

**EXHIBIT 1**  
**SOLICITATION NO. 0900000516**  
**SW0776 – TRAFFIC STRIPING**

The abbreviations and acronyms used in these Solicitation Specifications are based on Section 101.3 Abbreviations and Acronyms (Table 101:1) of the Oklahoma Department of Transportation (ODOT) Standard Specifications for Highway Construction. *ODOT presumes that references mentioned in this Solicitation Specifications are to the latest published edition, unless otherwise specified.*

**Scope of Work**

This Contract shall be for the entire State as one bid for each Item/Description. The historical spend averages \$3.5 to \$8 million a year. The eight (8) geographical regions of Oklahoma are as follows:

- 1) Division I
  - a. Counties: Adair, Cherokee, Haskell, McIntosh, Muskogee, Okmulgee, Sequoyah, Wagoner.
- 2) Division II
  - a. Counties: Atoka, Bryan, Choctaw, Latimer, LeFlore, McCurtain, Marshall, Pittsburg, Pushmataha.
- 3) Division III
  - a. Counties: Cleveland, Coal, Garvin, Hughes, Johnston, Lincoln, McClain, Okfuskee, Ponotoc, Pottawatomie, Seminole.
- 4) Division IV
- 5) Counties: Canadian, Cleveland, Garfield, Grant, Kay, Kingfisher, Logan, Noble, Oklahoma, Payne.
- 6) Division V
  - a. Counties: Beckham, Blain, Custer, Dewey, Greer, Harmon, Jackson, Kiowa, Roger Mills, Tillman, Washita.
- 7) Division VI
  - a. Counties: Alfalfa, Beaver, Cimarron, Ellis, Harper, Major, Texas, Woods, Woodward.
- 8) Division VII
  - a. Counties: Caddo, Carter, Comanche, Cotton, Grady, Jefferson, Love, Murray, Stephens.
- 9) Division VIII
  - a. Counties: Craig, Creek, Delaware, Mayes, Nowata, Osage, Ottawa, Pawnee, Rogers, Tulsa, Washington.

All Items are to be bid on an installed basis at the locations shown on the plans to be provided to the Contractual Vendor with placement in accordance with the Department's Construction Specifications, Department's Special Provisions, Department Standards, the latest edition of the

MUTCD and the Oklahoma MUTCD Supplement. Plans will be provided after awarded with individual purchase order for specific projects. The Contractual Vendor shall be limited to working on a maximum number of locations at one time as shown on the plans or as directed by the Engineer.

All materials and work performed on this contract shall be in accordance with the Department's Construction Specifications including applicable Special Provisions, the MUTCD, AASHTO M249, the Oklahoma MUTCD Supplement, the Department's Standard Drawings and other details showing installation practices, and project plan notes as well.

If unable to install permanent pavement markings immediately after existing pavement markings are removed (or if installation of permanent pavement markings is required in a location where prior removal is not necessary); temporary pavement markings that conform with ODOT Standards and Specifications shall be installed and maintained for a period not to exceed 72 hours, at which time new permanent pavement markings shall be installed. If inclement weather or other conditions prohibit the installation of new pavement markings within a timely manner, no pavement markings should be removed.

Failure to comply will result in penalties charged to the Contractual Vendor in the amount of \$200.00 per day for each violation, up to a maximum penalty of 50% of the value of work for the work order in violation. All penalties will be deducted from payment.

All required pre-marking prior to placement of any item listed for bid in this contract shall be the responsibility of the Contractual Vendor.

### **Work Schedules**

The Contractual Vendor will be required to furnish a written schedule, detailing his proposed work sequence, upon the request of the Engineer. The Engineer shall reserve the right to direct the Contractual Vendor to a specific work area when such action is deemed necessary. Written schedule is required so that work can be scheduled and inspected.

An extension of contract time for a purchase order may be granted by the Department if the Contractual Vendor finds it impossible for reasons beyond his control; to complete the work within the contract time, provided the Contractual Vendor makes a written request to the Engineer responsible for the area in which the work is to be accomplished for an extension of time setting forth therein the reasons which he believes will justify the request (A plea that insufficient time was specified is not a valid reason for an extension). For each calendar day that any work provided for by the purchase order shall remain uncompleted after the contract time, the sum of \$250.00 per calendar day will be assessed to the Contractual Vendor as a liquidated damage. If an extension is granted, then the liquidated damages would not be charged after the extension deadline.

The Contractual Vendor shall perform work and lane closure in the urban areas between 9:00 AM to 3:00 PM on weekdays. If work and lane closure is proposed to be done after the evening rush hour through before the morning rush hour, then approval must come from the Engineer. No work or lane closure without specific approval from the Engineer on holidays or major travel days associated with a holiday.

## **Signing**

The Contractual Vendor shall provide a quality written and/or drafted Temporary Traffic Control (TTC) Plan in accordance with the MUTCD latest approved edition, MUTCD Chapter 6 latest approved edition, corresponding Oklahoma MUTCD Supplement, and ODOT Standard Drawings. The Contractual Vendor shall submit the TTC Plan to ODOT's local field division and shall not begin any work prior to the written approval by ODOT's local field division.

All TTC devices shall meet crash worthiness according to the Manual for Assessing Safety Hardware (MASH) crash test. Cost for the installation and subsequent removal of all necessary construction traffic control shall be included in the cost of other items of the contract required for completion of work.

## **Final Clean Up**

The Engineer will not assign a Completion Date until the Contractual Vendor complete the work, final clean up and disposal of all waste generated in accordance to Section 104.10 of the Department's Construction Specifications.

## **Performance Bond**

Within 20 calendar days from the date of the work order and prior to starting any work, the Contractual Vendor will deposit with the Resident Engineer responsible for the work a Performance Bond at 100% value per each purchase order issued totaling \$13,500.00 or more under this contract. Failure to supply bonds will result in cancellation of the purchase order and subsequent cancellation of this contract.

For each purchase order issued, the Contractual Vendor will be given 30 calendar days from the date of the work order letter for securing materials; after which the resident engineer will schedule the pre-work conference. The Contractual Vendor will be expected to begin work on or before the 31<sup>st</sup> calendar day and will complete the work within the specified number of calendar days listed below:

<u>PURCHASE ORDER AMOUNT</u>	<u>CONTRACT TIME (*)</u>
\$0.00 TO \$30,000.00	10 Calendar Days
\$30,001 to \$60,000.00	15 Calendar Days
\$60,001 or more	20 Calendar Days
One additional calendar day for each \$10,000.00 or less increment over \$60,000.00	

(\*) Contract time includes time lost per indicated in the above description for Work Schedules.

## Line Item Notes for Exhibit 2 – Pricing Template

- (A) All striping 0.050" thickness or less will be installed using spray application.
- (B) All striping over 0.050" thickness installed under this contract will be applied using the extrusion die method.
  - 1. Ribbon extrusion will not be an acceptable method of application for any thickness of thermoplastic markings, unless approved by the Engineer and/or requesting agency contact.
- (C) Design, shape and reflector of the raised pavement markers to meet Section 736 of the Specifications. Shown size is nominal, actual size of raised pavement marker can be slightly different. The Contractual Vendor is to provide any of the colors or combinations specified.
- (D) This item shall include cleaning of the existing marker casting to insure proper installation of the reflective lens in accordance with manufacturers recommendations and in a manner approved by the Engineer and/or requesting agency contact.
- (E) This items intent is to remove Class C Pavement Markers:

- 1. (Asphalt)

While performing the pavement marker removal, the Contractual Vendor shall fill the divot left by the removal of the pavement marker with an asphalt filler patch material. The asphalt filler patch material shall be approved by the engineer.

- 2. (PC Concrete)

While performing the pavement marker removal, the Contractual Vendor shall slightly overfill the divot left by the removal of the pavement marker with a PC concrete patch material. The PC concrete patch material shall be approved by the engineer. Prior to placing this concrete patch material into the marker divots, the surface shall be prepared by sand blasting, followed by an application of an acrylic bonding agent according to the manufacturer's recommendation.

- (F) Equipment used for the removal of the markings may be of any type. Removal of Pavement marking, including grooved markings will conform to the Standard Specifications for Highway Construction and/or Special Provision 857-2.

Use equipment for removing pavement markings that will not damage the pavement surface or pavement texture.

- (G) The pigments used for the yellow thermoplastic compound shall not contain any hazardous materials listed in the Environmental Protection Agency Code of Federal Regulations (CFR) 40, Section 261.24, and Table 1. The combined total of RCRA listed heavy metals shall not exceed 100 ppm when tested by X-ray fluorescence spectroscopy. The pigments shall also be heat resistant, UV stable and color-fast yellows, golds, and oranges, which shall produce a compound which shall match Federal Standard 595 Color 13538. The pigment shall be uniformly distributed throughout the thermoplastic compound.

Daylight Reflectance and Color: The thermoplastic compound after heating for four hours  $\pm$  five minutes at  $425^{\circ}\text{F} \pm 3^{\circ}\text{F}$  ( $218.3^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ) and cooled at  $77^{\circ}\text{F}$  ( $25^{\circ}\text{C}$ ) shall meet the following requirements for daylight reflectance and color, when tested, using a color spectrophotometer with 45 degree circumferential/zero degree geometry, illuminant C, and two degree observer

angle. The color instrument shall measure the visible spectrum from 380 to 720 nm with a wavelength measurement interval and spectral bandpass of 10 nm.

\*Yellow: Daylight Reflectance.....45 percent min

\*Shall meet the coordinates of the following color tolerance chart:

x	0.560	0.490	0.420	0.460
y	0.440	0.510	0.440	0.400

(H) Grooving – the process of placing the traffic stripe material below the pavement by creating a long narrow channel or depression in the road. Work under this item shall consist of grooving the pavement surface in a continuous or regularly spaced fashion for the placement of recessed traffic stripe according to the following specifications:

- I. Follow the Department's Construction Specifications or manufacturer's recommended practice and/or specification (if available) for proper surface preparations (including removal of pre-existing traffic stripe).
- II. In order to protect the pavement before and after grooving, and result in clean, dry and profiled surface to maximize bonding strength for the traffic stripe materials, the Engineer shall approve grooving equipment and manufacturer's recommended practice and/or specification before construction begins.
- III. The Contractual Vendor shall establish control points for measuring offsets and pre-marks along the entire distance of pavement being grooved. Prior to installation of the groove, the Contractual Vendor shall verify the equipment is capable of installing the correct width and spacing of the groove. The control points, pre-marks, and equipment will be reviewed by the Engineer prior to commencement of the work.
- IV. The groove will be considered defective if any edge of the groove varies more than 0.25 inch in a 10-foot length, or if the alignment of the groove visibly deviates from the normal alignment of the road. The Contractual Vendor shall repair any defective groove(s) to the satisfaction of the Engineer. All work in conjunction with this repair shall be performed at no additional cost to the Department.
- V. Upon request by the Engineer, the Contractual Vendor shall supply two accurate, easily readable gauges with which to verify groove depth for the duration of the project. The gauges shall be delivered no less than one week prior to the anticipated beginning of grooving operations. Gauges shall be accompanied by manufacturer's instructions for their use and calibrated per manufacturer's recommendation. The gauges will be returned to the Contractual Vendor at the conclusion of the project.
- VI. The groove shall not be installed continuously for intermittent traffic stripes, but only where stripes are to be applied. The groove shall not be installed on

bridge decks unless provided written instructions to do so from the Engineer, on bridge joints, at drainage structures, at loop detector saw-cut locations, or in other areas identified by the Engineer.

