

August 30, 2024

ADDENDUM NO. 1

RE: Item #4, September 4, 2024 Letting - IM 0293(113)78, PCN 065E, Minnehaha County - LSDC Overlay, Approach Slabs, Approach Pavement, Approach Guardrail, Steel Piling Repair

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: Please remove the Index of Special Provisions and replace with attached Index of Special Provisions revised 8/30/24. "Special Provision for Durable Pavement Markings" dated 8/30/24 was added.

Please add the Special Provision for Durable Pavement Markings" dated 6/15/05 after the "Special Provision for Contract Time", dated 8/6/24.

SDEBS BID PROPOSAL: *The electronic bid proposal for this contract has been revised to include the changes associated with this addendum. Bidders must log in to the SDEBS to retrieve and incorporate these changes into their bid.*

Bid Items were added:

Bid Item 633E3000 "Durable Pavement Marking, 4" White"
Bid Item 633E3005 "Durable Pavement Marking, 4" Yellow"
Bid Item 633E5100 "Grooving for Durable Pavement Marking, 4"

Quantities for Bid Items were changed:

Bid Item 634E0110 "Traffic Control Signs" changed from 1,638.6 to 1,648.6 SqFt
Bid Item 634E0700 "Traffic Control Movable Concrete Barrier" changed from 180 to 133 Each
Bid Item 634E0705 "Remove and Reset Traffic Control Movable Concrete Barrier" changed from 90 to 133 Each

PLANS: Please destroy sheets 2, 14 & 19 and replace with the enclosed sheets, dated 8/29/24. Sheet 19A was added.

Sheet 2: Bid Items were added:

Bid Item 633E3000 "Durable Pavement Marking, 4" White"
Bid Item 633E3005 "Durable Pavement Marking, 4" Yellow"
Bid Item 633E5100 "Grooving for Durable Pavement Marking, 4"

Quantities for Bid Items were changed:

Bid Item 634E0110 "Traffic Control Signs" changed from 1,638.6 to 1,648.6 SqFt

Bid Item 634E0700 "Traffic Control Movable Concrete Barrier" changed
from 180 to 133 Each
Bid Item 634E0705 "Remove and Reset Traffic Control Movable Concrete Barrier"
changed from 90 to 133 Each

Sheet 14: RETROREFLECTIVITY FOR PAVEMENT MARKING PAINT note was added.

Sheet 19: ITEMIZED LIST FOR TRAFFIC CONTROL Northbound I29 was revised.

Sheet 19A: Sheet was added.

Sincerely,

Sam Weisgram
Engineering Supervisor

SW/cj

CC: Travis Dressen, Mitchell Region Engineer
Harry Johnston, Sioux Falls Area Engineer

REV 8/30/24

INDEX OF SPECIAL PROVISIONS

PROJECT NUMBER(S): IM 0293(113)78 PCN: 065E

TYPE OF WORK: LSDC OVERLAY, APPROACH SLABS, APPROACH PAVEMENT,
APPROACH GUARDRAIL, STEEL PILING REPAIR

COUNTY: MINNEHAHA

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.

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.

Sara Garbe is the official in charge of the Sioux Falls Career Center for Minnehaha County.

THE FOLLOWING ITEMS ARE INCLUDED IN THIS PROPOSAL FORM:

Special Provision for Contract Time, dated 8/6/24.

Special Provision for Durable Pavement Markings, dated 8/30/24.

Special Provision for Prosecution and Progress, dated 1/21/21.

**Special Provision Regarding Railroad Insurance Requirements
for Ellis & Eastern Company, dated 11/6/23.**

NOTE: The Contractor WILL NOT be granted permission to proceed with any work on Railroad Right-of-Way until he has been notified by the Railroad that the insurance has been approved and the insurances and certificates has been provided to the SDDOT area office.

