

Department of Transportation

Office of Project Development

700 E Broadway Avenue

Pierre, South Dakota 57501-2586 605/773-3268

FAX: 605/773-6608

May 19, 2014

ADDENDUM NO. 1

RE: Item #10, May 21, 2014 Letting - PH 000S(255), PCN 02B0, Lincoln, Union County - Durable Pavement Marking (Epoxy Pavement Marking Paint)

TO WHOM IT MAY CONCERN:

The following addenda to the plans shall be inserted and made a part of your proposal for the referenced project.

SPECIAL PROVISIONS: PEN AND INK CHANGE on the cover of the proposal, please cross out (EPOXY PAVEMENT MARKING PAINT).

Please remove the Special Provisions checklist and replace with attached Special Provisions checklist revised 5/19/14.

Please remove the "Special Provision Durable Pavement Markings", dated 4/16/14 and replace with the "Special Provision for Durable Pavement Markings", dated 5/19/14.

BID ITEM FILE: *Bidders must log in to retrieve the addendum bid item file that must be loaded into the SDEBS to incorporate the revisions listed here.*

Bid Items were added:

Bid Item 633E3000 "Durable Pavement Marking, 4" White"

Bid Item 633E3005 "Durable Pavement Marking, 4" Yellow"

Bid Item 633E3020 "Durable Pavement Marking, 12" White"

Bid Items were removed:

Bid Item 633E1100 "Epoxy Pavement Marking Paint, 4" White"

Bid Item 633E1105 "Epoxy Pavement Marking Paint, 4" Yellow"

Bid Item 633E1120 "Epoxy Pavement Marking Paint, 12" White"

PLANS: Please destroy sheets 1, 2, 3, and 4 and replace with the enclosed sheets, dated 5/19/14.

Sheet 1: Title sheet was changed from Epoxy Pavement Marking to Durable Pavement Marking

Sheet 2: **Bid Items were added:**

Bid Item 633E3000 "Durable Pavement Marking, 4" White"

Bid Item 633E3005 "Durable Pavement Marking, 4" Yellow"

Bid Item 633E3020 "Durable Pavement Marking, 12" White"

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Bid Item 633E1105 "Epoxy Pavement Marking Paint, 4" Yellow"

Bid Item 633E1120 "Epoxy Pavement Marking Paint, 12" White"

Sheet 3: All references in the notes were changed from Epoxy pavement markings to Durable pavement markings.

Sheet 4: Mobile Retroreflectivity Measurements notes were changed from Epoxy Markings to Durable Markings.

Sincerely,

Sam Weisgram
Engineering Supervisor

SW/cj

CC: Craig Smith, Mitchell Region Engineer
Ron Peterson, Yankton Area Engineer

REV. 5/19/23

SPECIAL PROVISIONS

PROJECT NUMBER(S): PH 000S(255) PCN: 02B0

TYPE OF WORK: DURABLE PAVEMENT MARKING

COUNTIES: LINCOLN, UNION

The following clauses have been prepared subsequent to the Standard Specifications for Roads and Bridges and refer only to the above described improvement, for which the following Proposal is made. In case of any discrepancy or conflict between said specifications and these Special Provisions, the latter are to govern.

The Contractor's attention is directed to the need for securing from the Department of Environment & Natural Resources, Foss Building, Pierre, South Dakota, permission to remove water from public sources (lakes, rivers, streams, etc.). The Contractor should make his request as early as possible after receiving his contract, and insofar as possible at least 30 days prior to the date that the water is to be used.

Greg Johnson, Jaci Benjamin is the official in charge of the Sioux Falls, Vermillion Career Center for Lincoln, Union Counties.

THE FOLLOWING ITEMS ARE INCLUDED IN THIS PROPOSAL FORM:

Special Provision for Durable Pavement Markings, dated 5/19/14.

Special Provision for Contractor Administered Preconstruction Meeting, dated 4/18/13.

Special Provision for Electronic Bidding Requirements, dated 12/18/13.

Special Provision for Fuel Cost Adjustment, dated 7/13/06.

Special Provision for Differing Site Conditions, dated 12/19/13.

Special Provision for Suspension of Work, dated 2/13/04.

Standard Title VI Assurance, dated 7/14/08.

Special Provision For Disadvantaged Business Enterprise, dated 12/19/12.

Special Provision For EEO Affirmative Action Requirements on Federal and Federal-aid Construction Contracts, dated 9/1/97.

Special Provision For Required Contract Provisions Federal-aid Construction Contracts, Form FHWA 1273 (Rev. May/1/12), dated 4/30/13.

Required Contract Provisions Federal-aid Construction Contracts, Form FHWA 1273 (Rev. 5/1/12).

Special Provision Regarding Minimum Wage on Federal-Aid Projects, dated 4/30/13.

Wage and Hour Division US Department of Labor Washington DC.

- US Dept. of Labor Decision Number SD100010, dated 8/30/13.