- VII. Except for pavement marking tape application, cut the groove to be 1 inch wider than the anticipated traffic stripe width. The top coating of the reflective beads shall be embedded into the stripe, 50% of the bead diameter, and shall be flush to or slightly recessed below the pavement surface. A depth tolerance of +/-10% across the complete width of the groove is acceptable, depending upon pavement surface conditions and stripe type.
  - VIII. Grooving application of pavement marking tape: follow manufacturer's recommended practice and/or specification including, but not limited to, for proper surface preparations (including removal of pre-existing traffic stripe), cut width, depth, and cleaning, application of adhesive and placement of pre-formed tape. Contractual Vendor to furnish manufacturer's recommended practice and/or specification to the Engineer before work commences. The application of hot inlay of long lines shall not be considered as grooving since the application only requires embedding pavement marking tape into the road surface of fresh asphalt.
  - IX. If unable to install permanent pavement markings immediately install temporary traffic stripe per C.2.4 of this contract.
- (I) Use equipment fitted with a functional data logging system equipment listed on the Department's qualified products list (<http://www.odot.org/traffic/qpl/index.php>). Ensure the data logging system is operational, calibrated, and in use prior to striping operations. Provide the Engineer with a certification that the data logging system equipment meets the manufacturer's recommended calibration, along with the manufacturer's recommendations for equipment calibration frequency.
- (J) Raised Rumble Strip.

This pay item specification reference is located in RS1-2 in the ODOT Standards. These Standard drawing is included in this document.

**(K) Pavement Marking Tape – High Performance.**

Provide high performance tape, with preformed patterns embedded with high-visibility beads, and a polyurethane top coat and designed with a built-in reinforced netting. Tapes shall come with pressure sensitive adhesive on the back of the tape with or without a liner. Apply during 40 deg F (4 deg C) and rising or as recommended by the Manufacturer. Provide high performance contrast tape – with durable black borders for concrete and other light-colored pavement surfaces. Use 6" contrast tape for a 4" white or yellow stripe, and 9" contrast tape for a 6" white or yellow stripe (i.e. 1.5" black + required stripe wide +1.5" black).

**(L) Pavement Marking Tape – All Weather.**

Provide All Weather tape, with preformed patterns embedded with high-index optics that are highly visible and reflective, rain or shine, day or night, and a polyurethane top coat and designed with a built-in reinforced netting. Tapes shall come with pressure sensitive adhesive on the back of the tape with or without a liner. Apply during 40 deg. F (4 deg. C) and rising or as recommended by the Manufacturer. Provide All Weather contrast tape – with durable black borders for concrete and other light-colored pavement surfaces. Use 6” contrast tape for a 4” white or yellow stripe, and 9” contrast tape for a 6” white or yellow stripe (i.e. 1.5” black + required stripe wide +1.5” black).

**OKLAHOMA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION**  
**FOR**  
**TRAFFIC STRIPE PAINT – HIGH BUILD ACRYLIC WATERBORNE**

This Draft copy of Special Provision is for use with Statewide Stripping Contract SW776 ONLY

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Standard Specification for Highway Construction, English and Metric.

**711.06 TRAFFIC STRIPE PAINT – HIGH BUILD ACRYLIC WATERBORNE**

These specifications cover waterborne traffic paints for application directly onto bituminous or Portland Cement Concrete pavements or existing traffic stripe composed of solvent based paint, waterborne paint or thermoplastic compounds. Apply with spray equipment at application temperatures of 50 degrees to 120 degrees F [10 deg. C to 49 deg. C]. The paint shall be capable of receiving and holding glass beads for producing reflectorized traffic markings

**A. MATERIAL**

The traffic marking paint shall consist of a ready-mixed pigmented binder in a one-package system. The traffic marking paint shall be suitable for application on both asphalt concrete and cement concrete pavements at a wet film thickness of 25 mils (0.025 in.).

The finished waterborne traffic marking paint shall be formulated and manufactured from quality material and shall be a fast-drying, water-based, acrylic resin-type paint capable of withstanding air and roadway temperatures without bleeding, staining, discoloring or deforming. The dried paint film shall be capable of maintaining original dimensions and placement without chipping, spalling or cracking. The dry paint film shall not deteriorate from contact with normal roadway chemicals or materials.

**B. PIGMENT**

The manufacturer may use any pigment, provided it does not contain mercury, lead, chromium, toluene, chlorinated solvents, hydrolysable chlorine derivatives, ethylene-based glycol ethers and their acetates, nor any carcinogen, as defined in Environmental Protection Agency Code of Federal Regulation 29, Section 1910.1200.



### C. VEHICLE

The acrylic emulsion polymer used in the manufacture of the High Build Waterborne traffic marking paint shall be Dow® Fastrack™ HD-21A, Arkema Encor® DT 400 or equal.

The High Build waterborne traffic marking paints shall have the following physical properties:

Property (Test Method)	Requirement
Viscosity, 77 Deg., KU (ASTM D562)	83-98
Grind (Hegman Gauge), minimum	3
No-pick-Up Time, @ 25 mils, minutes, max. (ASTM D711),	25
Dry Through Time	See Note*
* The maximum time shall be based on the acrylic emulsion polymers specified in Section C but shall not exceed 150 minutes.	

### D. COMPOSITION

The supplier may use any combination of ingredients, provided the finished traffic marking paint satisfies the requirements herein. Sufficient quantities of dispersing, suspending, and anti- skimming agents shall be used to ensure proper manufacture and stability in containers during storage.

### E. DURABILITY AND TESTING

The supplier may be required to submit samples of the material, and a history of satisfactory use to Materials Division for testing and evaluation. The sample quantity submitted shall be at the discretion of Materials Division.

Determination of conformance to this specification will include, but will not be limited to, the evaluation of test data from National Transportation Product Evaluation Program (NTPEP) or other Department approved facilities. The maintained retroreflectivity and durability shall be in accordance with the following requirements after being installed on at least one NTPEP test deck in a northern, cold climate region for a minimum of six (6) months, including December, January and February.

- The minimum initial retroreflectivity of beaded lines shall be 250 mcd/m2/lux for white and 165 mcd/m2/lux for yellow when tested in accordance with ASTM E1710.
- The minimum retroreflectivity of beaded lines after 12 months of exposure on the NTPEP test deck shall be 150 mcd/m2/lux for white and 100 mcd/m2/lux for yellow, when measured in the wheel path area for both asphalt concrete and cement concrete pavements.
- The traffic paint shall have a durability rating of at least “6” on a scale of “0” to “10” for both asphalt concrete and cement concrete pavements when tested in the skip line and wheel path of the NTPEP test deck after 12 months.

## F. MIXED PAINT

The paint shall be strained before filling using a screen not coarser than 40 mesh (425  $\mu\text{m}$ ) or a suitable sieve meeting the approval of the Materials Engineer.

The volatile content of the finished paint shall contain less than 1.25 pounds/ gallon (150 grams/liter) of volatile organic matter per total non-volatile paint material in accordance with ASTM D 3960.

- Color

For white, the color shall closely match Color Chip 37925 of Federal Standard 595b. For yellow, the color shall closely match Color Chip 33538 of Federal Standard 595b. Color determination will be made for markings and the diffuse daytime color of the markings shall be in accordance with the below CIE Chromaticity coordinate limits. Color determination for liquid marking material will be made over the black portion of a 2A or 5C Leneta Chart or equal, at least 24 hours after application of a 15-mil wet film. Color readings will be determined in accordance with the requirements of ASTM E 1349 using CIE 1931 2o standard observer and CIE standard illuminant D65.

CIE Chromaticity Coordinate Limits (Initial)								
	x	y	x	y	x	y	x	y
White	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375
Yellow	0.510	0.490	0.473	0.453	0.490	0.432	0.537	0.462

- Flexibility

The paint shall show no cracking or flaking when tested in accordance with Federal Specification TT-P- 1952B.

- Water Resistance

The paint shall conform to Federal Specification TT-P-1952B. There shall be no blistering or appreciable loss of adhesion, softening or other deterioration after examination.

- Freeze-Thaw Stability

The paint shall show no coagulation, discoloration or change in consistency greater than 10 Kreb Units, when tested in accordance with Federal Specification TT-P- 1952E.

- Heat Stability

The paint shall show no coagulation, discoloration or change in consistency greater than 10 Kreb Units, when tested in accordance with Federal Specification TT-P- 1952E.

- Dilution Test

The paint shall be capable of dilution with water at levels without curdling or precipitation such that the wet paint can be readily cleaned up with water only.

## Storage Stability

After 30 days storage in three-quarters (3/4) filled, closed container, the paint shall show no caking that cannot be readily remixed to a smooth, homogeneous state, no skinning, livering, curdling, or hard settling. The viscosity shall not change more than 5 Kneb Units from the viscosity of the original sample.

- Contrast Ratio

The minimum contrast ratio shall be 0.98 when applied to a wet film thickness of 15 mils (381  $\mu\text{m}$ ) on a 2A Leneta Chart or equal and air dried for 24 hours. Contrast Ratio = Black/White.

- Reflectance

The daylight directional reflectance of the white paint shall not be less than 84% and not less than 50% for yellow paint of a 15 mils (381  $\mu\text{m}$ ) wet film applied to a 2A Leneta Chart or equal. After drying 24 hours, measure the reflectance of the paint over the black portion of the chart using a Colorimeter and test method ASTM E1347 (replaces ASTM E97).

Provide white and yellow films with an initial minimum reflectance value at observation angles of 1.050 and an 88.760 entrance angle, measured in accordance with ASTM E1710. Ensure the specific luminance is measured in millicandelas per square foot per foot-candle ( $\text{mcd}/\text{ft}^2/\text{fc}$ ) [millicandelas per square meter per lux ( $\text{mcd}/\text{m}^2/\text{lx}$ )].

<b>Table 711:1</b>		
<b>White and Yellow Film Reflective Properties</b>		
<b>Property</b>	<b>White</b>	<b>Yellow</b>
Specific luminance, $\text{mcd}/\text{ft}^2/\text{fc}$ , (ASTM E1710)	550	410

- Bleeding

The paint shall have a minimum bleeding ratio of 0.97 when tested in accordance with Federal Specification TT-P-1952E. The asphalt saturated felt shall conform to ASTM D 226 for Type I.

- Abrasion Resistance

No less than 50 gal of sand shall be required for removal of the paint film when tested in accordance with Federal Specification TT-P-1952E.

- No-Tracking Time Field Test

The paint shall dry to a no-tracking condition under traffic in ninety (90) seconds maximum when applied at 15 mils  $\pm$  1 mil (381  $\mu\text{m}$   $\pm$  25  $\mu\text{m}$ ) wet film thickness plus six (6) pounds of glass beads per gallon of paint under 129.2 deg. F (54 deg. C). "No tracking" shall be determined by passing over an applied test line at approximately 30 degrees with a standard size passenger car or pickup truck. A line showing no visual deposition of the paint to the pavement surface when viewed from a distance of 50 ft. (15.2 m) shall be considered as conforming to the dry-time requirements.

- **Dry Through Time**

The paint shall be applied to a non-absorbent substrate at a wet film thickness of 15 mils  $\pm$  1 mil (381  $\mu\text{m}$   $\pm$  25  $\mu\text{m}$ ) and placed in a humidity chamber controlled at 50

$\pm$  5% R.H. and 72.5  $\pm$  2.5 degrees F. The dry through time shall be determined according to ASTM D1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

## **G. MANUFACTURE**

All ingredient materials shall be delivered in the original containers and shall be used without adulteration.