**Special Provision Regarding Working on Railroad Property for Ellis &
Eastern Company, dated 11/6/23.**

Special Provision for Acknowledgment and Certification Regarding Article 3, Section 12 of the South Dakota Constitution, dated 8/24/23.

Special Provision for Buy America, dated 5/1/24.

Special Provision for Liability Insurance, dated 4/21/22.

Special Provision for Responsibility for Damage Claims, dated 4/21/22.

Special Provision for Restriction of Boycott of Israel, dated 1/31/20.

Special Provision for Contractor Administered Preconstruction Meeting, dated 12/18/19.

Fuel Adjustment Affidavit, DOT form 208 dated 7/15.

Standard Title VI Assurance, dated 3/1/16.

Special Provision For Disadvantaged Business Enterprise, dated 2/9/24.
Special Provision For EEO Affirmative Action Requirements on Federal and Federal-Aid Construction Contracts, dated 2/5/24.
Special Provision For Required Contract Provisions Federal-Aid Construction Contracts, Form FHWA 1273 (Rev. October 23, 2023), dated 10/18/23.
Required Contract Provisions Federal-Aid Construction Contracts, Form FHWA 1273 (Rev. 10/23/23).
Special Provision Regarding Minimum Wage on Federal-Aid Projects, dated 10/24/19. Wage and Hour Division US Department of Labor Washington DC. - US Dept. of Labor Decision Number SD20230032, dated 3/10/23.
Special Provision for Supplemental Specifications to 2015 Standard Specifications for Roads and Bridges, dated 9/7/22.
Special Provision for Price Schedule for Miscellaneous Items, dated 12/6/23.

Special Provision Regarding Storm Water Discharge, dated 5/8/18.
General Permit for Storm Water Discharges Associated with Construction Activities, dated 4/1/18
<https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/stormwater/StormWaterConstruction.aspx>

**STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION
FOR
DURABLE PAVEMENT MARKINGS**

**PROJECT IM 0293(113)78, PCN 065E
MINNEHAHA COUNTY**

AUGUST 30, 2024

I. DESCRIPTION

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

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

II. MATERIALS

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

A. CERTIFICATIONS

The Contractor will provide the Engineer with a copy of the manufacturer's product data sheet, component certification, and instructions for material application at least 14 calendar days before application work begins. Whenever the manufacturer's recommendations are more stringent than these provisions, the manufacturer's recommendations will apply. The Contractor will 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 will 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, will not contain or produce volatile solvents. If Type II epoxy pavement marking material is used, it will be completely free of TMPTA (Tri-Methyl Propane Tri-Acrylate)

and other multi-functional monomers. All materials will 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 will meet the following:

White: The color will be within the Chromaticity coordinates listed in Tables 1 & 2 when tested in accordance with ASTM E1347 or ASTM E1349

Yellow: The color will match Federal Test Standard Number 595a, Color 13538 or will be within the Chromaticity coordinates listed in Tables 1 & 2 when tested in accordance with ASTM E1347 or ASTM E1349.

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 will not be less than 75 when tested in accordance with ASTM D2240 after the material has cured for 72 hours at 73°F ± 5°F.

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 will be allowed to cure for 72 hours at 73°F ± 5°F.

- d. **Weather Resistance:** Apply the mixed epoxy, both white and yellow, at 15 mils ± 1 mil thick to 3 inch x 6 inch aluminum panels. Do not apply beads to the epoxy sample. Expose the cured sample in an Environmental Test Chamber meeting the requirements of ASTM G154. Conduct the test for 80 hours at 122°F, alternating four-hour cycles of condensation and ultraviolet light. At the end of the exposure period, the material will 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 will 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 will be resistant to calcium chloride, sodium chloride, fuels, and oils.
- g. **Reflective Elements and Glass Beads:** Bonded core reflective elements and glass beads will be used as recommended by the durable pavement marking manufacturer for all durable pavement markings on this project. Glass beads will meet the following gradation requirements when tested according to ASTM D1214:

Sieve Size	Percent Passing
#14	100
#18	65 - 80
#30	30 - 50
#50	0 - 5

Glass beads will have a minimum of 70% true spheres.