Supplemental Specification for Errata, dated 3/3/10.

Supplemental Specification to Standard Specifications for Roads and Bridges, dated 3/3/10.

Special Provision for Price Schedule for Miscellaneous Items, dated 9/26/13.

* * * *

**STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION
FOR
DURABLE PAVEMENT MARKINGS**

**PROJECT PH 000S(255), PCN 02B0
LINCOLN & UNION COUNTIES**

MAY 19, 2014

I. DESCRIPTION

Durable pavement markings, for the purpose of the special provision, include epoxy, methyl methacrylate, and polyurea. Water base paint will not be considered a durable marking product.

This work shall consist of furnishing and applying durable pavement markings in accordance with the plans, this provision, and as directed by the Engineer.

II. MATERIALS

The Contractor shall submit the type of material to be used at the preconstruction meeting prior to application of the durable pavement marking.

A. CERTIFICATIONS

The Contractor shall provide the Engineer with a copy of the manufacturer's product data sheet, component certification, and instructions for material application at least two weeks before application work begins. Whenever the manufacturer's recommendations are more stringent than these provisions, the manufacturer's recommendations shall apply. The Contractor shall provide the Engineer a copy of the certified batch test results, showing the product meets the following requirements, upon delivery of the product to the job site.

B. MATERIAL REQUIREMENTS

- 1. Marking Material:** The Contractor shall follow the manufacturer's mixing ratio. No solvents are to be given off to the environment upon application to a pavement surface. The components, when combined, shall not contain or produce volatile solvents. If type II epoxy pavement marking material is used, it shall be completely free of TMPTA (Tri-Methyl Propane Tri-Acrylate) and other multi-functional monomers. All materials shall be

free of lead, cadmium, mercury, hexavalent chromium, and other toxic heavy metals as defined by the United States Environmental Protection Agency.

a. Color: The pavement marking colors shall meet the following:

White: The color shall be within the Chromaticity coordinates listed in Tables 1 & 2 when tested in accordance with ASTM E-1347 or ASTM E-1349

Yellow: The color shall match Federal Test Standard Number 595a, Color 13538 or shall be within the Chromaticity coordinates listed in Tables 1 & 2 when tested in accordance with ASTM E-1347 or ASTM E-1349.

TABLE 1

Color	Chromaticity coordinates (corner points)								Y values %			
									With Glass Beads		Without Glass Beads	
	x	Y	x	y	x	y	x	y	Min	Max	Min	Max
White	.355	.355	.305	.305	.285	.325	.335	.375	60	--	70	--
Yellow	.560	.440	.490	.510	.420	.440	.460	.400	30	--	35	--

TABLE 1 - Daytime Color Specification Limits for Pavement Markings Material with CIE 2° Standard Observer and 45/0 (0/45) Geometry and CIE D65 Standard Illuminant

TABLE 2

Color	Chromaticity coordinates (corner points)							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White	.480	.410	.430	.380	.405	.405	.455	.435
Yellow	.575	.425	.508	.415	.473	.453	.510	.490

TABLE 2 - Nighttime Color Specification Limits for Pavement Marking Retroreflective Material with CIE 2° Standard Observer and Observation Angle = 1.05°, Entrance Angle = 88.76° (beta angle 2 and epsilon = 0°) and CIE Standard Illuminant A

b. Hardness: The type D durometer hardness of the material shall not be less than 75 when tested in accordance with ASTM D 2240 after the material has cured for 72 hours at 73°F ± 5°F (23°C ± 2°C).

- c. **Adhesion Capabilities:** When tested in accordance with the American Concrete Institute Committee 503 testing procedure, the adhesion must be a minimum of 250 psi, or the failure of the system must take place in the substrate. The prepared specimens shall be allowed to cure for 72 hours at 73°F ± 5°F (23°C ± 2°C).
- d. **Weather Resistance:** Apply the mixed epoxy, both white and yellow, at 15 mils ± 1 mil thick to 3-inch x 6-inch (75 mm x 150 mm) aluminum panels. Do not apply beads to the epoxy sample. Expose the cured sample in an Environmental Test Chamber meeting the requirements of ASTM G 154. Conduct the test for 80 hours at 122°F (50°C), alternating four-hour cycles of condensation and ultraviolet light. At the end of the exposure period, the material shall show no substantial change in color or gloss.
- e. **Abrasion Resistance:** When the abrasion resistance of the material is tested in accordance with ASTM D4060 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82 (The wear index is the weight in milligrams that is abraded from the sample under the test conditions).
- f. **Chemical Resistance:** Cured markings shall be resistant to calcium chloride, sodium chloride, fuels, and oils.
- g. **Reflective Elements or Glass Beads:** Reflective elements or glass beads as recommended by the durable pavement marking manufacturer shall be used for all durable pavement markings on this project. Glass beads, when used, shall meet the following gradation requirements when tested according to ASTM D 1214:

Percent passing a No. 16 (1.18 mm) sieve	95-100
Percent passing a No. 20 (850 µm) sieve	90-100
Percent passing a No. 30 (600 µm) sieve	70-95
Percent passing a No. 50 (300 µm) sieve	10-35
Percent passing a No. 100 (150 µm) sieve	0-5

Glass beads shall have a minimum of 80% true spheres. Roundness shall be tested in accordance with SD 510.

