing line is visible.

Conduct field tests in accordance with FM 5-541. Remove and replace markings not meeting the requirements of this Section.

701-4.2 Thickness: Apply base lines having a thickness of *0.100*~~0.079~~ to 0.1*5*~~2~~0 inches, exclusive of the ~~transverse~~ audible *bumps*~~bars~~, when measured above the pavement surface at the edge of the base line.

As an alternative to the flat base line, a profiled baseline meeting the following dimensions may be applied. The profiled baseline shall have a minimum height of 0.155 inches, when measured above the pavement surface at the edge of the inverted rib profile. The thickness in the bottom of the profile marking shall be 0.035 to 0.050 inches. The individual profiles shall be located transversely across the full width of the traffic stripe at approximately 1.0 inch on center, with a bottom width between 0.090 *to* ~~-~~ 0.310 inches.

Measure, record and certify on a Department approved form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5-541.

701-4.3 Dimensions of ~~Transverse~~ Audible B*umps*~~ars~~: Apply the raised ~~transverse~~ b*umps*~~ar~~ with a profile such that the leading and trailing edge*s* are sloped at a sufficient angle to create an audible and vibratory warning.

Bumps~~Transverse bars~~ 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*~~glass spheres~~. *Bumps*~~The bars~~ shall have a~~n~~ *minimum dimension*~~approximate length~~ of 2.5 inches. The b*umps*~~ars~~ may have a drainage channel~~, on each bar,~~ the width of each drainage channel will not exceed 1/4 inch at the bottom of the channel. The longitudinal distance between b*umps*~~ars~~ shall be approximately 30 inches.

701-4.4 Retroreflectivity: Apply white and yellow audible and vibratory markings that will attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and not less than 250 mcd/lx ~~-~~m^2, respectively. Measure, record and certify on a Department

approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5-541.

The Department reserves the right to test the markings within 3 days of receipt of the Contractor's certification. If the retroreflectivity values measure below values shown above, remove and reapply the striping.

701-4.5 Color: Use pavement marking materials that meet the requirements of 971-1.

701-4.6 *Reflective Elements*~~Glass Spheres~~: Apply *reflective elements*~~glass spheres~~ to all markings *at the rates determined by the manufacturer's recommendations as identified for the QPL System.*~~. The manufacturer shall determine if a single or double application of glass spheres is used and the recommended drop rates for each application.~~

701-4.7 Loss: *If more than 1% of the bumps or more than three consecutive bumps are missing or broken (less than ~~50%~~half a bump remaining) within the first 45 days under traffic, replace all failed bumps at no expense to the Department. If more than 2% of the bumps fail within the first 45 days under traffic, the replacement period will extend an additional 45 days from the date all replacement bumps were installed. If, at the end of the additional 45 days, more the 2% of all bumps (initial and replacement) fail, replace all failed bumps at no expense to the Department. Measure, record and certify on a Department approved form and submit to the Engineer, the loss of bumps.*

701-5 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of audible and vibratory markings. Furnish the Engineer with the manufacturer's name and batch numbers of the thermoplastic materials and *reflective elements*~~glass spheres~~ to be used. Ensure that the batch numbers appear on the thermoplastic materials and *reflective elements*~~glass spheres~~ packages.

701-6 Protection of Newly Applied Audible and Vibratory Markings.

Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause.

701-7 Observation Period.

Pavement markings are subject to a 180 day observation period under normal traffic. The observation period will begin with the satisfactory completion and acceptance of the pavement marking work.

The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 701- 4.4. The Department reserves the right to check the color and retroreflectivity anytime prior to the end of the observation period.

Replace, at no expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

701-8 Corrections for Deficiencies.

Correct all deficiencies by removal and reapplication of a 1.0 mile section centered around the deficiency at no cost to the Department.

701-9 Submittals.

701-9.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

701-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O'clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification of quantities consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

701-10 Method of Measurement.

The quantities to be paid for under this Section will be as follows:

(a) The length, in net miles, of 6 inches Solid Traffic Stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 skip line. The actual applied line is 25% of the traverse distance for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

701-11 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Payment will be made under:

Item No. 701- 1 Audible and Vibratory Pavement Markings.