## **H. MINIMUM QUALIFICATIONS**

No response will be considered unless the firm submitting the response can meet the following conditions:

That it has in operation a plant adequate for and devoted to manufacture of the pavement marking paint that it proposes to furnish, and is capable of producing batch sizes of at least 3,000 gallons and consistent with the quantities to be delivered.

That it maintains a laboratory to scientifically control the product quoted upon to assure accuracy and quality of formulation.

That it has produced high build waterborne paint over the last two (2) years with a successful application record. At least three (3) separate and independent references shall be furnished with the response. The Department reserves the right to contact the provided references and request additional references prior to awarding any contracts.

All other policies and regulation regarding qualification of suppliers, were not in conflict with these provisions, shall apply.

## **I. QUALIFICATION OF PAINT**

Successful supplier(s) shall submit a type "A" certification in accordance with subsection 106.04 of the 2009 Oklahoma Standard Specifications for Highway Construction and state that all materials and final products meet the above specifications.

The certification supplied by the manufacturer shall include reference to the specific NTPEP test deck to which the paint formulation was applied, including NTPEP identification numbers and report numbers.

## **J. ACCEPTANCE**

The State of Oklahoma reserves the right to make field tests of material prior to award to determine its suitability for application in its equipment and for purposes of determining compliance with the drying time requirements of this specification. The quantity of paint for this procedure shall be no less than 50 gallons of each color and shall be furnished at no cost to the department.

After storage for periods of up to 9 months from the date of packaging the material shall meet the following:

- The pigment shall not settle badly or cake in the container, nor shall the paint skin nor thicken in storage sufficiently to cause an undesirable change in consistency or show spoilage.
- The paint shall comply with all the provisions of these specifications and be capable of being re-dispersed with a paddle to a smooth, homogeneous condition of useable consistency.
- Any paint furnished under this contract that does not meet these provisions, or that cannot be satisfactorily applied shall be disposed of by the supplier and immediately replaced with acceptable material entirely at the supplier's expense, including handling and transportation charges.

**OKLAHOMA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION FOR  
ALL WEATHER REFLECTIVE BONDED CORE ELEMENTS  
FOR TRAFFIC STRIPE (Thermoplastic and Multipolymer)**

This Draft copy of Special Provision is for use with Statewide Stripping Contract SW776 ONLY

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Standard Specification for Highway Construction, English and Metric.

**711.07 Reflective Bonded Core Elements**

**A. General**

This work shall consist of furnishing and installing bonded core reflective elements (elements) as a part of a multiple component, retroreflective traffic marking system in accordance with this provision and in reasonably close conformance to the dimensions and lines shown on the plans or established by the engineer.

This specification describes the bonded core reflective elements used to reflectorize thermoplastic and multipolymer pavement marking binder materials at a rate specified by the engineer. Due cost of the elements, this specification recommends elements to be applied on grooved or inlaid thermoplastic or multipolymer traffic markings.

The binder material shall be applied in a liquid state, by methods as called out in the plans, and immediately followed by application of bonded core reflective elements and glass beads. The resulting traffic marking system shall produce a stripe of specified thickness, length, and width that is retroreflective in dry and wet conditions and capable of resisting deformation by traffic.

**B. Materials**

Provide elements containing either clear or yellow tinted composite cluster comprised of a core element and shall contain an outer shell containing elements surrounding it. The shell elements shall be permanently attached to the core element. The core and shell elements shall be manufactured from glass, ceramic, or silica.

All “dry-performing” elements shall have a minimum refractive index of 1.9 when tested using the liquid immersion method. All “wet-weather-performing” elements shall have a minimum refractive index of 2.40 when tested using the liquid immersion method.

**(1) Reflective Elements for Thermoplastic Markings**

The elements shall be coated by manufacturer's recommendations for application within thermoplastic binder. Fifty (50) percent of the elements shall have refractive index of 1.9 (dry performing) and fifty (50) percent shall have a refractive index of 2.4 (wet-weather performing). Since formulations may vary, the Engineer should test for ultimate compatibility and performance.

**(2) Reflective Elements for Multipolymer Markings**

The elements shall be coated by manufacturer's recommendations for application within multipolymer binder. Fifty (50) percent of the elements shall have refractive index of 1.9 (dry performing) and fifty (50) percent shall have a refractive index of 2.4 (wet-weather performing). Since formulations may vary, the Engineer should test for ultimate compatibility and performance.

**(3) Acid Resistance**

A sample of bonded core reflective elements supplied by the manufacturer shall show resistance to corrosion of their surface after 24-hr exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7 cc of concentrated acid into 1000 cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse.

**C. Reflectance**

Provide white and yellow films with an initial minimum reflectance value at observation angles of 1.05° and an 88.76° entrance angle, measured in accordance with ASTM E1710. Ensure the specific luminance is measured in millicandelas per square foot per foot-candle (mcd/ft<sup>2</sup>/fc) [millicandelas per square meter per lux (mcd/m<sup>2</sup>/lx)].

<b>Table 711:4</b>		
<b>White and Yellow Film Reflective Properties</b>		
<b>Property</b>	<b>White</b>	<b>Yellow</b>
Specific luminance, <i>mcd/ft<sup>2</sup>/fc</i> , Dry (ASTM E1710)	550	410
Specific luminance, <i>mcd/ft<sup>2</sup>/fc</i> , Wet recovery (ASTM E2177)	300	250
Specific luminance, <i>mcd/ft<sup>2</sup>/fc</i> , Wet continuous (ASTM E2176 and E2832)	100	75

**A. Application of Reflective Elements and Glass Beads**

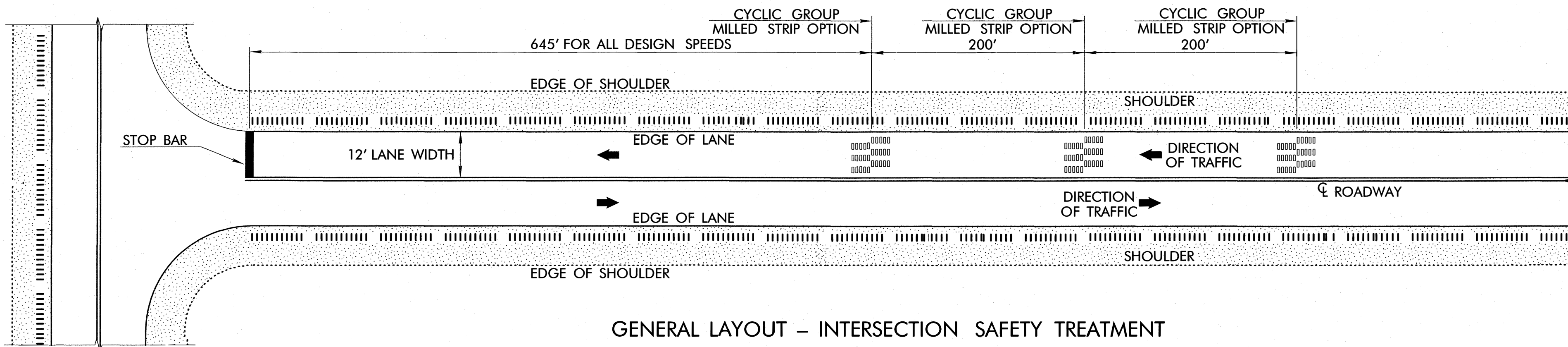
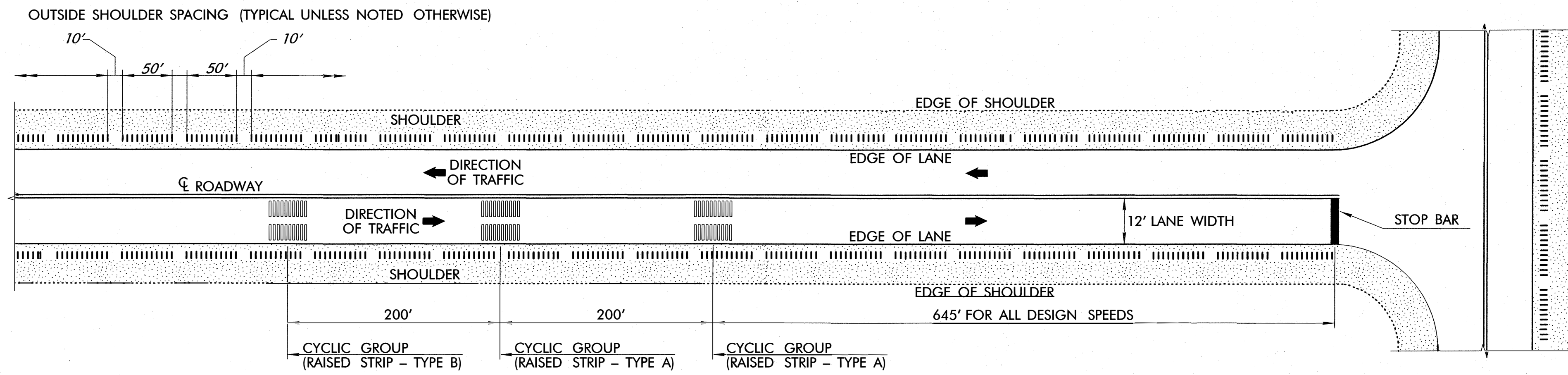
The elements shall be dropped immediately after binder application. The reflective media consists of retroreflective elements followed by glass beads called “double-drop” and shall be applied to

achieve the application rates shown in the following table.

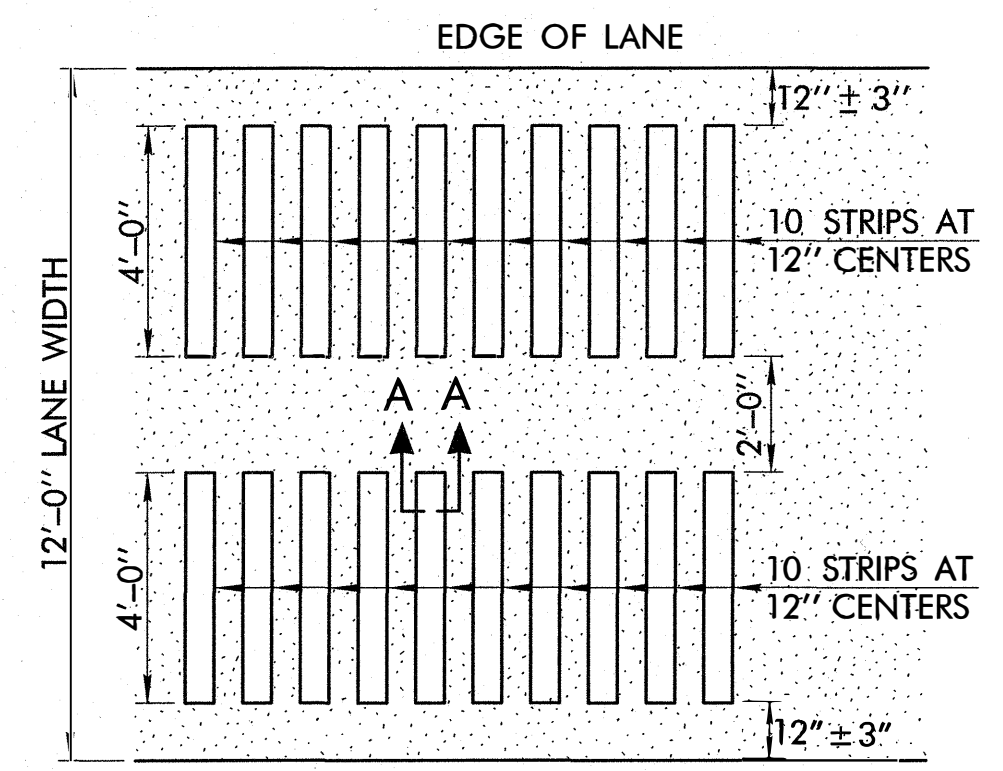
Apply standard reflective elements at a coverage rate of at least 6.6 lb per 100 ft<sup>2</sup> [3 kg per 10 m<sup>2</sup>] before applying Type IV beads. A second drop of glass beads is necessary to improve physical characteristics, durability of finished markings, and to assure expected track-free times. The glass beads usually provide some measure of increase visibility during dry conditions as well. Apply Type IV glass beads per Table 711:05.