- 2. **Epoxy Materials:** The following requirements, in addition to those specified in Part II.B.1, shall also apply when the Contractor elects to use epoxy pavement markings.
 - a. **Classification:** This specification provides for the classification of epoxy pavement marking systems by type.

Type I - A fast cure material suitable for line applications and, under ideal conditions, may not require coning.

Type II - A slow cure material suitable for all applications of pavement markings performed under controlled traffic conditions requiring coning and may require flagging as directed by the Engineer.

Type II epoxy material shall be used for epoxy pavement markings except as specified otherwise in the plans.

- b. Composition:** Furnish a two component 100 percent solids epoxy material containing no fillers or pigment extenders. Follow the manufacturer's mixing ratio when mixing the two components. Mix the components within plus or minus two and one half percent of the manufacturer's recommended mix ratio.
- c. Pigment and Epoxy Resin:** The pigment and resin component shall meet the following percentages by weight:

<u>Pigment</u>	<u>White</u>	<u>Yellow</u>
TiO ₂ , meeting ASTM D476	18-25	12-17
Organic Yellow		7-9
<u>Epoxy Resin</u>	75-82	74-82

Test the epoxy content of the epoxy resin in accordance with ASTM D 1652 and calculate as the Weight per Epoxy Equivalent (WPE) for both white and yellow. Determine the epoxy content on a pigment free basis. The accepted epoxy content range (WPE) is ± 50 of the manufacturer's target value.

Ensure the activator/curing agent meets the following requirements:

Test the amine value in accordance with ASTM D 2074. Ensure the total amine value meets the manufacturer's target value with the acceptance range being ± 50 of the target value.

- d. Tensile Strength:** The tensile strength of the epoxy paint material, when tested in accordance with ASTM D 638, shall not be less than 6,000 psi after 72 hours cure at 73°F \pm 5°F (23°C \pm 2°C).

3. Polyurea Materials: The following requirements, in addition to those specified in Part II.B.1, shall also apply when the Contractor elects to use polyurea pavement markings.

a. Composition: The polyurea pavement marking material shall consist of 100 percent solid two part system formulated and designed to provide a simple volumetric mixing ratio of two components (part A and part B). No volatile or polluting solvents or fillers will be allowed.

Upon heating to application temperature, the material shall not exude fumes which are toxic or injurious to persons or property.

b. Pigment: White polyurea coating materials shall contain not less than 13% by weight rutile titanium dioxide (TiO₂), meeting ASTM D476. Yellow pigments shall be an organic yellow and contain no heavy metals.

4. Methyl Methacrylate Materials: The following requirements, in addition to those specified in Part II.B.1, shall also apply when the Contractor elects to use methyl methacrylate pavement markings.

a. Composition: The system shall be a two component, liquid applied methyl methacrylate compound capable of full cure without external heat sources. Part A shall consist of a 100 percent reactive and solvent free methacrylate resin. Part B shall consist of benzyl peroxide liquid plasticizer.

b. Tensile Strength: The tensile strength of the methyl methacrylate paint material, when tested in accordance with ASTM D 638, shall not be less than 125 psi at break.

c. Pigment: White and yellow methyl methacrylate coating materials shall contain not less than 6% by weight rutile titanium dioxide (TiO₂) meeting ASTM D476. Organic yellow shall contain pigment sufficient to meet the color standard.

III. CONSTRUCTION REQUIREMENTS

A. Equipment for durable pavement marking: Equipment furnished shall be designed to apply the type of durable pavement marking material selected including reflecting elements or glass beads. The equipment shall be capable of applying marking materials in a solid and/or intermittent line pattern, according to the details in the plans. The equipment shall be capable of placing stripes on the left and right sides. The left carriage shall be capable of placing three lines simultaneously with each line in a solid or intermittent pattern in yellow or white. The equipment shall be capable of accumulating the footage of paint applied per gun, individually, each day. Only material

application shall activate the footage accumulators. The readout shall be digital and not adjustable. The equipment shall accurately meter the two or more component materials. The equipment shall produce and maintain the mixing head temperature, meeting the manufacturer's specifications.

The equipment shall be capable of applying reflective elements or glass beads in a pressurized system, synchronized with the spray guns. All guns on the spray carriages shall be in full view of the operator(s) during operation.

The equipment in the striping train shall have permanently mounted Type C flashing arrow boards as specified in the Manual on Uniform Traffic Control Devices (MUTCD). All traffic control items that are mounted on the equipment shall be incidental to the other contract items. No separate payment will be made.

