Toole, Deborah

From: Maxwell, Stefanie
Sent: Wednesday, January 28, 2015 3:54 PM
To: Toole, Deborah; Henson, Chester
Cc: Gentry, Paul; Lewis, Christopher
Subject: Pavement Marking Specs
Attachments: 711-csl.sdm1-26-15.docx; 713-csl.sdm1-26-15.docx; 709-csl.sdm1-26-15.docx; 5460000 Comments2o GJM Admin Changes 01-13-15.smaxwelledits 01-26-15.docx; 701redln715.smaxwelledits1-26-15.docx; 7100000 ind revised 1-26-15.doc

Attached are the pavement marking spec changes that are required as a result of the Roadway Design Bulletin.

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JIM BOXOLD
SECRETARY

ROADWAY DESIGN BULLETIN 15-02
(FHWA Approved: January 21, 2015)

DATE: January 22, 2015

TO: District Directors of Transportation Operations, District Directors of Transportation Development, District Design Engineers, District Consultant Project Management Engineers, District Roadway Design Engineers, District Construction Engineers, District Maintenance Engineers, District Traffic Operations Engineers and Program Management Engineers

FROM: Michael Shepard, P.E., State Roadway Design Engineer

COPIES: Brian Blanchard, Tom Byron, Duane Brautigam, David Sadler, Lora Hollingsworth, Tim Lattner, Trey Tillander, Robert Robertson, Mark Wilson, Bruce Dana, John Krause, Bob Crim, Rudy Powell, Greg Schiess, Nicholas Finch (FHWA), Chad Thompson (FHWA), and Phillip Bello (FHWA)

SUBJECT: **Pavement Marking Materials Selection**

This bulletin clarifies existing policy on the selection of pavement marking materials and introduces a new policy on Profiled Thermoplastic (previously "Audible and Vibratory") and Rumble Striping as further supported by Roadway Design Bulletin 15-03 and Estimates Bulletin 15-01.

REQUIREMENTS

1. Meet the requirements of Roadway Design Bulletin 15-03 and Estimates Bulletin 15-01.

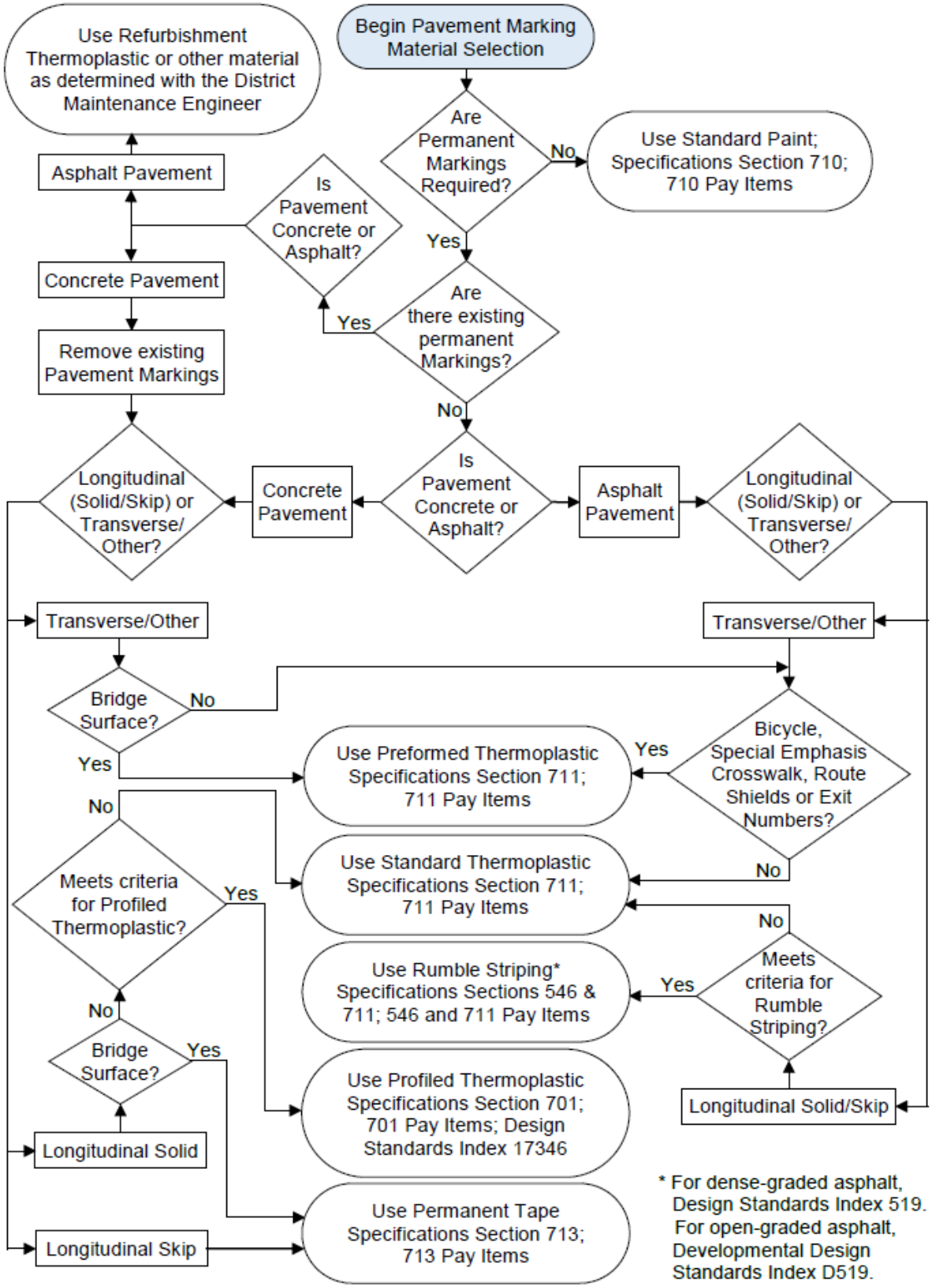
2. A ***Design Standards Revision (DSR)*** for Index 17346, Sheets 1, 2, 13 and 14 is released.