<b>B. Table 711:05</b>		
<b>C. Type III Glass Beads Application Rates</b>		
<b>D. Units</b>	<b>E. Application Rates (Multipolymer)</b>	<b>F. Application Rates (Thermoplastic)</b>
<b>G. Pounds per 100 ft<sup>2</sup></b>	<b>H. 15 – 27.5</b>	<b>I. 9.92 – 15.87</b>
<b>J. Kg per 10 m<sup>2</sup></b>	<b>K. 6.8 – 12.50</b>	<b>L. 4.4 – 7.2</b>

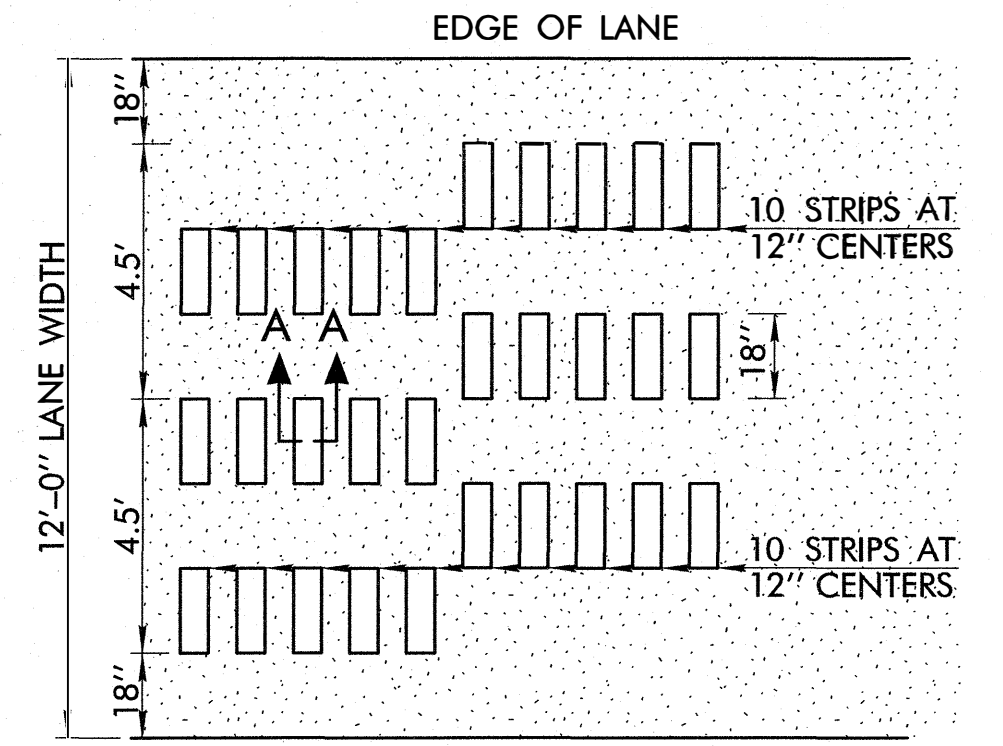




GENERAL LAYOUT - INTERSECTION SAFETY TREATMENT

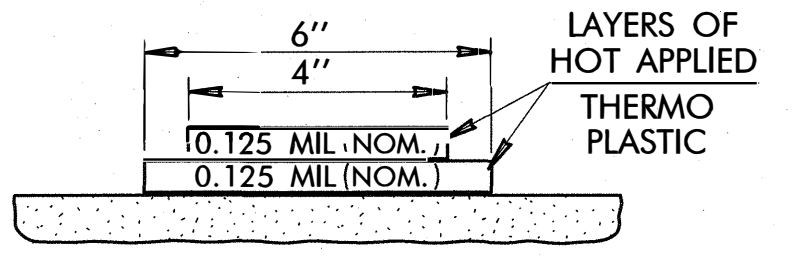


RAISED CYCLIC GROUP (TRANSVERSE RUMBLE STRIPS)

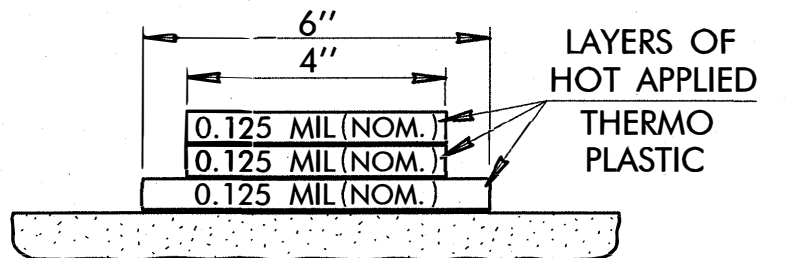


MILLED CYCLIC GROUP (TRANSVERSE RUMBLE STRIPS)

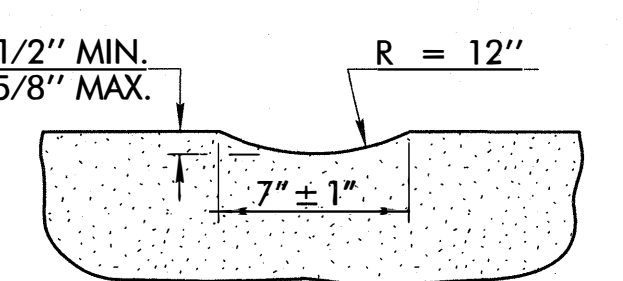
REVISIONS		DATE
DESCRIPTION		



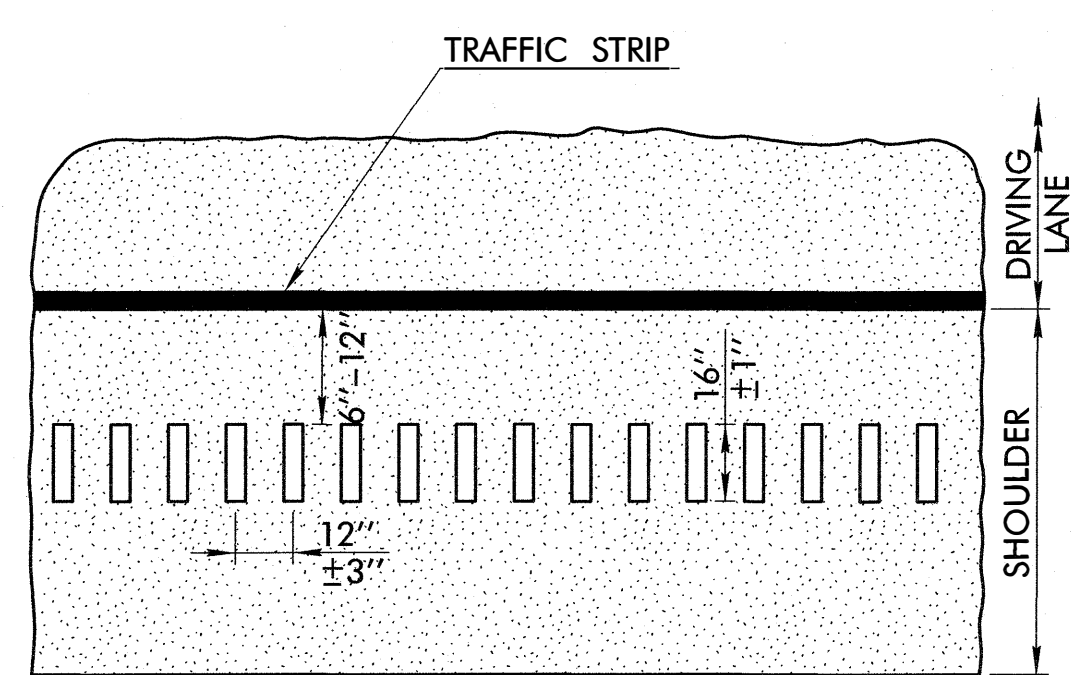
SECTION A - A  
RAISED STRIP - TYPE A CYCLIC GROUP



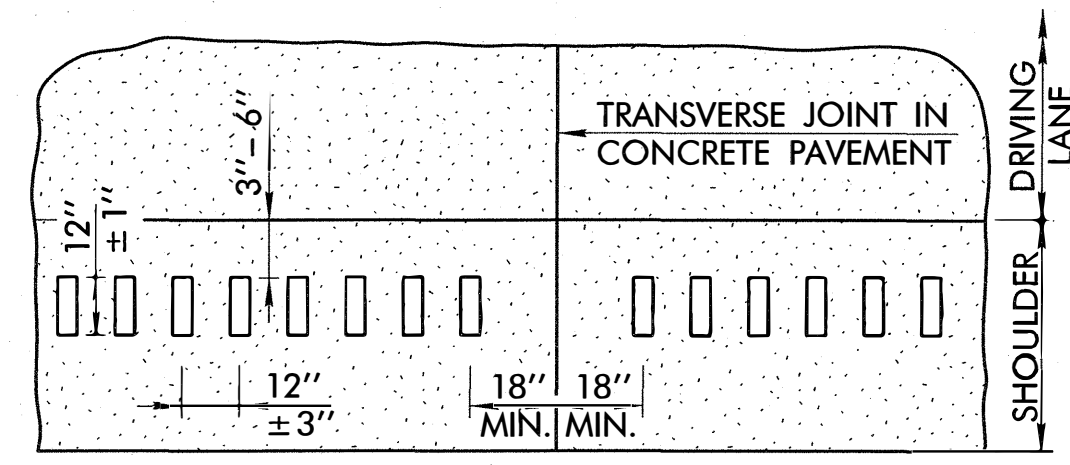
SECTION A - A  
RAISED STRIP - TYPE B CYCLIC GROUP



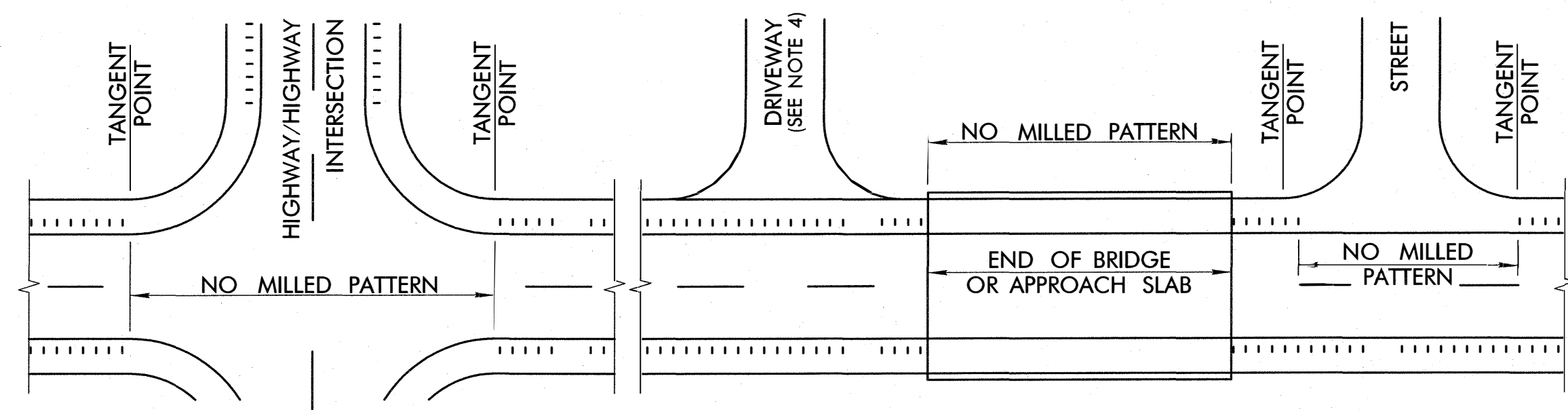
SECTION A - A  
MILLED STRIP OPTION CYCLIC GROUP