B. Seasonal Limitations: Pavement markings shall only be placed between May 1 and October 15 (inclusive) or as recommended by the manufacturer.

C. Application: Pavement markings shall be placed in accordance with the details shown in the plans. Markings shall not be applied over a longitudinal joint. Markings shall not be applied when the wind or other conditions cause a film of dust to be deposited on the pavement surface before the material can be applied.

The Contractor shall place necessary control points for striping and to indicate necessary starting and cutoff points.

The Contractor shall use a vacuum truck to clean the pavement in the pavement marking areas unless otherwise specified in the plans. The Contractor shall ensure a clean, dry pavement surface free of deleterious material. Cost for this work shall be incidental to the contract unit price for durable pavement marking.

The final location of the pavement marking shall be placed in the area of road way surface as prepared as per Section III.B above.

The material application shall be immediately preceded by a minimum of 80 psi air blast. Placement of marking materials shall be only on clean, dry pavement with air and pavement temperatures at least 50°F (10°C) and rising and within the seasonal limitation dates listed above.

The Contractor shall apply the durable pavement markings prior to the section being opened to traffic. If weather conditions or seasonal limits prevent placement of durable pavement markings, temporary pavement markings shall be applied before the section is opened to traffic and then removed prior to durable pavement marking application at no additional cost to the Department.

Edge marking and lane lines on divided roadways shall be applied in the direction of travel.

Tracking of applied pavement marking will not be allowed. The Contractor shall adjust the pavement marking operation to prevent tracking. The “no-tracking” shall be determined by passing over the line with a passenger car or pickup truck at a speed of 25 to 35 mph (40 to 55 kmph) in a simulated passing maneuver. A line showing no visual deposition of the material to the pavement surface when viewed from a distance of 50-feet (15m) shall be considered as showing “no-tracking” and conforming to the requirement for “no-track”.

All material heated over the manufacturer’s upper limit on temperature shall be discarded.

D. Durable Pavement Marking Application Rates & Thickness:

The pavement marking shall be applied at the rate and thickness as recommended by the manufacturer. Pavement markings applied at a wet thickness less than 20 mils will not be accepted.

E. Reflective Elements or Glass Beads: Reflective elements or glass beads shall be applied at a rate necessary for meeting minimum levels of retroreflectivity.

For sprayable markings, reflective elements or glass beads shall be applied immediately after the placement of the marking.

F. Application Tolerances:

- The length of the stripe shall not vary more than plus or minus 3 inches (75 mm) from the plans requirement.
- The minimum width of the stripe shall be its nominal width as required in the plans with 1/2” (12 mm) greater than nominal width allowed provided the variation is gradual and does not detract from the general appearance.
- The stripe shall have the same general appearance and width in both daytime and nighttime conditions (no shadowing or shading).
- The length of a 40-foot (12-meter) cycle length (stripe and gap) shall not vary more than 3 inches (75 mm).
- The alignment from the plans requirement or existing markings shall not vary more than plus or minus 1 inch (25 mm) in 200 feet (61 meters).
- The maximum longitudinal deviation from the existing markings at the beginning of the painted roadway segment shall not vary more than plus or minus 6 inches (150 mm).

- Placement of cycle shall coincide with the existing markings at each end of the project limits.

Any markings that are outside of these tolerances will be removed and replaced by the Contractor at no cost to the Department. Removal shall be performed utilizing equipment that is not detrimental to the final surface, as required by the Engineer. Establishment of application tolerances shall not relieve the Contractor of the responsibility to comply as closely as practicable with plan dimensions.

G. Retroreflectivity Testing General: If replacement of markings can not be applied within the same year, the contractor shall schedule subject work to be completed no later than June 15th in the following year. Upon replacement, the retroreflectivity testing process will be done again requiring new readings.

H. Retroreflectivity Requirements: The pavement markings shall meet the following minimum retroreflectivity requirements.

Initial Readings (within 3 - 30 days of the line application):

Pavement Marking Color	Minimum Value
White	331 mcd/m ² /lux
Yellow	206 mcd/m ² /lux

I. Non-conformance: All pavement markings not conforming to the requirements of the contract will be considered under the provisions of Section 5.3 and may be required to be removed. Additional retroreflectivity readings will be taken by the Department to determine the limits of removal. The removal shall be accomplished using suitable sand blasting or grinding equipment unless the Engineer authorizes other means. The removal process shall remove at least 90% of the deficient line, with no excessive scarring of the existing pavement. The removal width shall be one inch wider all around the nominal width of the pavement marking to be removed. Removal and replacement of the pavement markings shall be at Contractor's expense, with no cost incurred by the State.

IV. METHOD OF MEASUREMENT

A. Durable Pavement Marking: Durable pavement markings, of the width and color specified, will be measured to the nearest foot (0.1 meter).