3. Delete ***PPM***, Volume 1, Section 7.6 and replace it with the following:

7.6 Pavement Markings

7.6.1 Pavement Marking Materials Selection

Use the following flowchart as a tool for selection of the appropriate pavement marking material.


Begin Pavement Marking Material Selection
Are Permanent Markings Required?
No
Use Standard Paint; Specifications Section 710; 710 Pay Items
Yes
Are there existing permanent Markings?
Yes
Is Pavement Concrete or Asphalt?
Asphalt Pavement
Concrete Pavement
Use Refurbishment Thermoplastic or other material as determined with the District Maintenance Engineer
Remove existing Pavement Markings
No
Is Pavement Concrete or Asphalt?
Concrete Pavement
Asphalt Pavement
Longitudinal (Solid/Skip) or Transverse/ Other?
Longitudinal (Solid/Skip) or Transverse/ Other?
Transverse/Other
Transverse/Other
Bridge Surface?
No
Yes
Use Preformed Thermoplastic Specifications Section 711; 711 Pay Items
Yes
Bicycle, Special Emphasis Crosswalk, Route Shields or Exit Numbers?
No
Use Standard Thermoplastic Specifications Section 711; 711 Pay Items
No
Meets criteria for Profiled Thermoplastic?
Yes
No
Use Rumble Striping* Specifications Sections 546 & 711; 546 and 711 Pay Items
Yes
Meets criteria for Rumble Striping?
No
Bridge Surface?
Yes
Use Profiled Thermoplastic Specifications Section 701; 701 Pay Items; Design Standards Index 17346
Longitudinal Solid/Skip
Longitudinal Solid
Use Permanent Tape Specifications Section 713; 713 Pay Items
Longitudinal Skip
* For dense-graded asphalt, Design Standards Index 519. For open-graded asphalt, Developmental Design Standards Index D519.

Once the pavement marking material is selected from the flowchart above, verify the project meets the following criteria for the selected pavement marking material.

7.6.1.1 Standard and Refurbishment Thermoplastic

Use Standard Thermoplastic material for all lines and markings not meeting the criteria for Rumble Striping, Profiled Thermoplastic, Preformed Thermoplastic or Permanent Tape.

Where there are existing permanent pavement markings on concrete pavement, include the removal pay item for the existing material.

Where there are existing permanent pavement markings on asphalt pavement, coordinate with the District Maintenance Engineer to determine if Refurbishment Thermoplastic or other pavement marking is warranted and to evaluate the existing markings to determine if they need to be removed. If it is determined that the existing markings are to be removed, include the removal pay item for the existing material.

For existing asphalt pavement, contact the District Maintenance Engineer to determine if contrast is required for skip lines, messages and arrows. If required, use black paint for contrast.

Modification for Non-Conventional Projects:
Delete the last three paragraphs above and see the RFP.

Commentary: This is Standard Thermoplastic, not the Hot Spray Thermoplastic used by Maintenance.
Standard Thermoplastic is not used on bridges with concrete riding surfaces due to vibration/durability.
The performance of Refurbishment Thermoplastic has been evaluated by the Department for a period of 36 months.

7.6.1.2 Rumble Striping

Use Rumble Striping on asphalt pavement for edge lines and center lines on all rural, two-lane and multi-lane, flush shoulder, non-limited access facilities, where posted speed is 50 mph or greater. This includes areas on rural facilities where the posted speed has been reduced due to restricted horizontal or vertical geometry. For dense-graded asphalt, use ***Design Standards*** Index 519; for open-graded asphalt, use ***Developmental Design Standards*** Index D519.

For existing asphalt pavement, contact the District Maintenance Engineer to determine if the remaining service life of the asphalt warrants the use of Rumble Striping.

Modification for Non-Conventional Projects:
Delete the paragraph above and see the RFP.

Commentary: Rumble Striping provides an audible and vibratory effect and is used on asphalt pavement as a countermeasure for lane departures and center line crossover crashes. Rumble Striping is created by utilizing the rumble striping process as specified in Specifications Section 546 and ***Design Standards*** *Index 519 or* ***Developmental Design Standards*** *Index D519. Standard Thermoplastic markings are installed over the ground-in rumble strips producing "Rumble Striping". No contrast is used with Rumble Striping.*

7.6.1.3 Profiled Thermoplastic

Use Profiled Thermoplastic on concrete pavement for edge lines and center lines on all rural, two-lane and multi-lane, flush shoulder, non-limited access facilities, where posted speed is 50 mph or greater. This includes areas on rural facilities where the posted speed has been reduced due to restricted horizontal or vertical geometry. Use ***Design Standards*** Index 17346.

Commentary: Profiled Thermoplastic provides an audible and vibratory effect and is used on concrete pavement as a countermeasure for lane departure and center line crossover crashes. Permanent Tape markings are typically used on bridges with concrete riding surfaces due to vibration/durability. However, Profiled Thermoplastic markings may be used on bridges with narrow shoulders as a measure to reduce the number of impacts to the barriers. No contrast is used with Profiled Thermoplastic markings.