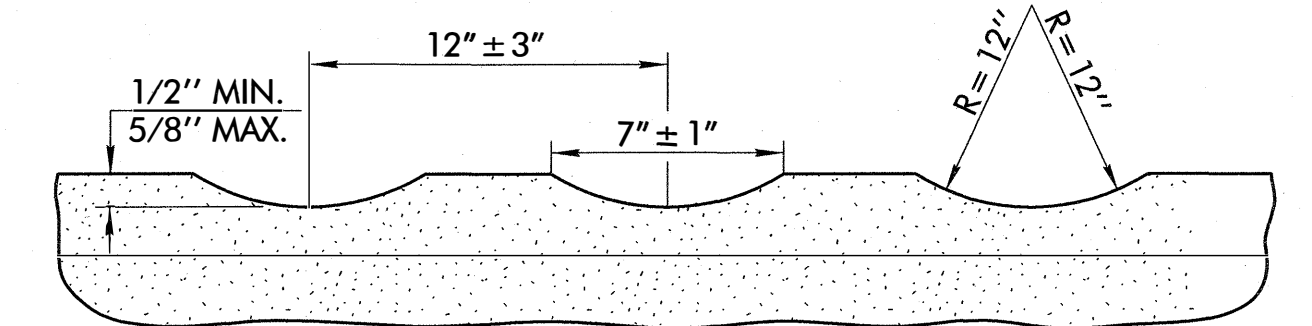
TYPICAL SPACING IN ASPHALT PAVED SHOULDERS GREATER THAN 4' WIDE



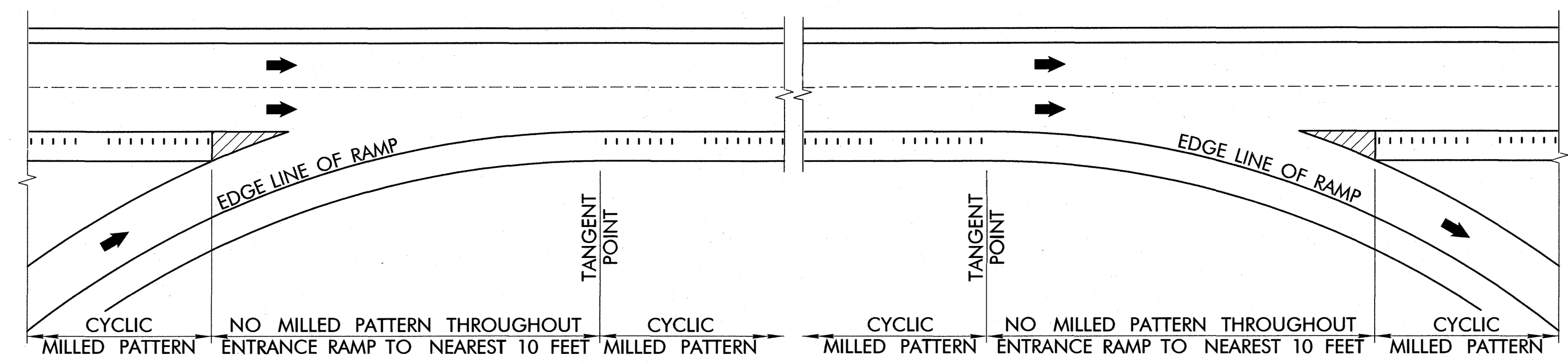
TYPICAL SPACING IN 4' OR LESS PAVED SHOULDERS



GENERAL LAYOUT AT INTERSECTIONS AND BRIDGES



TYPICAL SECTION THROUGH CYCLIC MILLED PATTERN



GENERAL LAYOUT AT ENTRANCE RAMP

GENERAL LAYOUT AT EXIT RAMP

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
- MATERIALS SPECIFICATIONS FOR RAISED RUMBLE STRIPS SHALL CONFORM TO SECTION 711.01 OF THE SPECIFICATIONS.
- FOR CYCLIC GROUP TRANSVERSE RUMBLE STRIP, THE MILLED STRIP OPTION IS THE PREFERRED METHOD OF INSTALLATION. THE RAISED STRIP OPTION MAY BE USED IN LIEU OF THE MILLED STRIP, WHEN APPROVED BY THE ENGINEER.
- WHERE A DRIVEWAY INTERSECTS THE HIGHWAY, THE SHOULDER RUMBLE STRIP SHALL NOT BE BROKEN. THERE COULD BE EXCEPTIONS TO THIS POLICY. IF THE FIELD DIVISION ENGINEER, OR HIS/HER REPRESENTATIVE, DETERMINES THE DRIVEWAY TO BE A HEAVILY USED COMMERCIAL, INDUSTRIAL OR SUBDIVISION DRIVEWAY, IF AN EXCEPTION IS MADE, THE LOCATION AND EXTENT OF THE BREAK IS TO BE DETERMINED BY THE FIELD DIVISION ENGINEER OR HIS/HER REPRESENTATIVE.
- THE GAPS IN THE RUMBLE STRIPS SHALL BE 10 FEET LONG. THE LENGTH OF THE CONTINUOUS PORTION OF THE RUMBLE STRIP SHALL BE 50 FEET. THE GAP AND CONTINUOUS PORTION COMPLETES A CYCLE LENGTH OF 60 FEET. IMMEDIATELY FOLLOWING ANY OTHER GAPS (E.G. INTERSECTING ROADS, ETC.) THE CONTINUOUS PORTION OF THE 50 FEET RUMBLE STRIP SHALL START OVER. A 10 FOOT GAP SHALL NOT BE PLACED ADJACENT, OR VERY CLOSE, TO OTHER GAPS THAT OCCUR FOR OTHER REASONS WITHIN THIS STANDARD.
- PAYMENT FOR THIS PAY ITEM SHALL BE BASED ON THE TOTAL LINEAR FEET, INCLUDING THE NORMAL 10 FOOT GAP. GAPS FOR OTHER AREAS SHALL BE EXCLUDED, FOR EXAMPLE, GAPS ACROSS STREETS, OTHER HIGHWAYS, MEDIAN OPENINGS, RAMPS, AND TRANSVERSE JOINTS.
- THE RAISED STRIP (THERMOPLASTIC) OPTION OR THE MILLED STRIP OPTION SHALL BE INCLUDED IN THE PRICE BID FOR THIS PAY ITEM.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
413 (B)	RUMBLE STRIP - METHOD HMA-CYC	(6) L.F.
413 (D)	RUMBLE STRIP - METHOD PCC-CYC	(6) L.F.
413 (B)	RUMBLE STRIP - METHOD HMA-CYC GROUP	(7) E.G.
413 (D)	RUMBLE STRIP - METHOD PCC-CYC GROUP	(7) E.G.

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TRAFFIC ENGINEER: *[Signature]* DATE: 7-14-16

TRAFFIC STANDARD  
CYCLIC RUMBLE STRIP  
(NON-INTERSTATE  
SYSTEM ONLY)

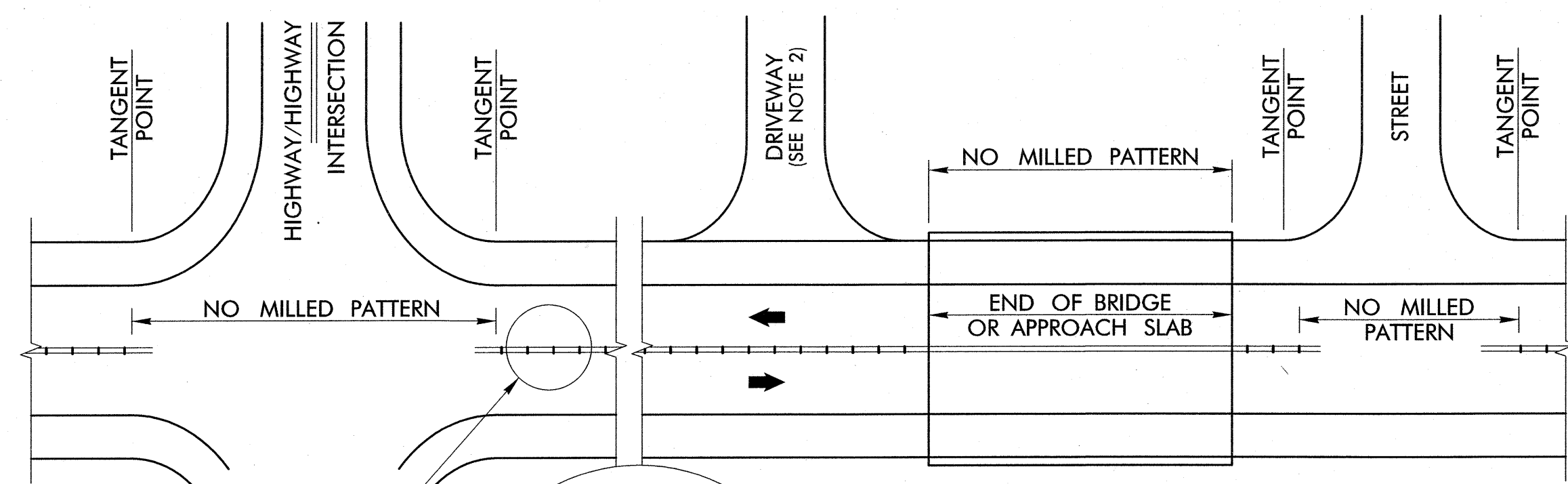
2009 SPECIFICATIONS

RS1-2	00
T-611	

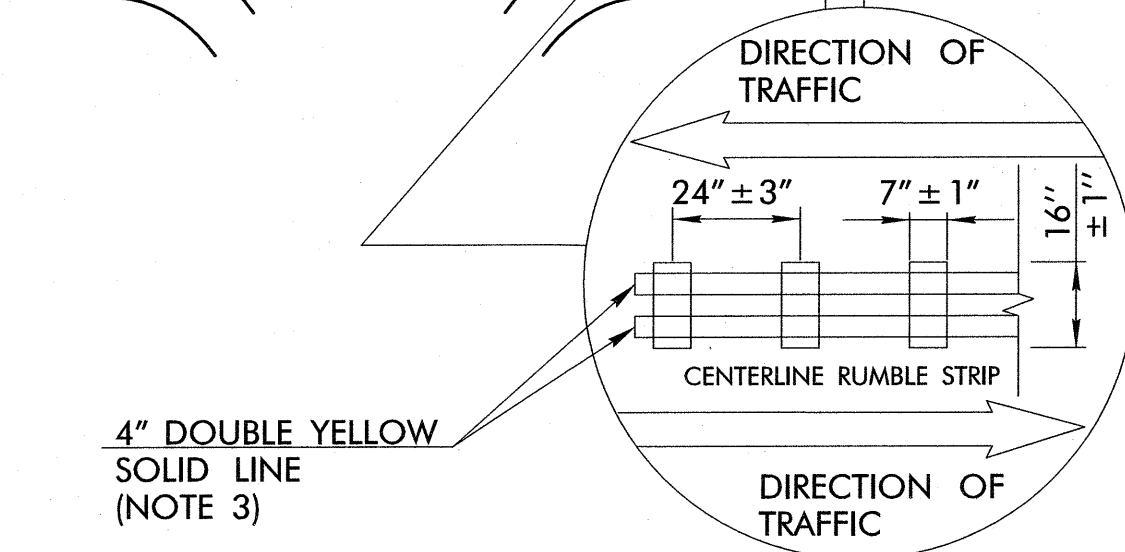
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Pay Items Corrected  
2/5/2017, HB