The glass spheres will be transparent, colorless, and free of milkiness, dark particles, carbon residues, and excessive air inclusions. All glass beads retained on the #18 sieve will be produced from virgin glass by direct melt methods.

The glass beads will be without floatation properties. The glass beads will have dual surface treatment consisting of a moisture resistant silicone treatment and a silane adherence surface treatment.

The bonded core reflective elements will contain either clear or yellow tinted microcrystalline ceramic beads bonded to the outer surface. The bonded core reflective elements will provide a 50/50 blend of dry to wet ratio of reflective element. All microcrystalline ceramic beads bonded to reflective elements will have a minimum index of refraction of 1.8 for dry retroreflectivity and 2.4 for wet retroreflectivity when tested using the liquid oil immersion method.

Reflective media will require a certificate of compliance for certification for each type, source, and lot. Acceptance sampling will not be required.

2. Epoxy Materials: The following requirements, in addition to those specified in Section II.B.1 of this special provision, will 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 will be used for epoxy pavement markings except as specified otherwise in the plans.

b. Composition: Furnish a two component 100% solids epoxy material containing no fillers or pigment extenders. Follow the manufacturer's mixing ratio when mixing the two components. Mix the components within $\pm 2.5\%$ of the manufacturer's recommended mix ratio.

c. Pigment and Epoxy Resin: The pigment and resin component will meet the following percentages by weight:

Material	White	Yellow
Pigment		
TiO ₂ , meeting ASTM D476	18 - 38	12 - 17
Organic Yellow		7 - 9
Epoxy Resin	75 - 82	74 - 82

Test the epoxy content of the epoxy resin in accordance with ASTM D1652 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 D2074. 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 D638, will not be less than 6,000 psi after 72 hours cure at 73°F ± 5°F.
- 3. **Polyurea Materials:** The following requirements, in addition to those specified in Section II.B.1 of this special provision, will also apply when the Contractor elects to use polyurea pavement markings.
 - a. **Composition:** The polyurea pavement marking material will consist of 100% 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 will not exude fumes which are toxic or injurious to persons or property.

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

III. CONSTRUCTION REQUIREMENTS

A. Equipment for Durable Pavement Marking: Equipment furnished will be designed to apply the type of durable pavement marking material selected including reflecting elements or glass beads. The equipment will be capable of applying marking materials in a solid and intermittent line pattern, according to the details in the plans. The equipment will be capable of placing lines on the left and right sides. The left carriage will be capable of placing three lines simultaneously with each line in a solid or intermittent pattern in yellow or white, with each gun applying 4 to 8 inches wide. The equipment will be capable of accumulating the footage of marking applied per gun, individually, each day. Only material application will activate the footage accumulators. The readout will be digital and not adjustable. The equipment will accurately meter the two or more component materials. The equipment will produce and maintain the mixing head temperature, meeting the manufacturer's specifications.

The equipment will be capable of applying reflective elements or glass beads in a pressurized system, synchronized with the spray guns, uniformly across the entire marking. All guns on the spray carriages will be in full view of the operator during operation.

The equipment in the striping train will be capable of displaying a left or right Type C sequential chevron. The Type C sequential chevrons will meet the current Manual on Uniform Traffic Control Devices (MUTCD) standard for minimum size, legible distance, number of elements, and other specifications.

All traffic control items mounted on the equipment will be incidental to the other contract items. No separate payment will be made.

B. Grooving for Durable Pavement Marking: When specified in the plans, the Contractor will groove the pavement prior to applying the durable pavement marking in accordance with the following.