7.6.1.4 Preformed Thermoplastic

Use Preformed Thermoplastic for the following markings on asphalt pavement:

- Bicycle Markings shown on ***Design Standards*** Index 17347
- Special Emphasis Crosswalks
- All Route Shields
- Exit Numbers for Ramps

Use Preformed Thermoplastic for the following markings on concrete pavement (including bridges with concrete riding surfaces):

- Bicycle Markings shown on ***Design Standards*** Index 17347
- Special Emphasis Crosswalks
- All Route Shields
- Exit Numbers for Ramps
- White dotted Lines (2'-4') with trailing black contrast (2' white preformed thermoplastic + 2' black preformed thermoplastic). Use only the alternating skip pattern.
- Arrows, Messages and Symbols. Black contrast border is required for design speeds 45 mph and less, and black contrast block is required for design speeds 50 mph and greater. Provide a detail in the plans. Contact the Roadway Design Office for guidance.

7.6.1.5 Permanent Tape

Use Permanent Tape for the following conditions on concrete pavement:

- White skip lines (10'-30') with trailing black contrast (10' white tape + 10' black tape). Use only the alternating skip pattern.
- White dotted lines (6'-10') with trailing black contrast (6' white tape + 6' black tape). Use only the alternating skip pattern.
- White dotted lines (3'-9') with trailing black contrast (3' white tape + 3' black tape). Use only the alternating skip pattern.
- Yellow skip lines. Do not use contrast.
- Center lines and edge lines of bridges with concrete riding surfaces. Do not use contrast.

Include the removal pay item when installing permanent tape on concrete pavement.

7.6.1.6 Two Reactive Components

Two Reactive Components may be used as an alternative to Standard Thermoplastic markings for edge lines and skip lines on asphalt pavement and edge lines only on concrete pavement.

The use must be approved by both the District Maintenance Engineer and the District Construction Engineer on a project specific basis.

For existing asphalt pavement, contact the District Maintenance Engineer to determine if contrast is required for skip lines, messages and arrows. If required, use black paint for contrast.

Modification for Non-Conventional Projects:
Delete the last two paragraphs above and see the RFP.

Commentary: The cost of Two Reactive Components pavement markings has historically been greater than Standard Thermoplastic pavement markings and the service life is unknown. The equipment for installation of Two Reactive Components pavement markings is not readily available. Two Reactive Components pavement markings may be feasible for larger projects.

7.6.1.7 Standard and Durable Paint

Use Standard Paint for work zone markings on asphalt and concrete pavement.

Use Durable Paint for refurbishment markings on asphalt pavement where the longer service life of Refurbishment Thermoplastic is not required. Contact the District Maintenance Engineer to determine if Durable Paint is acceptable.

Modification for Non-Conventional Projects:
Delete the paragraph above and see the RFP.

Commentary: The performance of Durable Paint products on the APL have been evaluated by the Department for a period of 18 months. The performance of Standard Paint products on the APL have been evaluated by the Department for a period of 6 months.

For refurbishment markings, consider the following factors:

- *Service life of pavement*
- *Thickness and conditions of existing markings*
- *Traffic volumes*
- *Cost of markings*
- *Other special requirements such as contrast needs or rumble striping*

7.6.2 No-passing Zones

The procedures required by the Department for determining the limits of no-passing zones are contained in the ***Manual on Uniform Traffic Studies, (MUTS)***. The requirements of this manual must be followed.

Limits of pavement markings for no-passing zones shall be established by one of the following methods:

1. On projects where existing roadway conditions (vertical and horizontal alignments) are to remain unaltered by construction, the no-passing zones study shall be accomplished as part of the design phase. This will be either by in-house staff or included in design consultant contracts.

   The limits of the no-passing zones shall be included in the contract documents, and a note to this effect shown on the plans.

2. On projects with new or altered vertical and horizontal alignments, limits for no-passing zones shall be established during construction. The required traffic study and field determination of limits shall be performed through the design consultant as a post design service, or as part of a district wide consultant contract for such services.

When this service is included as part of post design services, sufficient time shall be included to accomplish the required field operations without delaying or interfering with the construction process.

COMMENTARY

These criteria and guidelines were developed by a Department wide task team to clarify and agree on the proper pavement marking material selection for each application.

The ***Design Standards Revision (DSR)*** for ***Design Standards*** Index 17346, Sheets 1, 2, 13 and 14 is released to accommodate the change to the naming conventions. Revisions to Sheets 13 and 14 were required to accommodate the name change from "Audible and Vibratory" markings to "Profiled Thermoplastic" markings. This is necessary due to the implementation of Rumble Striping which is another type of the Department's standardized audible and vibratory pavement markings. The distinction between the two types of audible and vibratory markings is required to provide clear and consistent criteria, guidance and specifications. This ***DSR*** includes updates to the notes and figures to provide additional clarifications.

Standard Specification Sections 546, 701, 709, 710, 711, 713 and 971 are being revised for the July 2015 Workbook to align terminology to be consistent with the PPM.

IMPLEMENTATION

The requirements of this bulletin are effective for all projects with LET dates after July 1, 2015.

To meet the requirements of this bulletin, when Profiled Thermoplastic markings are to be used on the project insert the revised ***Design Standards*** Index drawings in the Plans as described in the ***PPM***, ***Vol. 2***, *Section 3.6.1*.

CONTACT

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ESTIMATES BULLETIN 15-01

DATE: January 23, 2015

TO: District Estimates Engineers, District Directors of Transportation Operations, District Directors of Transportation Development, District Design Engineers, District Consultant Project Management Engineers, District Roadway Design Engineers, District Construction Engineers, District Maintenance Engineers, District Traffic Operations Engineers and Program Management Engineers

FROM: Phillip "Greg" Davis, PE, State Estimates Engineer

COPIES TO: Brian Blanchard, Tom Byron, Duane Brautigam, David Sadler, Tim Lattner, Trey Tillander, Michael Shepard, Robert Robertson, Mark Wilson, Bruce Dana, John Krause, Rudy Powell, Greg Schiess, Nick Finch (FHWA), Chad Thompson (FHWA), and Phillip Bello (FHWA), David Sadler, Daniel Scheer, Gevin McDaniel, Chester Henson, Stefanie Maxwell, Deanna Carroll, Chris Lewis

SUBJECT: Pavement Marking Guidance

This bulletin updates the pay items, in coordination with Roadway Design Bulletin 15-02, for the selection of pavement marking materials. The criteria and guidelines included in the bulletin were developed by a Department wide task team to clarify and agree on the proper pavement marking material selection for each application. The method of measurement and basis of payment were also updated in the specifications, to be consistent across the various pavement marking sections.