AUDIBLE AND VIBRATORY PAVEMENT MARKINGS.
(REV 4-28-10)

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701-2.2 Retroreflective Elements: Use reflective elements recommended by the manufacturer that meet the requirements of 971-1.7 and are part of the system listed on the QPL.

701-3 Equipment.

Use equipment capable of providing continuous, uniform heating of the striping material to temperatures exceeding 390ºF, mixing and agitating the material in the reservoir to provide a homogenous mixture without segregation. Use equipment that will maintain the striping material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which is capable of producing a consistent pattern of transverse bumps positioned at regular and predetermined intervals. Use equipment which meets the following requirements:

(a) capable of traveling at a uniform rate of speed, both uphill and downhill, to produce a uniform application of striping material and capable of following straight lines and making normal curves in a true arc.

(b) capable of applying reflective elements to the surface of the completed stripe by automatic dispensers attached to the striping machine such that the reflective elements are dispensed closely behind the installed line. Use reflective element dispensers equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the reflective elements uniformly on the entire traffic stripe surface with 50 to 60% embedment.

(c) equipped with a special kettle for uniformly heating and melting the striping material. The kettle must be equipped with an automatic temperature control device and material thermometer for positive temperature control and to prevent overheating or scorching of the thermoplastic material.

(d) meets the requirements of the National Fire Protection Association, state and local authorities.

701-4 Application.

701-4.1 General: Before applying traffic stripes and markings, remove any material that would adversely affect the bond of the traffic stripes by a method approved by the Engineer.

Before applying traffic stripes to any Portland cement surface, apply a primer, sealer or surface preparation adhesive of the type recommended by the manufacturer. Offset longitudinal lines at least 2 inches from construction joints of Portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 50ºF and rising for asphalt surfaces and 60°F and rising for concrete surface.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and marking over existing markings, ensure that not more than 2 inches on either end and not more than 1 inch on either side of the existing line is visible.

Conduct field tests in accordance with FM 5-541. Remove and replace markings not meeting the requirements of this Section.

701-4.2 Thickness: Apply base lines having a thickness of 0.100 to 0.150 inches, exclusive of the audible bumps, when measured above the pavement surface at the edge of the base line.

As an alternative to the flat base line, a profiled baseline meeting the following dimensions may be applied. The profiled baseline shall have a minimum height of 0.155 inches, when measured above the pavement surface at the edge of the inverted rib profile. The thickness in the bottom of the profile marking shall be 0.035 to 0.050 inches. The individual profiles shall be located transversely across the full width of the traffic stripe at approximately 1.0 inch on center, with a bottom width between 0.090 to 0.310 inches.

Measure, record and certify on a Department approved form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5-541.

701-4.3 Dimensions of Audible Bumps: Apply the raised bumps with a profile such that the leading and trailing edges 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 a minimum dimension 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.

701-4.4 Retroreflectivity: Apply white and yellow audible and vibratory markings that will attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and not less than 250 mcd/lx·m^2, respectively. Measure, record and certify on a Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5-541.

The Department reserves the right to test the markings within 3 days of receipt of the Contractor's certification. If the retroreflectivity values measure below values shown above, remove and reapply the striping.

701-4.5 Color: Use pavement marking materials that meet the requirements of 971-1.

701-4.6 Reflective Elements: Apply reflective elements to all markings at the rates determined by the manufacturer's recommendations as identified for the QPL System.

701-4.7 Loss: If more than 1% of the bumps or more than three consecutive bumps are missing or broken (less than half a bump remaining) within the first 45 days under traffic, replace all failed bumps at no expense to the Department. If more than 2% of the bumps fail within the first 45 days under traffic, the replacement period will extend an additional 45 days from the date all replacement bumps were installed. If, at the end of the additional 45 days, more the 2% of all bumps (initial and replacement) fail, replace all failed bumps at no expense to the Department. Measure, record and certify on a Department approved form and submit to the Engineer, the loss of bumps.

701-5 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of audible and vibratory markings. Furnish the Engineer with the manufacturer's name and batch numbers of the thermoplastic materials and reflective elements to be used. Ensure that the batch numbers appear on the thermoplastic materials and reflective elements packages.

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