Grooving for durable pavement markings will not be allowed on bridge decks. All pavement markings on bridge decks will be surface applied. Unless otherwise specified in the plans, the Contractor will groove the surface for pavement markings as specified below:

The grooving will be performed within the following specifications and tolerances:

Description	Specification	Tolerance
Depth of Groove	Marking Thickness* ¹ + 15 mils	+ 5 mils
Width of Groove	5 to 6 inches	± 1/8 inch
Length of Skip Lines* ²	10 foot 6 inches	± 3 inch
Tapers at ends of lines	6 to 9 inches	
Between Double Lines	4 inches	± 1/2 inch

*¹ Marking thickness will include the thickness of marking material and reflective media.

*² Additional length may be required as specified in the plans.

The equipment will be capable of:

- grooving the total width of the groove in one pass or uniform depths with multiple passes
- grooving without causing damage to the pavement joints or joint sealant material
- providing uniform alignment and depth
- moving continuously to permit a mobile traffic work operation

If damage to joints, joint sealant material, backer rod, etc. occurs, the grooving operation will be stopped and modifications will be made to the grooving operation to prevent further damage. The Contractor may be required to use specially prepared circular diamond blade cutting heads to prevent damage at the joints. Damage caused to joints, the joint sealant material, backer rod, etc will be repaired or replaced by the Contractor, as directed by the Engineer. No additional payment will be made for the repair work or any reapplication of the pavement marking in the area of the repair.

The Contractor will establish a positive means for the removal of grooving residue. Solid residue will be removed from the pavement surfaces before being blown by traffic action or wind. The Contractor will conduct this work to control and minimize airborne dust and similar debris that may become a hazard to motor vehicle operation or a nuisance to property owners. Residue

from wet grooving will not be permitted to flow across traffic lanes being used by public traffic or into gutter or drainage facilities. Residue, whether in solid or slurry form, will be disposed of in a manner that will prevent it from reaching any waterway in a concentrated state.

The bottom of the groove will be uniform and free of loose material. The groove will be flat and of uniform depth for the entire width of the groove.

- C. Surface Preparation for Pavement Marking:** When specified in the plans, the Contractor will prepare the pavement surface prior to applying the durable pavement marking in accordance with the following.

In areas where the existing groove meets the required depth and existing markings are still in place, the Contractor will clean the existing groove without adding additional depth beyond the required depth for the new pavement marking, including reflective media as noted in Section III.B of this special provision.

The cleaning will result in the existing pavement marking being adequately scuffed, abraded, and removed by light grinding or abrasive blasting or both to allow proper adhesion of the new durable pavement marking as per manufacturer's recommendations to comply with product warranties.

Existing grooves not meeting the required depth will be re-grooved in accordance with Section III.B of this special provision to the required depth for the new pavement marking, including reflective media.

- D. Seasonal Limitations:** Pavement markings will only be placed during conditions as per the manufacturer's recommendations.

- E. Application:** Pavement markings will be placed in accordance with the details shown in the plans. Markings will not be applied over a longitudinal joint. Markings will 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 will place necessary control points for striping and to indicate necessary starting and cutoff points.

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

The final location of the pavement marking will be placed in the area of road way surface as prepared as per Section III.B or III.C of this special provision.

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

The Contractor will 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 will 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 will be applied in the direction of travel.

Tracking of applied pavement marking will not be allowed. The Contractor will adjust the pavement marking operation to prevent tracking. The “no-tracking” will be determined by passing over the line with a passenger car or pickup truck at a speed of 25 to 35 mph 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 will be considered as showing “no-tracking” and conforming to the requirement for “no-track”.

During pavement marking operations on sections of roadway open to traffic, the Contractor will protect the markings from tracking.

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

F. Durable Pavement Marking Application Rates & Thickness: The pavement marking will 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.