REQUIREMENTS

1. Meet the requirements of Roadway Design Bulletin 15-02, including the Plans Preparation Manual (PPM) changes for Pavement Marking Materials Selection.
2. Meet the requirements of Estimates Bulletin 15-02/Roadway Design Bulletin 15-03 for Rumble Stripe.

IMPLEMENTATION PLAN

Effective with the July 2015 letting, update the pay items in accordance with the Roadway Design Bulletin and PPM changes and the changes noted below. Refer to the Roadway Design Bulletin for additional guidance.

The following pay item changes have been made. Shaded areas are for maintenance use. Pay item and description changes are noted with redline and ~~strikeout~~. Note the unit of measure changes, especially for solid, 3-9 dotted and 2-4 dotted/ guidelines.

Estimators: Carefully review quantities for all pay item changes. Update unit prices as needed.

701-1A-BCD ~~AUDIBLE & VIBRATORY~~ PROFILED THERMOPLASTIC

Use Profiled Thermoplastic on concrete pavement for edge lines and center lines on all rural two lane and multi-lane, flush shoulder, rural, non-limited access facilities, where posted speed is 50 mph or greater. Contrast is not allowed with profiled thermoplastic markings. These markings are NOT used on bridges with concrete riding surfaces, due to vibration/durability; refer to PPM guidance for concrete bridges.

The pay items for Audible & Vibratory Pavement Marking have been updated to include "Profiled Thermoplastic" in the description field. After a transition period of approximately one year, the term "Audible & Vibratory" will be removed. During the transition period, either the old, transition, or new description is acceptable in the plans. DO NOT require a plans revision to change the pay item description.

Not valid for transverse or other markings.

Pay items for "asphalt surfaces" will be valid through 6-30-2015. Rumble Stripe is required for asphalt surfaces, in accordance with Roadway Design Bulletin 15-02.

701- 1A-BCD PROFILED THERMOPLASTIC

A= Class
- ~~1 (Standard) valid through 12-31-13*~~
- ~~5 (Standard- Open graded asphalt surfaces) for 6" and 8" longitudinal stripes; C=1 or 2~~
- ~~6 (Standard- Other surfaces) for 6" and 8" longitudinal stripes on dense graded asphalt or concrete surfaces; C=1 or 2~~
- 7 (Standard- concrete surfaces) C=1 or 2, effective 7-1-15

B= Color
- 1 (White)
- 2 (Yellow)

C= Type of Marking
- 0 (Solid) GM effective 7-1-15
- ~~1 (Solid) NM~~ valid through 6-30-15
- 2 (Skip) GM

D= Width
- 1 (6")
- ~~2 (8") approval required*~~

709- 1A-BCD TRAFFIC STRIPE-TWO REACTIVE COMPONENTS

Two Reactive Components may be used as an alternative to Standard Thermoplastic markings for edge lines and skip lines on asphalt surfaces and edge lines only on concrete surfaces. The use must be approved by both the District Maintenance Engineer and the District Construction Engineer on a project specific basis.

For existing asphalt surfaces, contact the District Maintenance Engineer to determine if black paint contrast is required for skip lines, messages and arrows.

Not valid for transverse or other markings. (Possible future use for transverse markings is under review by Product Evaluation.)

709- 1A-BCD TWO REACTIVE COMPONENTS PAVEMENT MARKINGS

A= Class
- 1 (Standard)
- 7 (Remove) SF, BCD= Blank. NOT FOR MOT marking removal

B=Color
- 1 (White)
- 2 (Yellow)
- ~~3 (Black)~~ valid through 6-30-15

C= Type of Marking
- 0 (Solid) GM effective 7-1-15
- ~~1 (Solid) NM; D=1 or 2~~
- ~~2 (Solid) LF valid through 6-30-15~~
- 3 (Skip/Dotted) GM;
  - D= 1 for 6" wide 10-30 skip or 3-9 dotted
  - ~~D=3 for 12" wide 3-9 dotted lane drop~~
- 4 (2'-4' Dotted Guide line/ 6'-10' Dotted Extension line) GM, D=1 effective 7-1-15
- ~~5 (6-10 Gap Extension) LF, D=1~~

D= Width
- 1 (6")
- 2 (8")
- ~~3 (12")~~
- ~~4 (18") valid through 6-30-15~~
- ~~5 (24") valid through 6-30-15~~

710- 11-BCD PAINTED PAVEMENT MARKINGS

Use Standard Paint for temporary markings on asphalt and concrete surfaces.

Use Durable Paint for refurbishment of markings on existing asphalt surfaces where the service life of Refurbishment Thermoplastic is not required. Contact the District Maintenance Engineer to determine if Durable Paint is acceptable.

For refurbishment markings, consider the following factors:
- *Required service life*
- *Traffic volumes*
- *Cost of markings*
- *Thickness and conditions of existing markings*
- *Other special requirements such as contrast or rumble striping*

The term "Guideline" was changed to "2-4 Dotted" on Design Standard Index 17346. DO NOT require a plans revision to update this pay item description change.

710- 1A-BCD PAINTED PAVEMENT MARKINGS

A= Class
- 1 (Standard)
- 2 (Durable)
- 7 (Remove) SF, BCD=blank.
  - Maintenance use only. NOT FOR MOT marking removal; see details above.