REVISIONS	
DESCRIPTION	DATE



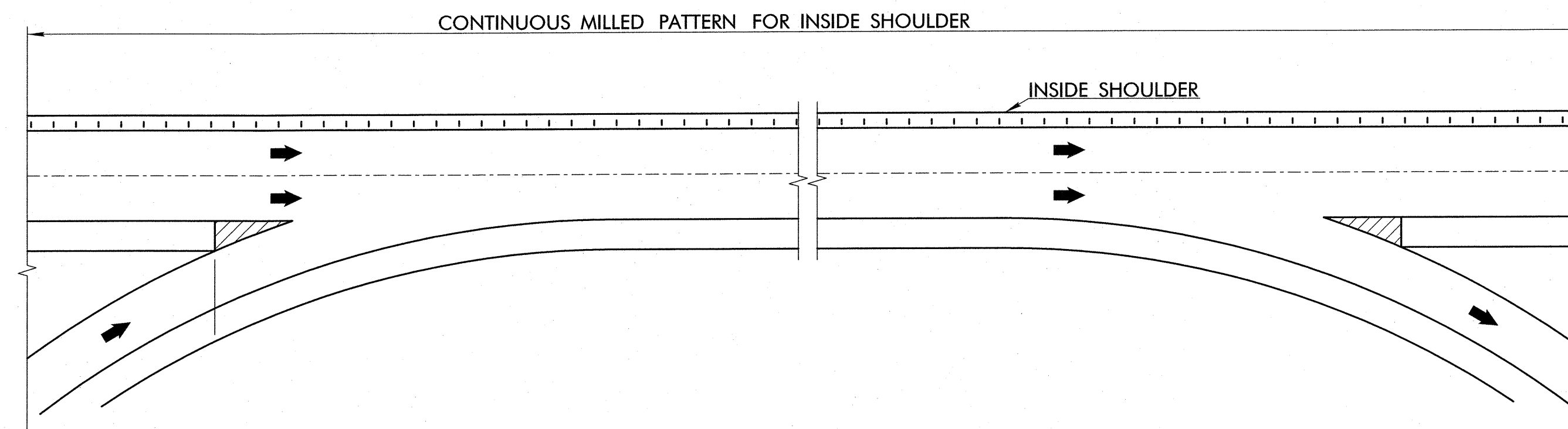
GENERAL LAYOUT FOR CENTERLINE RUMBLE STRIP  
AT INTERSECTIONS AND BRIDGES



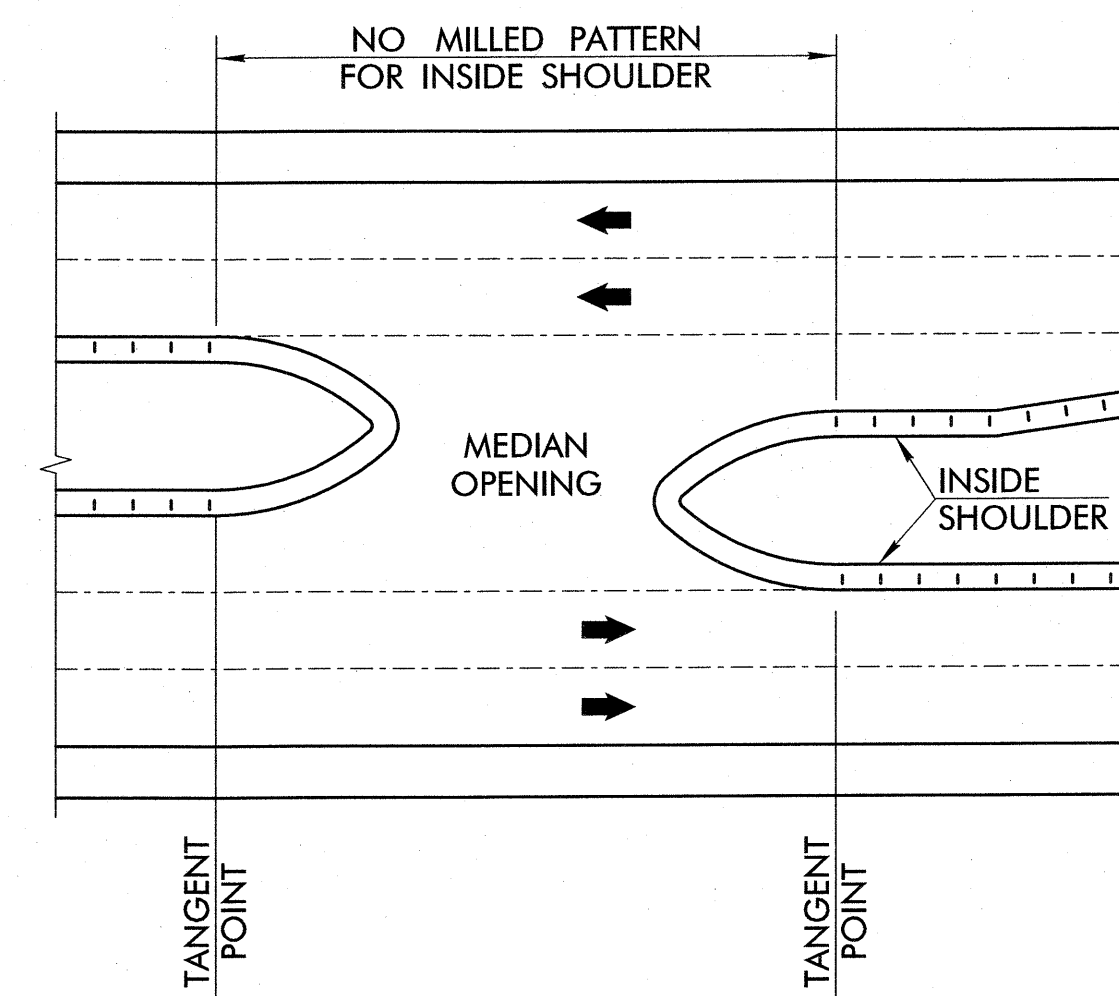
TYPICAL SECTION THROUGH CONTINUOUS MILLED PATTERN  
CENTERLINE RUMBLE STRIP  
(SEE NOTE 4 FOR ADDITIONAL APPLICATIONS)

### GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
- WHERE A DRIVEWAY INTERSECTS THE HIGHWAY, THE CENTERLINE RUMBLE STRIP SHALL NOT BE BROKEN. THERE COULD BE EXCEPTIONS TO THIS POLICY IF THE FIELD DIVISION ENGINEER, OR HIS/HER REPRESENTATIVE, DETERMINES THE DRIVEWAY TO BE A HEAVILY USED COMMERCIAL, INDUSTRIAL OR SUBDIVISION DRIVEWAY. IF AN EXCEPTION IS MADE, THE LOCATION AND EXTENT OF THE BREAK IS TO BE DETERMINED BY THE FIELD DIVISION ENGINEER OR HIS/HER REPRESENTATIVE.
- APPLY PAVEMENT MARKINGS OVER THE CENTER LINE AND TWO WAY LEFT TURN LANE RUMBLE STRIP FOR NORMAL PAVEMENT MARKING SPACING.
- PAYMENT FOR THIS PAY ITEM SHALL BE BASED ON THE TOTAL LINEAR FEET. GAPS, FOR EXAMPLE, ACROSS STREETS, OTHER HIGHWAYS, MEDIAN OPENINGS, RAMPS, AND TRANSVERSE JOINTS, SHALL BE EXCLUDED. THIS PAY ITEM IS TO BE USED FOR CENTERLINE, TWO WAY LEFT TURN LANES, AND INSIDE SHOULDER APPLICATIONS