G. Reflective Elements and Glass Beads: Reflective elements and glass beads will be applied at a rate necessary for meeting the minimum levels of retroreflectivity. Application of reflective elements and glass beads will be a double drop system. For application on epoxy pavement markings, the first drop will consist of a minimum of 4.2 lbs/gallon of reflective elements and the second drop will consist of a minimum of 16 lbs/gallon of glass beads. For application on polyurea pavement markings, the first drop will consist of a minimum of 4.2 lbs/gallon of reflective elements and the second drop will consist of a minimum of 7 lbs/gallon of glass beads.

Reflective elements and glass beads will be applied immediately after the placement of the marking.

H. Application Tolerances:

- The length of the stripe will not vary more than plus or minus 3 inches from the plans requirement.
- The minimum width of the stripe will be its nominal width as required in the plans with 1/2 inch greater than nominal width allowed provided the variation is gradual and does not detract from the general appearance.
- The stripe will have the same general appearance and width in both daytime and nighttime conditions (no shadowing or shading).
- The length of a 40 foot cycle length (stripe and gap) will not vary more than 3 inches.
- The alignment from the plans requirement or existing markings will not vary more than plus or minus 1 inch in 200 feet.
- The maximum longitudinal deviation from the existing markings at the beginning of the painted roadway segment will not vary more than plus or minus 6 inches.
- Placement of cycle will 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 will be performed utilizing equipment that is not detrimental to the final surface, as required by the Engineer. Establishment of application tolerances will not relieve the Contractor of the responsibility to comply as closely as practicable with plan dimensions.

- I. **Retroreflectivity Testing General:** The Department will take retroreflectivity readings on the pavement marking lines no sooner than 3 calendar days and no later than 30 calendar days after the completion of all line applications required for an individual highway route using a portable retroreflectometer conforming to 30 meter geometry. Retroreflectivity readings will be taken on a test location with cleaning being limited to light hand brooming.

If replacement of markings cannot be applied within the same year, the contractor will 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.

The Department will randomly select one test location per mile of each edgeline and one test location per mile of centerline (solid and/or skip line will be considered as one centerline). The Department will randomly select one test location on each ramp edgeline and one test location on each ramp gore area. Three retroreflectivity readings will be taken at each test location. The three readings will be averaged and become the reading for that test location.

J. Retroreflectivity Testing Divided Four Lane Two Way Roadways: Each edge line and lane line will be tested. Three readings will be taken at each test location on each edge line and lane line in the direction of travel and will become the test reading for that test location.

K. Retroreflectivity Testing Undivided Two and Four Lane Two Way Roadways with Center Turn Lane: Each edge line and lane line will be tested. Three readings will be taken at each test location on each line in the direction of travel and will become the test reading for that test location.

Each combination solid yellow/skip yellow lines for the turn lane will be tested. Three readings will be taken at each location on each line in one direction, the reflectometer will be turned 180 degrees and three more readings on each line will be taken. The six readings for the centerline(s) will be averaged and become the test reading for that test location. If the random location does not fall on a line, the marking(s) closest to the random location will be tested.

L. Retroreflectivity Testing Two Lane Two Way Roadways: Each edge line and centerline(s) will be tested. Three readings will be taken at each test location on the edge lines in the direction of travel. Three readings will be taken on centerline in one direction, the reflectometer will be turned 180 degrees and three more readings will be taken. The six readings for the centerline(s) will be averaged and become the test reading for that test location. If the random location for the centerline(s) does not fall on a line, the marking(s) closest to the random location will be tested.

M. Retroreflectivity Testing Interstate Interchange Off and On Ramps: Each edge line will be tested. Three readings will be taken at each test location on the edge line in the direction of travel, the three readings averaged and the result will become the test reading for that test location.

N. Retroreflectivity Testing Interstate Interchange Off and On Ramp Gore Areas: The 12 inch edge line on mainline interstate and the 12 inch edge line on the ramp that, in combination, form a “V” at an interstate gore area will be tested. Three readings will be taken at each test location on the edge line in the direction of travel, the three readings averaged and the result will become the test reading for that test location.