B= Color
- 1 (White)
- 2 (Yellow) C= 0, 1, 2, 3, 4, 5, 9
- 3 (Black) C=3
- 4 (Blue)
  - C=2 for accessible markings
  - C=6 valid through 6-30-15

C= Type of Marking
- 0 (Solid) GM effective 7-1-15
- ~~1 (Solid) NM; D = 1, 2*, 3~~ valid through 6-30-15
- 2 (Solid) LF; D = 1, ~~2,~~ 3, 4, 5
- 3 (Skip/Dotted) GM;
  - D= 1 for 6" wide 10-30 skip or 3-9 dotted
  - D= 3 for 12" wide 3-9 dotted lane drop and approach to toll plaza

4 (2'-4' Dotted Guide line/ 6'-10' Dotted Extension line) GM, D=1 effective 7-1-15
~~5 (2'-4' Dotted Guide line/ 6'-10' Dotted Extension line) LF; D=1~~ valid through 6-30-15
6 (Message or Symbol) EA; D=0,
7 (Arrows) EA complete marking; D=0
8 (Yield Line) LF; D=0 see details above
9 (Island Nose) SF; D=0

D= Width

0 valid for C=6-9

1 (6") ~~NM~~ valid through 6-30-15
1 (6") GM
1 (6" for parking lot- accessible markings) blue only, LF
1 (6" for parking lot and maintenance use) LF

~~2 (8") LF~~ valid through 6-30-15
~~2 (8") NM~~ valid through 6-30-15
2 (8" for interchange and urban island) GM effective 7-1-15

~~3 (12") NM~~ valid through 6-30-15
3 (12") GM
3 (12" for cross walk or roundabout) LF

4 (18" for diagonal or chevrons) LF

5 (24" for stop line or crosswalk) LF

Maintenance pay items

A=2 (Durable)

Durable paint items will be opened upon request through the Maintenance Office.

711- 1A-BCD THERMOPLASTIC

711-11-BCD, 711-15-BCD, and 711-16-BCD are all Standard Thermoplastic.

Use Standard Thermoplastic material for all lines and markings not meeting the criteria for Rumble Striping, Profiled Thermoplastic, Preformed Thermoplastic or Permanent Tape.

Maintenance pay items (for use on Maintenance Contracts ONLY. LF pay items are permitted for longitudinal markings, in accordance with maintenance specifications.)

711- 12-BCD THERMOPLASTIC- REFURBISHMENT

Refer to Roadway Design Bulletin 15-02 or the PPM for guidance on refurbishment markings on existing surfaces.

711-13-BCD THERMOPLASTIC- HOT SPRAY

Hot Spray is used by Maintenance for edge and skip pavement markings. DO NOT use for new construction.

711-14-BCD PREFORMED THERMOPLASTIC

Asphalt pavement:

- *Bicycle symbols, messages and arrows shown on **Design Standards** Index 17347*
- *Special Emphasis Crosswalks*

- *All Route Shields*
- *Exit numbers for ramps. For exit numbers to be placed on existing asphalt surfaces, contact the District Maintenance engineer to determine if black paint contrast is required.*

Concrete pavement (including bridges with concrete riding surfaces):

- *All bicycle markings shown on **Design Standards** Index 17347*
- *Exit Numbers for ramps*
- *Special Emphasis Crosswalks*
- *All Route Shields*
- *White dotted Lines (2'-4') with trailing black contrast (2' white preformed thermoplastic + 2'*
- *black preformed thermoplastic). Use only the alternating skip pattern.*
- *Arrows, Messages and Symbols. Black contrast border is required for design speeds 45 mph and less, and black contrast block is required for design speeds 50 mph and greater.*

711- 1A-BCD THERMOPLASTIC PAVEMENT MARKINGS

A=Class

1 (Standard) Use A=5 or 6 for 6" or 8" longitudinal stripes
2 (Refurbishment)
3 (Hot Spray) Maintenance Use Only
4 (Preformed)
5 (Standard- Open graded asphalt surfaces) for 6" and 8" longitudinal stripes; C=1 or 3
6 (Standard- Other surfaces) for 6" and 8" longitudinal stripes on dense graded asphalt or concrete surfaces; C=1 or 3
7 (Remove) SF, BCD=blank. NOT FOR MOT marking removal; see details above.

B=Color

1 (White) C=1-8
2 (Yellow) C=0~~1~~-5
3 (Black) not valid as of 12-15-05; use 710 paint items. See details above.
4 (Blue) C=2, 6
5 (White with Black Contrast) A=4 only; C=6 or 7 only
6 (Multi-color) defined in plans; specs may be needed- DO NOT OPEN

C= Type of Marking

0 (Solid) GM effective 7-1-15
~~1 (Solid) NM, longitudinal lines, D=1, 2~~ valid through 6-30-15
2 (Solid) LF, transverse lines; D = 2, 3, 4, 5
3 (Skip/Dotted) GM, longitudinal lines
D= 1 for 6" wide 10-30 skip or 3-9 dotted
D= 3 for 12" wide 3-9 dotted lane drop and approach to toll
4 (2'-4' Dotted Guide line/ 6'-10' Dotted Extension line) GM, D=1 effective 7-1-15
5 (Dotted/Guideline/6-10 Gap Extension) LF, D=1, 2 or 3
6 (Message or Symbol) EA Includes Yield Messages and painted curb face, D=0
7 (Arrows) EA ; D=0
8 (Yield Line) LF, D=0

D= Width

0 valid for C=6-8

1 (6") NM valid through 6-30-15
1 (6") GM
1 (6" for parking lot- accessible markings) blue only, LF
1 (6" for parking lot and maintenance use) LF2 (8")

8" solid longitudinal lines, channelizing line
8", 2'-4' skip at roundabout

~~2 (8") LF~~ valid through 6-30-15
~~2 (8") NM~~ valid through 6-30-15
2 (8" for interchange and urban island) GM effective 7-1-15

~~3 (12") NM~~ valid through 6-30-15
3 (12") GM

3 (12" for crosswalk or roundabout) LF
4 (18" for diagonal or chevrons) LF
5 (24" for stop line or crosswalk) LF

713-1A-BCD ~~PREFORMED~~ PERMANENT TAPE-

"Preformed Tape" was changed to "Permanent Tape". The term "High Performance" was removed from the specification. The pay items have been updated to reflect this change.