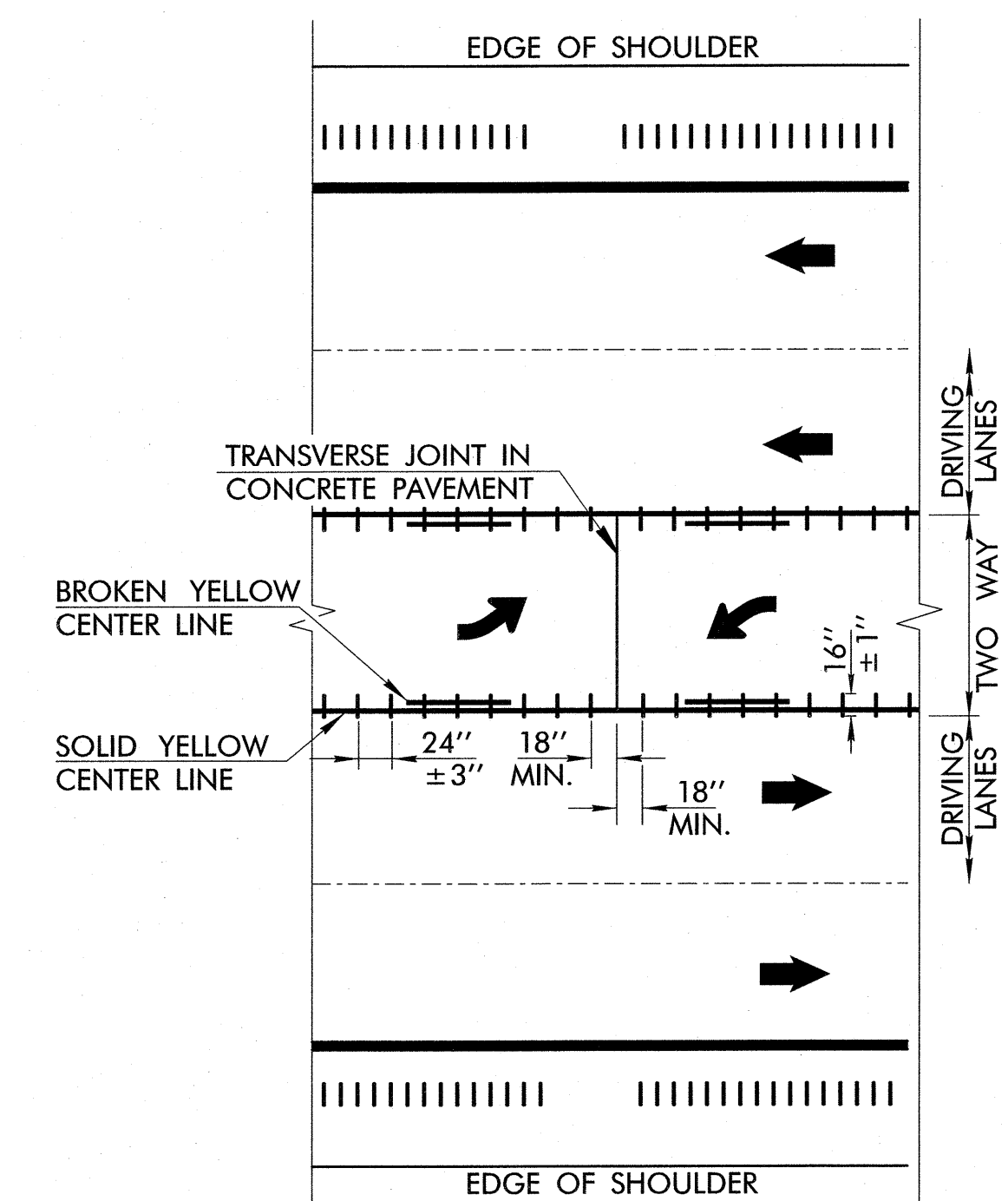


GENERAL LAYOUT AT ENTRANCE RAMP

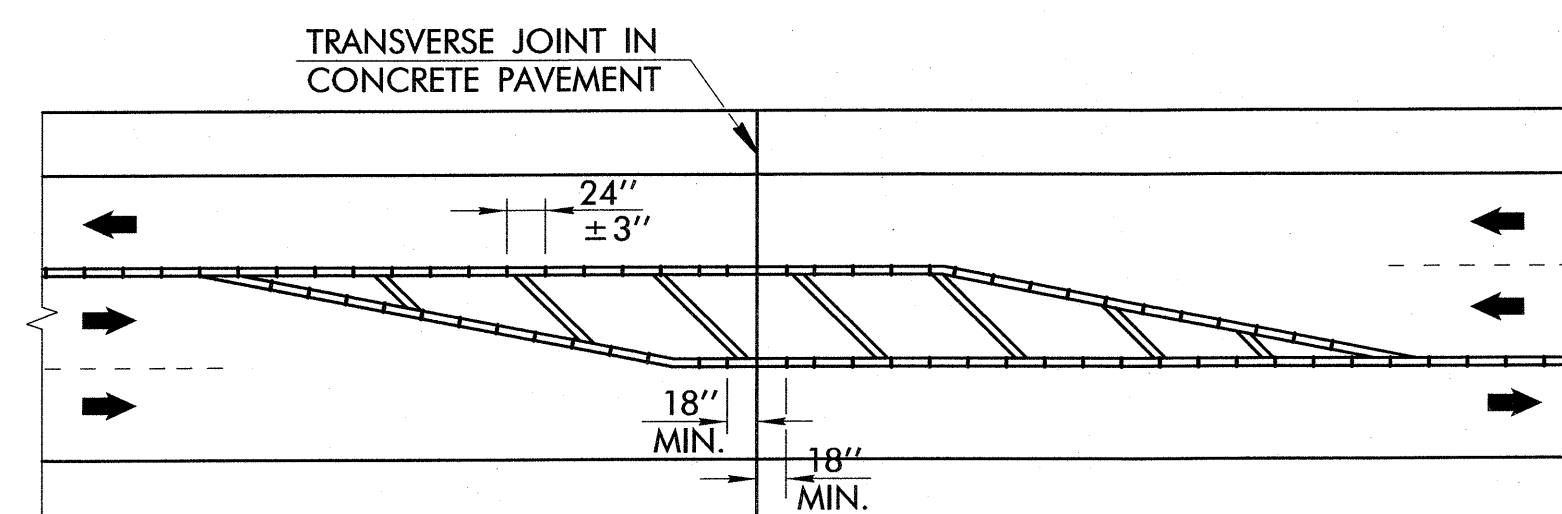


GENERAL LAYOUT  
INSIDE SHOULDERS AND MEDIAN OPENING

GENERAL LAYOUT AT EXIT RAMP

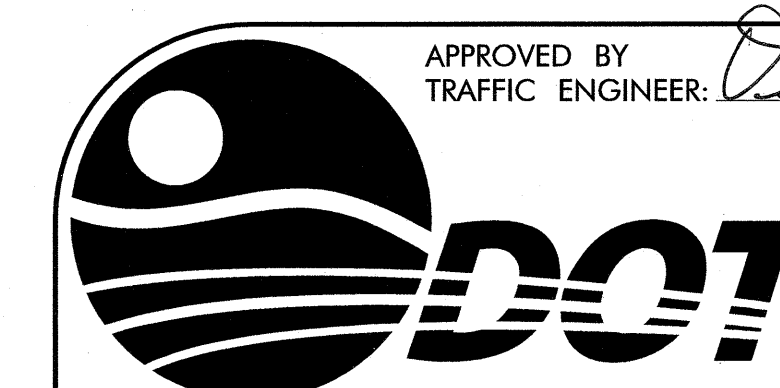


TYPICAL SPACING  
TWO WAY LEFT TURN LANES  
(TWLTL)



GENERAL LAYOUT FOR CENTERLINE RUMBLE STRIP  
AT SUPER TWO TRANSITION  
(TWO-WAY THREE LANE HIGHWAY)

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
413 (A)	RUMBLE STRIP - CENTERLINE HMA-CON	(4) L.F.
413 (C)	RUMBLE STRIP - CENTERLINE PCC-CON	(4) L.F.



APPROVED BY  
TRAFFIC ENGINEER: *[Signature]* DATE: 7-14-16

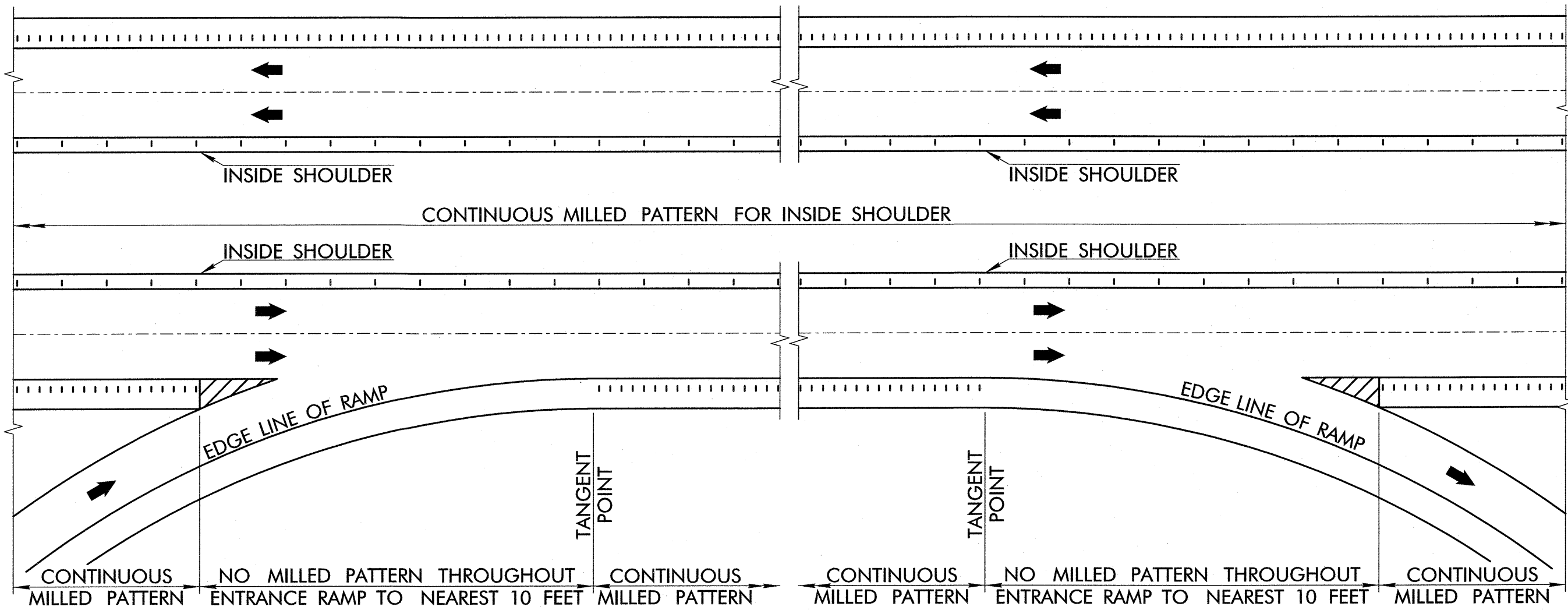
TRAFFIC STANDARD  
CENTERLINE RUMBLE STRIP  
(NON-INTERSTATE  
SYSTEM ONLY)