O. Retroreflectivity Requirements: The pavement markings will meet the following minimum retroreflectivity requirements.

Pavement Marking Color	Minimum Value
White	275 mcd/m ² /lux
Yellow	170 mcd/m ² /lux

P. 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 will be accomplished using suitable sand blasting or grinding equipment unless the Engineer authorizes other means. The removal process will remove at least 90% of the deficient line, with no excessive scarring of the existing pavement. The removal width will be one inch wider all around the nominal width of the pavement marking to be removed. Removal and replacement of the pavement markings will be at Contractor's expense, with no cost incurred by the Department.

IV. METHOD OF MEASUREMENT

- A. Grooving for Durable Pavement Marking:** Grooving will be measured to the nearest foot, along the length of the groove for the width of the grooving specified.
- B. Grooving for Durable Pavement Marking Arrow:** Grooving for durable pavement marking arrow will be measured by the count of each arrow type specified.
- C. Grooving for Durable Pavement Marking Area:** Grooving for durable pavement marking area will be measured to the nearest square foot.
- D. Surface Preparation for Pavement Marking:** Surface preparation for pavement marking will be measured to the nearest foot, square foot, or each as required by the respective contract item.
- E. Durable Pavement Marking:** Durable pavement markings, of the width and color specified, will be measured to the nearest foot.
- F. Durable Pavement Marking Arrow:** Durable pavement marking arrows will be measure by count of each type specified.
- G. Durable Pavement Marking Area:** Durable pavement marking areas will be measured to the nearest square foot.

V. BASIS OF PAYMENT

- A. Grooving for Durable Pavement Marking:** Grooving for durable pavement marking will be paid at the contract unit price per foot for the width of groove specified. Payment will be full compensation for equipment, labor, materials, and all incidentals required.

- B. Grooving for Durable Pavement Marking Arrow:** Grooving for durable pavement marking arrow will be paid for at the contract unit price per arrow type specified. Payment will be full compensation for equipment, labor, materials, and all incidentals required.
- C. Grooving for Durable Pavement Marking Area:** Grooving for durable pavement marking area will be paid for at the contract unit price per each square foot. Payment will be full compensation for equipment, labor, materials, and all incidentals required.
- D. Surface Preparation for Pavement Marking:** Surface preparation for pavement marking will be at the contract unit price per foot, square foot, or each as required by the respective contract item. Payment will be full compensation for equipment, labor, materials, and all incidentals required.
- E. Durable Pavement Marking:** Cost for durable pavement marking will be paid at the contract unit price per foot 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, equipment, labor, materials, and all incidentals required.
- F. 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, equipment, labor, materials, and all incidentals required.
- G. Durable Pavement Marking Area:** Durable pavement marking areas will be paid for at the contract unit price per square foot. Payment will be full compensation for all items necessary to complete the work including, but not limited to, all traffic control, equipment, labor, materials, and all incidentals required.

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ESTIMATE OF QUANTITIES

STATE OF SOUTH DAKOTA	PROJECT IM 0293(113)78	SHEET 2	TOTAL SHEETS 260
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8/29/2024 GAW