Use Permanent Tape for the following conditions on concrete pavement:

- *White skip lines (10'-30') with trailing black contrast (10' white tape + 10' black tape). Use only the alternating skip pattern.*
- *White dotted lines (6'-10') with trailing black contrast (6' white tape + 6' black tape). Use only the alternating skip pattern.*
- *White dotted lines (3'-9') with trailing black contrast (3' white tape + 3' black tape). Use only the alternating skip pattern.*
- *Yellow skip lines. Do not use contrast.*
- *Center lines and edge lines of bridges with concrete riding surfaces. Do not use contrast.*

Include the removal pay item when installing permanent tape on concrete pavement.

713-1AA-BCD PERMANENT TAPE

AA= Class
- ~~01 (Standard) Transverse lines, arrows, and messages only, per spec. Valid through 12-31-13.~~
- ~~02 (High Performance) required for longitudinal skip stripe, per spec~~
- 03 blank- no class distinction in spec, effective 7-1-15
- 07 (Removal of Permanent Tape or Paint for Surface Preparation) SF, BCD=blank.

B= Color
- 1 (White)
- 2 (Yellow)
- 3 (Black)

C= Type of Marking
- 0 (Solid, for bridges with concrete surfaces) GM
- ~~1 (Solid) NM,~~ valid through 6-30-15
- 3 (Skip/Dotted, for concrete surfaces) GM;
  - D= 1 for 6" wide 10-30 or 3-9 ~~skip~~ dotted

D= Width
- 1 (6")

Plans: For applicable projects, update the plans, tabulation sheets/Plan Summary Boxes, and Proposal Summary of Quantities (Trnsport report).

Plans Preparation Manual (PPM): The PPM will be updated with the Roadway Design Bulletin.

Specifications: Specifications are available with the July 2015 eBook.

Design Standards: Rumble Strip and Rumble Stripe standards are available, as well as changes to Index 17346. Refer to the Roadway Design Bulletin and web pages for additional information.

Basis of Estimates (BOE): The BOE will be updated to clarify the use of the pay items, as described above.

If you have any questions, please contact:
Estimates: Melissa Hollis, Melissa.Hollis@dot.state.fl.us, or 850-414-4182
Roadway Design: Chester Henson, Chester.Henson@dot.state.fl.us , or 850-414-4117
Construction: Stefanie Maxwell, Stefanie.Maxwell@dot.state.fl.us , or 850-414-4134
Maintenance: Deanna Carroll, Deanna.Carroll@dot.state.fl.us, or 850-410-5634

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JIM BOXOLD, P.E.
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M E M O R A N D U M

DATE: February 2, 2015

TO: Specification Review Distribution List

FROM: Daniel Scheer, P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **7100000 Painted Pavement Markings. REVISED**

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

This change was proposed by Paul Gentry of the Department's Product Evaluation Office to incorporate language from Developmental Specification 710 to the Standard Specifications. The required 18 month weathering test has been successfully completed. Formatting changes were also made for consistency with current Department practice.

Additional changes were proposed for language consistency due to the release of Roadway Design Bulletin 15-02 on January 22, 2015.

Please share this proposal with others within your responsibility. Review comments are due within two weeks and should be sent to Mail Station 75 or online at http://www2.dot.state.fl.us/SpecificationsEstimates/Development/IndustryReview.aspx . Comments received after **February 13, 2015,** may not be considered. Your input is encouraged.

DS/dt
Attachment

PAINTED PAVEMENT MARKINGS.

(REV ~~12-17-14~~*1-828-15*) ~~(FA 1-29-15) (7-15)~~**

SECTION 710 is deleted and the following substituted:

SECTION 710
PAINTED PAVEMENT MARKINGS

710-1 Description.

Apply ~~P~~*p*ainted ~~t~~*Traffic S*~~stripes and~~*pavement* ~~M~~*m*arkings, in accordance with the Contract Documents.

710-2 Materials.

Use only materials listed on the Department's Approved Product List (APL) meeting the following requirements:

Raised Retroreflective Pavement Markers and Bituminous Adhesive .....Section 970
Standard ~~Waterborne Fast Dry Traffic~~ Paint971-1 and 971-3
Durable ~~*Waterborne Traffic*~~Fast Dry Solvent Paint971-1 and 971-4
Glass Spheres .....971-1 and 971-2

The Engineer will take random samples of all material in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

710-3 Equipment.

Use equipment that will produce continuous uniform dimensions of pavement markings of varying widths and meet the following requirements:

~~(a)~~*1.* Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of paint and capable of following straight lines and making normal curves in a true arc.

~~(b)~~*2.* Capable of applying glass spheres to the surface of the completed ~~stripe~~*line* by an automatic sphere dispenser attached to the striping machine such that the glass spheres are dispensed closely behind the installed line. Use a glass spheres dispenser equipped with an automatic cut-off control that is synchronized with the cut-off of the ~~traffic~~ paint and applies the glass spheres in a manner such that the spheres appear uniform on the entire pavement markings surface ~~with, 50 to 60% embedment~~.