B. Durable Pavement Marking, Arrow: Durable pavement marking arrows will be measure by count of each type specified.

C. Durable Pavement Marking, Area: Durable pavement marking areas will be measured to the nearest square foot (0.1 square meters).

V. BASIS OF PAYMENT

- A. Durable Pavement Marking:** Cost for durable pavement marking will be paid at the contract unit price per foot (0.1 meter) for Durable Pavement Marking. Payment will be full compensation for all items necessary to complete the work including, but not limited to, all traffic control as required.
- B. Durable Pavement Marking, Arrow:** Durable pavement marking arrows of the type specified will be paid for at the contract unit price per each. Payment will be full compensation for all items necessary to complete the work including, but not limited to, all traffic control as required.
- C. Durable Pavement Marking, Area:** Durable pavement marking areas will be paid for at the contract unit price per square foot (0.1 square meters). Payment will be full compensation for all items necessary to complete the work including, but not limited to, all traffic control as required.

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STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	PH 000S(255)	1	9

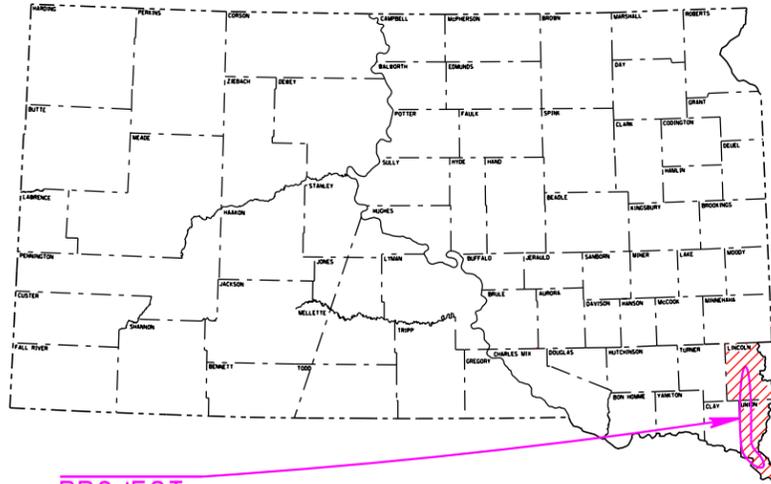
Plotting Date: 05/19/2014 Revised 5/19/14 GB

PLANS FOR PROPOSED
PROJECT PH 000S(255)
INTERSTATE 29
LINCOLN and UNION COUNTIES

INDEX OF SHEETS

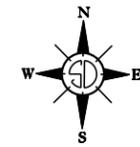
Sheet 1	Title Sheet
Sheet 2	Estimate of Quantities and typical pavement marking layout
Sheet 3 and 4	Notes
Sheet 5	Itemized List for Traffic Control
Sheet 6	Ramp Pavement Marking Layout
Sheet 7 and 8	Standard Plates
Sheet 9	Mobile Operations Layout