2009 SPECIFICATIONS

RS2-2 00

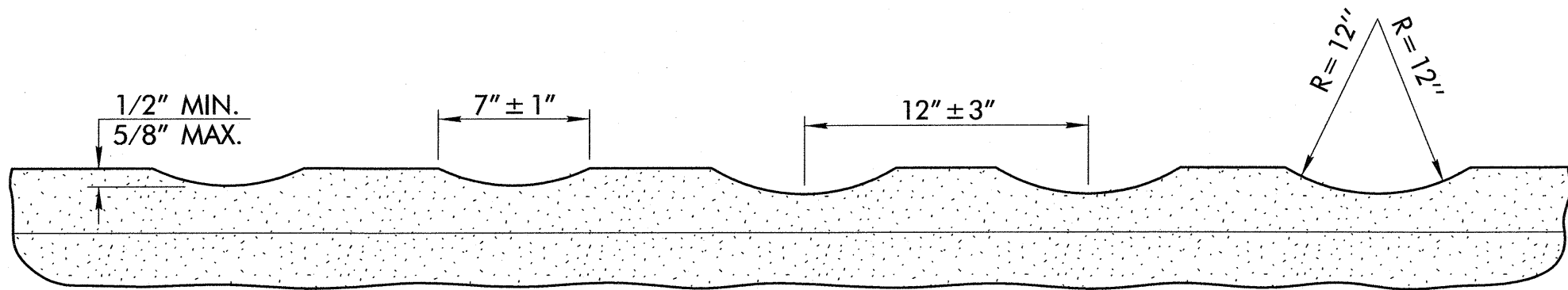
T-612

REVISIONS		
DESCRIPTION		DATE

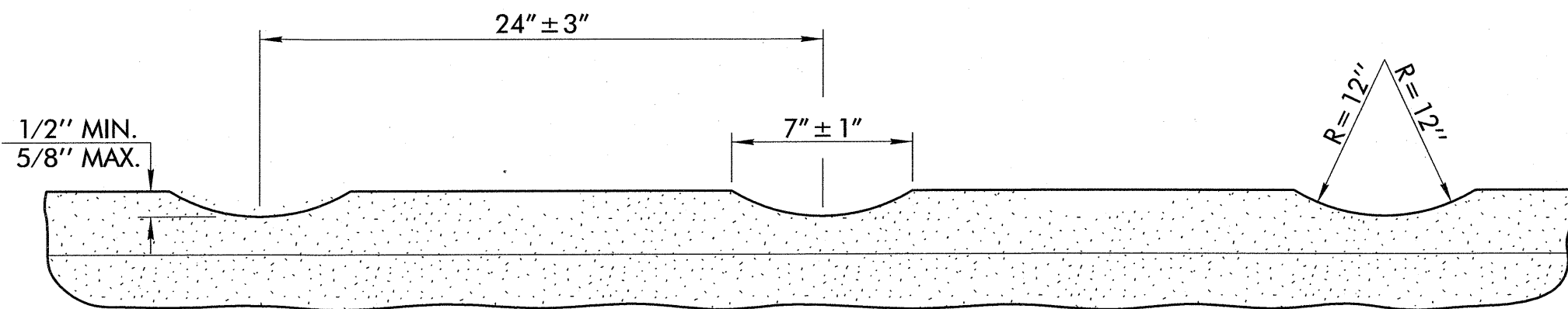


GENERAL LAYOUT AT ENTRANCE RAMP

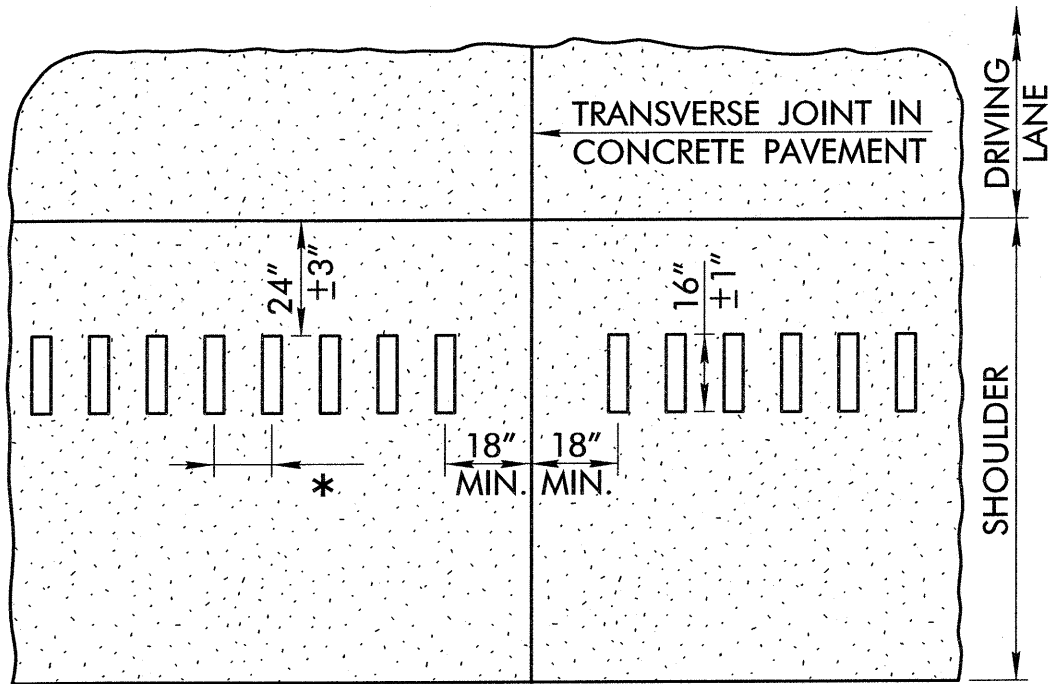
GENERAL LAYOUT AT EXIT RAMP



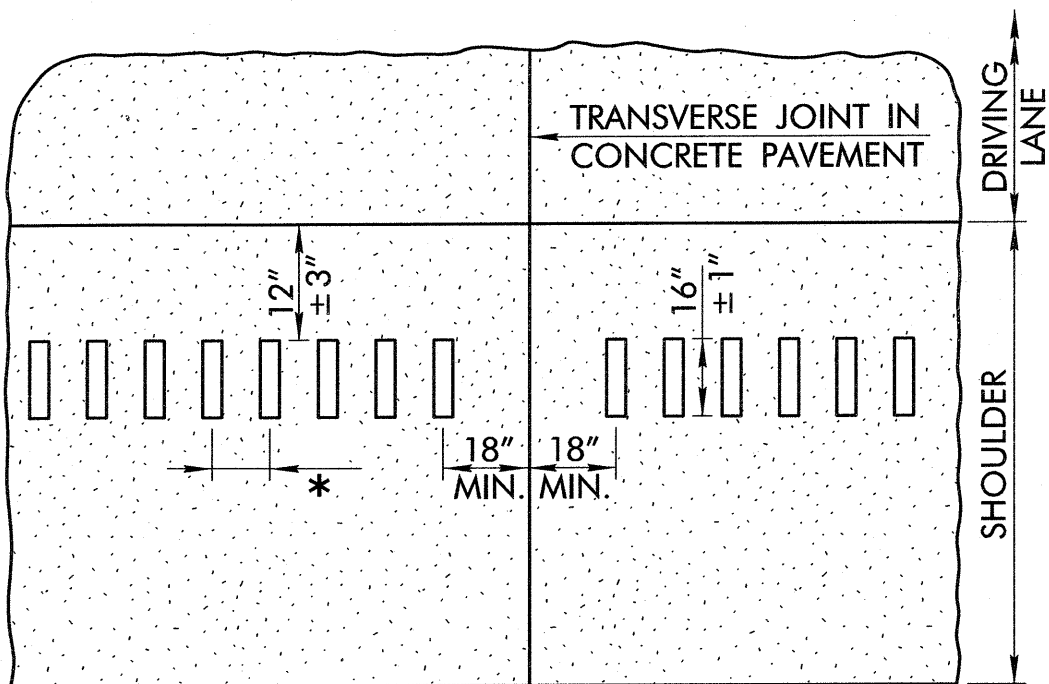
TYPICAL SECTION THROUGH CONTINUOUS MILLED PATTERN AT OUTSIDE SHOULDERS ONLY



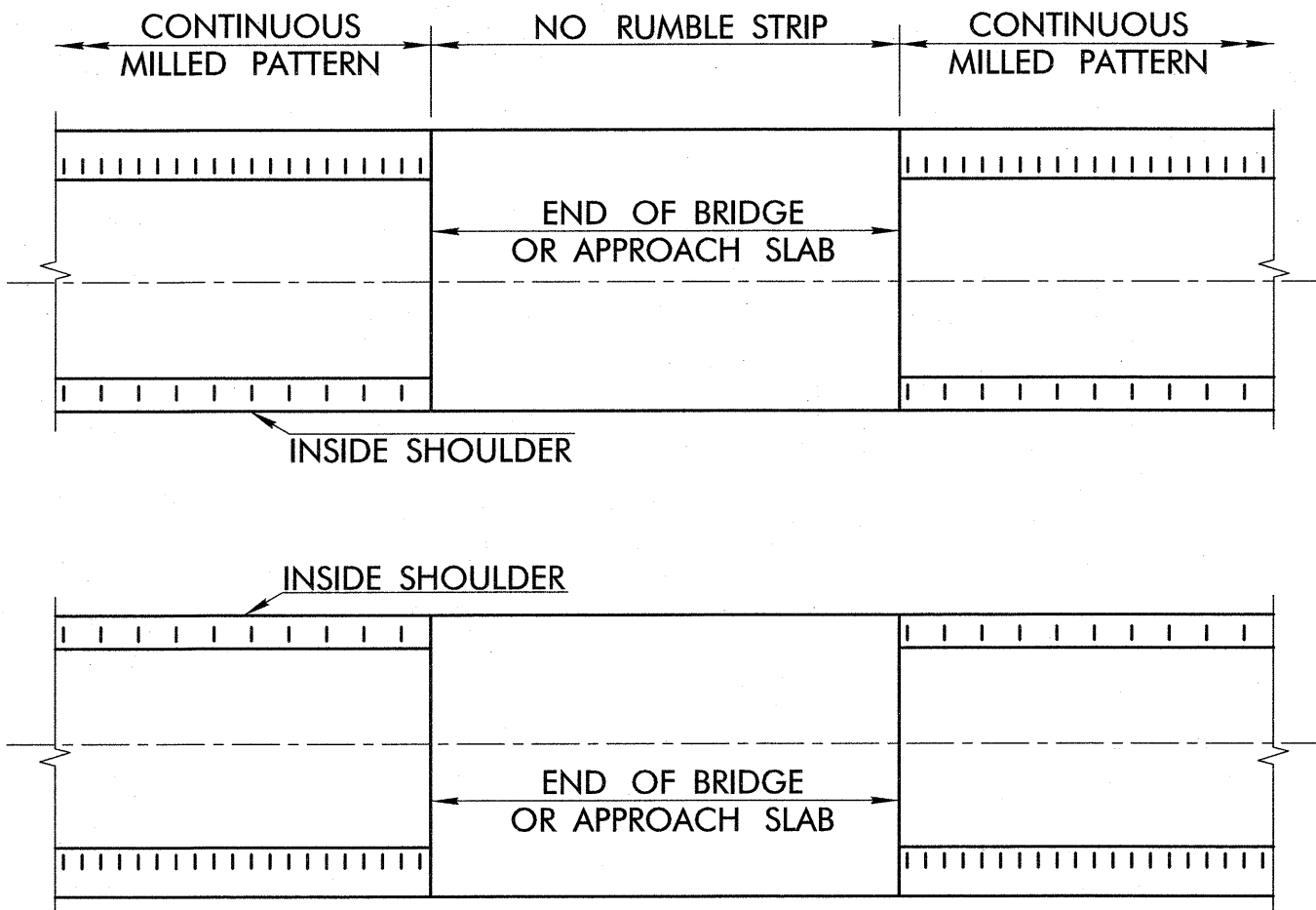
TYPICAL SECTION THROUGH CONTINUOUS MILLED PATTERN AT INSIDE SHOULDERS ONLY



TYPICAL SPACING IN PAVED SHOULDERS GREATER THAN 4' WIDE  
 \* INSIDE SHOULDER: 24" ± 3"  
 OUTSIDE SHOULDER: 12" ± 3"



TYPICAL SPACING IN PAVED SHOULDERS 4' WIDE OR LESS  
 \* INSIDE SHOULDER: 24" ± 3"  
 OUTSIDE SHOULDER: 12" ± 3"



GENERAL LAYOUT AT BRIDGE LOCATIONS

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
- PAYMENT FOR THIS PAY ITEM SHALL BE BASED ON THE TOTAL LINEAR FEET. GAPS FOR RAMP, AND TRANSVERSE JOINTS, SHALL BE EXCLUDED.
- REFER TO GENERAL NOTES ON RS1-1 AND RS2-1 FOR MORE INFORMATION.
- THIS PAY ITEM IS TO BE USED FOR CENTERLINE, TWO WAY LEFT TURN LANES, AND INSIDE SHOULDER APPLICATIONS

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
413 (A)	RUMBLE STRIP – METHOD HMA-CON	(2) L.F.
413 (C)	RUMBLE STRIP – METHOD PCC-CON	(2) L.F.
413 (A)	RUMBLE STRIP – CENTERLINE HMA-CON	(2)(4) L.F.
413 (C)	RUMBLE STRIP – CENTERLINE PCC-CON	(2)(4) L.F.

APPROVED BY  
TRAFFIC ENGINEER: *[Signature]* DATE: 7-14-16

TRAFFIC STANDARD

CONTINUOUS RUMBLE STRIP  
(INTERSTATE SYSTEM ONLY)

2009 SPECIFICATIONS

RS3-1

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T-613