~~(c)~~*3.* Capable of spraying the paint to the required thickness and width without thinning of the paint. Equip the paint tank with nozzles equipped with cut-off valves, which will apply broken or skip lines automatically.

710-4 Application~~:~~.

710-4.1 General: Remove existing pavement markings, such that scars or traces of removed markings will not conflict with new pavement markings, by a method approved by the Engineer. ~~Payment for marking removal will be in accordance with 102-5.8.~~

Before applying ~~traffic stripes and~~*painted pavement* markings, remove any material ~~by a method approved by the Engineer~~ that would adversely affect the bond of the ~~traffic stripes~~*pavement markings by a method approved by the Engineer*.

Apply *standard* ~~*waterborne* traffic stripes and markings~~*paint* ~~only~~ to dry surfaces *only*, and when the ambient air and surface temperature is at least 40ºF and rising.

Apply durable ~~*waterborne traffic stripes and markings*~~*paint* ~~*only*~~ *to dry surfaces only. Do not apply durable* ~~*waterborne traffic*~~ *paint when the ambient air and surface temperature is below 50°F, relative humidity is above 80% or when the dew point is within 50°F.*

Do not apply ~~traffic stripes and~~*painted pavement* markings when winds are sufficient to cause spray dust.

Apply ~~traffic stripes and~~*painted pavement* markings, having well defined edges, over existing pavement markings such that not more than 2 inches on either end and not more than 1 inch on either side is visible. When stencils are used to apply symbols and messages, the areas covered by the stencil reinforcing will not be required to be painted.

Mix the paint thoroughly prior to pouring into the painting machine. Apply paint to the pavement by spray or other means approved by the Engineer.

Conduct field testing in accordance with FM 5-541. Remove and replace ~~traffic stripes and~~*painted pavement* markings not meeting the requirements of this Section at no additional cost to the Department.

Apply all pavement markings prior to opening the road to traffic.

710-4.1.1 Final Surface: *When permanent pavement markings (thermoplastic, tape, etc.)are placed on newly constructed asphalt, p*ainted pavement markings (final surface) *will include one application of standard paint*~~*ed pavement markings*~~ *and one application of retroreflective pavement markers applied to the final surface; otherwise, painted pavement markings (final surface)* will include two applications of standard paint~~ed pavement markings~~ and one application of retroreflective pavement markers applied to the final surface. Wait at least 14 days after the first application to apply the second application of paint~~ed pavement markings (final surface)~~. Second application must be applied prior to final acceptance of the project.

Apply all retroreflective pavement markers per the requirements of Section 706.

710-4.2 Thickness: Apply *standard* ~~*waterborne*~~ paint to attain a minimum wet film thickness in accordance with the manufacturer's recommendations. ~~*For*~~*Apply durable* ~~*waterborne*~~ *paint*~~*,*~~ ~~*apply paint*~~ *to attain a minimum* ~~*25*~~ *wet* ~~*mil*~~ *film thickness of 0.025 inches or 25 mils. Measure, record*~~*,*~~ *and certify on a Department approved form*~~*,*~~ *and submit to the Engineer, the* ~~*wet film*~~ *thickness* ~~*using a wet film thickness gauge on panels. For longitudinal testing, use FM 5-541, section 4.1.2. For transverse testing locations, use*~~*of white and yellow durable paint pavement markings in accordance with FM 5-541*~~*, section 4.1.4*~~*.*

710-4.3 Retroreflectivity: Apply white and yellow standard ~~*waterborne*~~ pavement ~~markings~~*paint* 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. *Apply white and yellow durable paint that will attain an initial retroreflectance of not less than 450 mcd/lx·m^2 and not less than 300 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.

~~*Apply white and yellow durable waterborne pavement markings that will attain an initial retroreflectance of not less than 450 mcd/lx·m^2 and not less than 300 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~~ *three* days of receipt of the Contractor's certification. Failure to afford the Department opportunity to test the markings will result in non-payment. The test readings should be representative of the Contractor's striping performance. If the retroreflectivity values measure below values shown above, reapply the ~~striping~~ *pavement marking* at no additional cost to the Department.

For standard ~~*waterborne* pavement markings~~*paint*, ensure that the minimum retroreflectance of white and yellow pavement markings are not less than 150 mcd/lx m^2. If the retroreflectivity values *for standard paint* fall below the 150 mcd/lx m^2 value within six months of initial application, the ~~striping~~ *pavement marking* will be reapplied at the Contractor's expense.

~~*For durable waterborne pavement markings, ensure that the minimum retroreflectance of white and yellow pavement markings are not less than 150 mcd/lx m^2.*~~ *If the retroreflectivity values for durable paint fall below the initi~~t~~al values of ~~1~~450 mcd/lx m^2 value for white and 300 mcd/lx m2 for yellow within ~~18~~ six months of initial application, the ~~striping~~pavement marking will be reapplied at the Contractor's expense.*

710-4.4 Color: Use paint material that meets the requirements of 971-1.

710-4.5 Glass Spheres: Apply glass spheres on all pavement markings immediately and uniformly following the paint application. The rate of application shall be based on the manufacturer's recommendation.

For longitudinal durable paint markings, apply a double drop of Type 1 and Type 3 glass spheres. For transverse durable paint markings, apply a single drop of Type 3 glass spheres.

The rate of application shall be based on the manufacturer's recommendation.

710-5 Tolerances in Dimensions and in Alignment.

Establish tack points at appropriate intervals for use in aligning ~~stripes~~*pavement markings*, and set a stringline from such points to achieve accuracy.

710-5.1 Dimensions:

710-5.1.1 Longitudinal Lines: Apply painted skip line segments with no more than plus or minus 12 inches variance, so that over-tolerance and under-tolerance lengths between skip line and the gap will approximately balance. Apply longitudinal lines at least 2 inches from construction joints of portland cement concrete pavement.