PLOT SCALE - 1:200



PROJECT

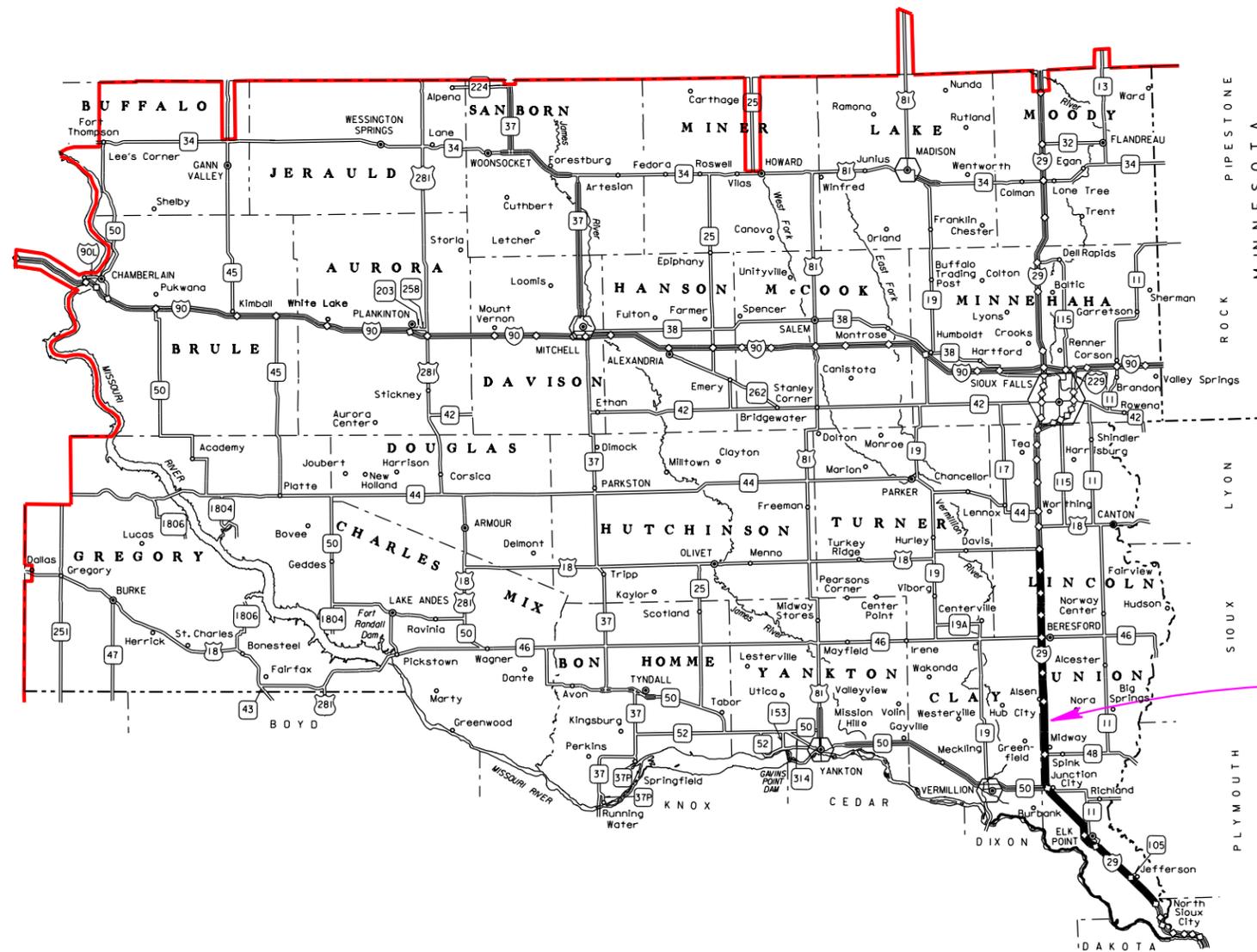
DURABLE PAVEMENT MARKING
PCN 02B0



ADT's
I-29N (MRM 5.0 - 59.0) - 6,354
I-29S (MRM 5.0 - 59.0) - 6,355

STORM WATER PERMIT
(None Required)

I-29 (MRM 5.0 - 59.0)
I-29 SB GROSS LENGTH 285120.0 FEET
I-29 NB GROSS LENGTH 285120.0 FEET
TOTAL NET LENGTH 570240.0 FEET



I-29
BEGIN MRM 5.0
END MRM 59.0

PLOTTED FROM - TRM111111

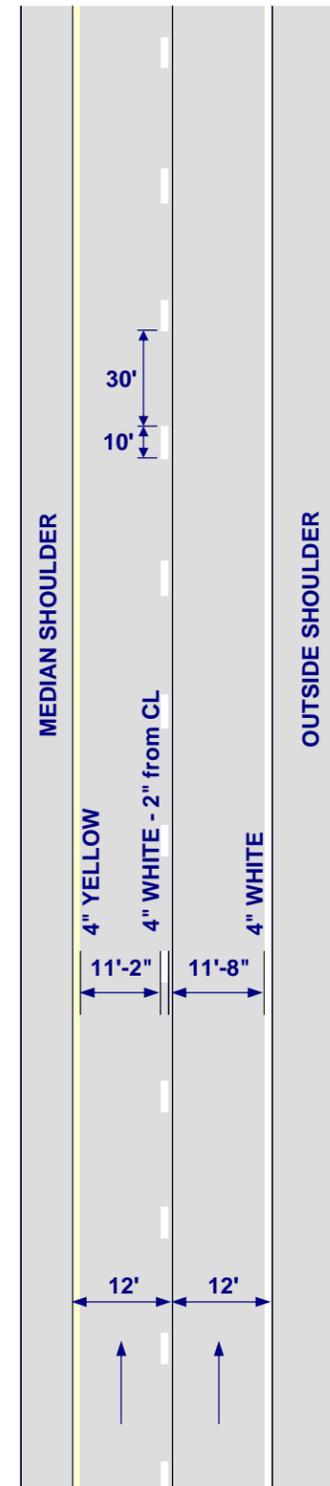
PLOT NAME - 1

FILE - ... \REGION\IDE2014\TITLE.DGN

ESTIMATE OF QUANTITIES

Bid Item Number	Item	Quantity	Unit
009E0010	Mobilization	Lump Sum	LS
633E3000	Durable Pavement Marking, 4" White	712,800	Ft
633E3005	Durable Pavement Marking, 4" Yellow	570,240	Ft
633E3020	Durable Pavement Marking, 12" White	18,943	Ft
633E5050	Surface Preparation for Pavement Marking	1,339,869	Ft
633E9200	Mobile Retroreflector Measurements	64,800	Mile
634E0010	Flagging	160	Hour
634E0100	Traffic Control	1,140	Unit
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
634E0420	Type C Advance Warning Arrow Panel	2	Each

**DIVIDED ROADWAY
(ONE DIRECTION SHOWN)**



PAVEMENT MARKING

Typical pavement marking as shown on this sheet shall be applied throughout the entire length of divided roadway.