Str. No. 50-176-219

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E0010	Mobilization	Lump Sum	LS
009E4200	Construction Schedule, Category II	Lump Sum	LS
110E0400	Remove Drop Inlet	16	Each
110E0420	Remove Drop Inlet Frame and Grate Assembly	4	Each
110E0500	Remove Pipe Culvert	44	Ft
110E0700	Remove 3 Cable Guardrail	3,397	Ft
110E0730	Remove Beam Guardrail	812.5	Ft
110E0740	Remove 3 Cable Guardrail Anchor Assembly	19	Each
110E0745	Remove 3 Cable Guardrail Slip Base Anchor Assembly	5	Each
110E0770	Remove W Beam Guardrail Breakaway Cable Terminal	9	Each
110E1010	Remove Asphalt Concrete Pavement	3,104.0	SqYd
110E1100	Remove Concrete Pavement	8,598.0	SqYd
120E0010	Unclassified Excavation	155	CuYd
120E0600	Contractor Furnished Borrow	200	CuYd
260E1010	Base Course	155.0	Ton
320E1200	Asphalt Concrete Composite	545.0	Ton
332E0010	Cold Milling Asphalt Concrete	520	SqYd
380E0050	8" Nonreinforced PCC Pavement	1,716.0	SqYd
380E0100	10.5" Nonreinforced PCC Pavement	716.0	SqYd
380E0140	12.5" Nonreinforced PCC Pavement	6,245.0	SqYd
380E6000	Dowel Bar	2,776	Each
380E6110	Insert Steel Bar in PCC Pavement	541	Each
380E6300	Reseal PCC Pavement Joint - Silicone	120	Ft
380E6302	Reseal PCC Pavement Joint - Hot Pour	256	Ft
380E6510	Grinding PCC Pavement	285.0	SqYd
410E2600	Membrane Sealant Expansion Joint	832.0	Ft
450E4739	12" CMP 16 Gauge, Furnish	204	Ft
450E4740	12" CMP, Install	204	Ft
450E5000	12" CMP Elbow, Furnish	4	Each
450E5001	12" CMP Elbow, Install	4	Each
450E5100	CMP Tee, Furnish	2	Each
450E5101	CMP Tee, Install	2	Each
* 450E8900	Cleanout Pipe Culvert	14	Each
451E3112	12" Pipe Cap	8	Each
630E0010	Straight Class A Thrie Beam Guardrail with Wood Posts	25.0	Ft
630E0500	Type 1 MGS	3,087.5	Ft
630E1501	Type 1 Retrofit Guardrail Transition	5	Each
630E1510	Type 3 Guardrail Transition	5	Each
630E2001	Asymmetrical W Beam to Thrie Beam Guardrail Transition	2	Each
630E2017	MGS MASH Flared End Terminal	3	Each
630E2018	MGS MASH Tangent End Terminal	7	Each
630E2065	MGS Trailing End Terminal	2	Each
632E2220	Guardrail Delineator	92	Each

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
633E3000	Durable Pavement Marking, 4" White	7,000	Ft
633E3005	Durable Pavement Marking, 4" Yellow	8,740	Ft
633E5100	Grooving for Durable Pavement Marking, 4"	12,352	Ft
634E0010	Flagging	40.0	Hour
634E0110	Traffic Control Signs	1,648.6	SqFt
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
634E0275	Type 3 Barricade	22	Each
634E0330	Temporary Raised Pavement Markers	61,425	Ft
634E0380	Tubular Marker	655	Each
634E0390	Replace Tubular Marker	66	Each
634E0420	Type C Advance Warning Arrow Board	4	Each
634E0525	Linear Delineation System Panel, Barrier Mounted	180	Each
634E0560	Remove Pavement Marking, 4" or Equivalent	9,930	Ft
634E0640	Temporary Pavement Marking	61,425	Ft
634E0700	Traffic Control Movable Concrete Barrier	133	Each
634E0705	Remove and Reset Traffic Control Movable Concrete Barrier	133	Each
634E0750	Temporary Concrete Barrier End Protection	6	Each
634E0755	Remove and Reset Temporary Concrete Barrier End Protection	6	Each
634E1215	Contractor Furnished Portable Changeable Message Sign	8	Each
634E1235	Queue Detection System	8.0	Mth
634E1245	Maintenance of Queue Detection System	100	Hour
670E1010	2' x 3' Type B Drop Inlet	16	Each
670E2200	Type C Frame and Grate	4	Each
670E5400	Precast Drop Inlet Collar	20	Each
670E6000	Adjust Drop Inlet	4	Each
734E0010	Erosion Control	Lump Sum	LS
998E0100	Railroad Protective Insurance	Lump Sum	LS