710-5.1.2 Transverse Markings, Gore Markings, Arrows, and Messages: Apply paint in multiple passes when the marking cannot be completed in one pass, with an overall line width allowable tolerance of plus or minus 1 inch.

710-5.1.3 Contrast Lines: Use black paint to provide contrast on concrete or light asphalt pavement, when specified by the Engineer. Apply black paint in 10 foot segments following each longitudinal skip line.

710-5.2 Alignment: Apply painted ~~stripes~~*pavement markings* that will not deviate more than 1 inch from the stringline on tangents and curves one degree or less. Apply painted ~~stripes~~*pavement markings* that will not deviate more than 2 inches from the stringline on curves greater than one degree. Apply painted edge ~~stripes~~*markings* uniformly, not less than 2 inches or more than 4 inches from the edge of pavement, without noticeable breaks or deviations in alignment or width.

Remove and replace at no additional cost to the Department, ~~traffic stripes~~*pavement markings* that deviate more than the above stated requirements.

710-5.3 Correction Rates: Make corrections of variations in width at a maximum rate of 10 feet for each 0.5 inch~~es~~ of correction. Make corrections of variations in alignment at a maximum rate of 25 feet for each 1 inch of correction, to return to the stringline.

710-6 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of the materials. Furnish the Engineer with the manufacturer's name and batch numbers of the materials and glass spheres to be used. Ensure that the approved batch numbers appear on the materials and glass spheres packages.

710-7 Protection of Newly ~~Painted~~ *Applied* Pavement 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, at no additional cost to the Department.

710-8 Corrections for Deficiencies to Applied Painted Pavement Markings.

Reapply a 1.0 mile section, centered around any deficiency, at no additional cost to the Department.

710-9 Submittals.

710-9.1 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.

710-9.2 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)~~*1.* Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

~~(b)~~*2.* 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.

710-10 Method of Measurement.

The quantities*, authorized and acceptably applied,* ~~to be paid for~~ under this Section will be *paid* as follows:

~~(a)~~*1.* The length, in ~~net~~ *gross* miles, of ~~6 inch~~ solid ~~traffic stripe, authorized and acceptably applied~~*, 10'-30' skip, 3'-9' dotted, 6'-10' dotted, and 2'-4' dotted lines*.

~~(b)2. The total traversed distance in gross miles of 10-30 or 3-9 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*length, in gross miles, of 10-30 or 3-9 skip* line.~~

~~(c)3.~~ The ~~net~~ length, in *linear* feet, of ~~each of all other types of lines and stripes, authorized and acceptably applied~~ *transverse lines, diagonal lines, chevrons, and parking spaces*.

~~(d)~~*4*~~3~~. The number of pavement messages, symbols, and ~~directional~~ arrows~~,~~ ~~authorized and acceptably applied~~. *Each arrow is paid as a complete marking, regardless of the number of "points" or directions.*

~~(e)~~*5*~~4~~. Lump Sum, as specified in 710-4.1.1 ~~when the item for painted pavement markings~~ (final surface) ~~is included in the proposal~~.

5. The area, in square feet, for removal of existing markings acceptably removed. Payment for removal of conflicting markings will be in accordance with 102-5.8. Payment for removal of non-conflicting markings will be paid separately.

~~The net length, in feet, of~~*Guide lines and* ~~dotted and skip stripes, other than 10-30 and 3-9,~~ *extension lines* ~~will be~~ *paid per linear foot,* ~~measured as the distance from the beginning of the first painted stripe~~*line* ~~to the end of the last painted stripe~~*line* ~~with proper deductions made for unpainted intervals as determined by plan dimensions or stations, subject to 9-1.3. Unpainted intervals will not be included in pay quantity.~~

The ~~net~~*gross mile measurement will be taken as the distance from the beginning of the* ~~solid~~*painted line to the end of the* ~~solid~~*painted line*~~. The gross- mile measurement of 10-30 and 3-9 skip traffic stripes~~*line* ~~will be taken as the distance from the beginning of the first painted stripes~~*skip line* ~~to the end of the last painted stripes~~*skip line*~~,~~ and will include the ~~unpainted~~ *unmarked* ~~intervals~~*gaps for skip and dotted lines*. ~~*The actual applied line is 25% of the traversed distance for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.* It~~ *The gross mile measurement* will not include ~~any lengths of~~*designated* ~~unpainted~~ *unmarked* ~~intervals which, by design or by other intent of the Department, are greater than 30 feet~~*lengths at intersections, turn lanes, etc*. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

710-11 Basis of Payment.

710-11.1 General: Price~~s~~ and payment~~s~~ 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.

710-11.2 Lump Sum Payment: ~~When the item for painted pavement markings (final surface) is included in the proposal, p~~*P*rice~~s~~ and payment~~s~~ *for painted pavement markings (final surface)* will be full compensation for ~~two~~ *all* applications of ~~all~~ painted pavement markings ~~applied~~ to the final surface, and one application of retroreflective pavement markers applied to the final surface in accordance with Section 706.

Payment will be made under:

Item No. 710	Painted Pavement Markings.	
	~~Traffic Stripes,~~ Solid - per ~~net~~ *gross* mile.	
	~~Traffic Stripes,~~ Solid - per *linear* foot.	
	~~Traffic Stripes,~~ Skip - per gross mile.	
	~~Traffic Stripes, Skip - per foot.~~	
	Dotted ~~*Extension/*~~Guide l*Line* - per ~~*linear* foot~~*gross mile*.	
	Message~~s~~ *or Symbol* -each.	
	Arrows - each.	
	Yield ~~Markings~~*Line* - per *linear* foot.	
	Island Nose - per square foot.	

Item No. 710-90 Painted Pavement Markings (Final Surface) - lump sum.