Traffic Control shall be incidental to the cost of application. The striper and advance or trailing warning vehicle shall be equipped with flashing amber lights and advance warning arrow panel.

NOTE: All pavement marking dimensions are based on 12' driving lanes.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	PH 000S(255)	3	9

Revised 5/19/14 GB

SPECIFICATIONS

South Dakota Department of Transportation Standard Specifications for Roads and Bridges, 2004 Edition, Required Provisions, Supplemental Specifications and/or Special Provisions as included in the Proposal.

WORK DESCRIPTION

I-29 Lincoln and Union Counties (MRM 5.0 to 59.0). Work shall include pavement marking removal, surface prep and applying durable pavement marking on edgelines, mainline skip lines, skip lines across ramps and gore markings on both mainline and ramps.

All work shall be completed prior to taking retroreflectivity readings.

SURFACE PREPARATION

The durable markings to be provided and installed shall have the existing groove prepared.

The preparation shall result with the existing pavement marking being removed, adequately scuffed, or abraded to allow proper adhesion of the new durable pavement marking as per manufacturer's recommendations to comply with product warranties. Any remaining glass beads in the existing marking shall be adequately broken and flattened to allow proper adhesion of the new durable pavement marking.

The depth of preparation shall be adequate to inlay the durable marking below the pavement surface equivalent to the sum of the pavement marking thickness (including reflective media) +15 mils ± 5 mils clear coat.

All costs associated with preparation of the existing groove shall be incidental to the contract unit price per foot for Surface Preparation for Pavement Marking. Surface preparation shall be measured as 4" equivalent.

GENERAL MAINTENANCE OF TRAFFIC

If Contractor elects to use lane closures, the lane closures shall be installed as per standard plate 634.63. Interstate lane closures shall be manned. No un-manned lane closure shall be left in place.

A minimum of a mobile work operation may be used on interstates with an average daily traffic less than 13,000 vehicles per day. The Contractor may use lane closures to complete the work should conditions dictate.

Vehicles used for mobile work operations should be equipped with highly visible devices on the equipment such as high-intensity rotating, flashing, oscillating, or strobe lights. All other equipment shall display high-intensity rotating, flashing, oscillating, or strobe lights visible to traffic in all directions. The use of shadow vehicles, truck mounted attenuators, truck mounted signs and arrow panels is encouraged.

Where practical and when needed, the work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.

During surface preparation or pavement marking operations the Contractor may close a lane of traffic on an interstate for no more than 3 miles.

Removing, relocating, covering, salvaging and resetting of existing traffic control devices, including delineation, shall be the responsibility of the Contractor. Cost for this work shall be incidental to the contract unit prices for the various items unless otherwise specified in the plans. Any delineators and signs damaged or lost shall be replaced by the Contractor at no cost to the State.

GENERAL MAINTENANCE OF TRAFFIC (CONTINUED)

Storage of vehicles and equipment shall be outside the clear zone and as near as possible to the right-of-way line. Contractor's employees should mobilize at a location off the right-of-way and arrive at the work sites in a minimum number of vehicles necessary to perform the work.

Indiscriminate driving and parking of vehicles within the right-of-way will not be permitted. Any damage to the vegetation, surfacing, embankment, delineators and existing signs resulting from such indiscriminate use shall be repaired and/or restored by the Contractor, at no expense to the State, and to the satisfaction of the Engineer.

The Contractor shall provide documentation that all breakaway sign supports comply with FHWA NCHRP 350 or MASH crash-worthy requirements. The Contractor shall provide installation details at the preconstruction meeting for all breakaway sign support assemblies.

Sufficient quantities and units for Traffic Control have been included to sign for two lane closures on a multi-lane highway. If the Contractor elects to use additional traffic control, the cost for additional traffic control devices or equipment shall be incidental to the contract unit price per Unit for Traffic Control.

Cost of equipment and traffic control devices on equipment for a mobile work operation, including arrow panels and signs, shall be incidental to the contract lump sum price for Traffic Control, Miscellaneous.

COORDINATION OF PROJECTS

Project IM-NH-P 0023(39) PCN 046F, Shoulder chip seal on I-29 MRM 4.813 to 47.748 will be completed by another Contractor in 2014. Contact Ron Peterson (605-668-2929) The Yankton Area Engineer for completion date.

The durable pavement markings shall be installed on the roadway after completion of the work on IM-NH-P 0023(39) PCN 046F.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	PH 000S(255)	4	9

Revised 5/19/14 GB

MOBILE RETROREFLECTIVITY MEASUREMENTS

All retroreflectivity measurements on Interstate 29 will be taken by an Independent Consultant hired by the Contractor. A retroreflectivity report of the measurements from the Independent Consultant shall be provided to the Engineer.

The Independent Consultant shall take measurements using a vehicle-mounted mobile retroreflectometer. The mobile retroreflectometer shall utilize 30 meter CEN geometry in accordance with ASTM E 1710 (Standard Test Method for Measurement of Retroreflective Pavement Markings Materials with CEN- Prescribed Geometry Reflectometers).

The retroreflectometer shall be calibrated no less than twice a day in accordance with the operating manual and calibration guide for the particular machine and vehicle.

Measurement shall consist of the average retroreflective readings and standard deviations for pavement marking placed under this Contract. Retroreflectivity measurements shall be taken on each edgeline, mainline and ramp gore marking, and skip centerline marking. Measure each line type separately. Measurement units shall be mcd/m²/lux. Retroreflectivity shall be measured by taking a minimum 40 retroreflectivity readings within 528' (1/10 mile) on solid lines and a minimum 20 retroreflectivity readings within 528' (1/10 mile) on skip lines. Gore markings shall have a minimum of two retroreflectivity readings taken on each marking. The average retroreflectivity readings for each individual 4" wide line shall be obtained at 528' (1/10 mile) intervals.

Payment will be made for the actual length of retroreflectivity measured. This is based on one laser instrument on one van that reads one line with each pass. Three passes are required for each mile of two-lane interstate in one direction; LEL – Left Edgeline, REL – Right Edgeline and all gore markings along right edgeline, CL- Centerline. One additional pass per the length of the gore marking on the left side of the ramp will be required.

Measurements shall be obtained no sooner than 3 days and no later than 30 days after the completion of all the line applications required for an individual highway route. Excess beads or reflective elements must not be visible when the retroreflectivity testing is conducted.

Measurements shall be collected when pavement and markings are dry, clean and no visible moisture is on the road surface. These criteria define initial pavement marking retroreflectivity values. Markings shall be measured in the direction of intended vehicular travel. The Independent Consultant should expect to retest failed segments after the markings have been replaced at no additional cost to the State.

The averaged 528' (1/10 mile) retroreflectivity reading shall meet the requirements for retroreflectivity as specified in the Special Provision for Durable Markings. Any retroreflectivity readings not meeting the Special Provision shall be considered failed. Failed markings will be removed and remarked by the Contractor in 528' lengths.

The Contractor shall mark the begin and end of the length of line to be removed and remarked that is represented by the failed 528' (1/10 mile) averaged reading.

RETROREFLECTIVITY MEASUREMENTS (CONTINUED)

The measurement report will be in the form of an electronic database file, or delimited text file, and contain all raw data collected. The electronic file must also contain a summary of findings. The retroreflectivity report, including the summary and a copy of the electronic file with all data, shall be provided to the Engineer. The measurement report will include:

- State Project number
- Trunk Highway number
- Date the measurements were taken
- Geographical location the measurements were taken including a distance from the nearest permanent site identification, such as a mile reference marker. The beginning and ending reference points of data collection rounded to the nearest thousandths of a mile and the beginning and ending coordinates determined by a Global Positioning System receiver with 3 meter accuracy, including the direction of travel in terms of increasing or decreasing reference points
- Identification of the pavement marking material including line type, color, age, and transverse location on the road. Identification of the marking to be included in the format; (LEL – Left Edgeline, REL – Right Edgeline, CL – Centerline, LL – Lane Line Skip, 1LL – left most LL in multilane, 2LL – second to left most LL in multilane, etc)
- Identification of the retroreflectometer
- A summary of the average retroreflective readings for each continuous length of 0.1 mile measured
- A separate summary of the gore marking retroreflectivity readings

Should another mobile unit be available, the maximum acceptable deviation for measurements made by the two different instruments of the same manufacturer and for the same roadway length shall be ± 10%.

Repeatability for the given mobile unit shall be ± 6%.

The locations of the measurements shall be randomly selected.

No final payment for pavement markings shall be made until the retroreflectivity measurements are taken and the retroreflectivity report is provided to the Engineer.

Cost for all mobile retroreflectivity measurements, reports, marking of failed lengths, equipment, materials and labor shall be included in the price bid per Mile for Mobile Retroreflectivity Measurements.

QUALITY ASSURANCE

A concrete pavement test deck site will be agreed upon. A 500' white and a 500' yellow stripe shall be marked by the Contractor on the test deck site. The Department and the Independent Consultant will conduct joint evaluations of both yellow and white longitudinal markings within the test site using the Department's handheld retroreflectometer and the Independent Consultant's mobile retroreflectometer. Five readings will be taken on the white marking and five readings will be taken on the yellow marking. The evaluation will be deemed successful if the mean average obtained by the Independent Consultant's mobile retroreflectometer differs by less than 10% to the mean average obtained by the Department's handheld retroreflectometer for each color.

Cost for Quality Assurance shall be included in the price bid per Mile for Mobile Retroreflectivity Measurements.