* - Denotes Non-Participating

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3310	Bridge Elevation Survey	Lump Sum	LS
110E0010	Remove Concrete Bridge Approach Slab	684.6	SqYd
120E0010	Unclassified Excavation	42	CuYd
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E2600	Membrane Sealant Expansion Joint	139.8	Ft
430E0200	Bridge End Embankment	40	CuYd
430E0300	Granular Bridge End Backfill	120.0	CuYd
460E0070	Class A45 Concrete, Bridge Repair	1.5	CuYd
460E0150	Concrete Approach Slab for Bridge	571.9	SqYd
460E0160	Concrete Approach Sleeper Slab for Bridge	112.7	SqYd
460E0300	Breakout Structural Concrete	1.5	CuYd
464E0100	Controlled Density Fill	3.3	CuYd
480E0504	No. 4 Rebar Splice	49	Each
480E0505	No. 5 Rebar Splice	48	Each
480E0506	No. 6 Rebar Splice	76	Each
480E5000	Galvanic Anode	8	Each
510E3260	HP 10 Steel Pile Vertical Splice	2	Each
550E0010	Low Slump Dense Concrete Bridge Deck Overlay	151	CuYd
550E0100	Concrete Removal Type 1A	2,139.0	SqYd
550E0110	Concrete Removal Type 1B	213.9	SqYd
550E0120	Concrete Removal Type 1C	106.9	SqYd
550E0130	Concrete Removal Type 1D	106.9	SqYd
550E0140	Concrete Removal Type B	20.0	Ft
550E0200	Class A45 Concrete Fill	23.0	CuYd
550E0500	Finishing and Curing	2,139.0	SqYd
680E0040	4" Underdrain Pipe	25	Ft

SPECIFICATIONS

Standard Specifications for Roads and Bridges, 2015 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

QUEUE DETECTION SYSTEM - OPERATION AND MAINTENANCE (CONTINUED)

Portable changeable speed signs will be integrated with the queue warning / detection system and will be capable of changing depending on traffic conditions. This will allow for interstate traffic to be slowed by regulatory speed signs prior to approaching stopped or slowed traffic. Integrating the portable changeable speeds signs with the queue detection system will require the use of Jamlogic® or approved equal software for each device, which may require a monthly cost for the software and labor for managing the automation of the signs. This monthly cost will be included in the appropriate bid item for the queue warning / detection system.

Speed limits will be reduced as follows, but may be changed by the Engineer depending on actual field conditions:

- If the queue detection system detects traffic at 30 mph to 5 mph, the previous zone's speed limit would be reduced to 45 mph.
- If the queue detection system detects traffic 5 mph or less, the previous zone's speed limit would be reduced to 30 mph, and the zone prior to that would be reduced to 45 mph.

The Contractor will develop a queue warning / detection system plan, which will be reviewed and approved by the Engineer prior to construction beginning on the project. The plan will show and include all portable changeable message signs (PCMS), portable changeable speeds signs, sensor, detection and all miscellaneous parts locations and quantities as determined by the Contractor.

A Queue Detection System Diagram is shown in the plans. The locations of the portable changeable speeds signs and portable changeable message signs (PCMS), within each zone are not fully specified on this diagram, as these locations will be determined by the Contractor. If the Contractor needs to adjust or move these sign locations during the project, the cost for this will be incidental to the contract unit price per hour for "Maintenance of Queue Warning System".

- All costs for the daily operation, adjustment, relocation, replacement, providing technical support, and maintenance (labor, materials and equipment) of the queue warning system will be incidental to the contract unit price per hour for "Maintenance of Queue Warning System".

All costs associated with furnishing and the initial installation and operation, including all equipment such as detection, sensors, trailers and all miscellaneous parts and materials will be incidental to the contract unit price per month for "Queue Detection System".

- This unit price will also include any required cell plan / modem upgrades and setup of the system.
- All costs for the portable changeable speeds signs, as discussed above, including all furnishing, installation, operation, and maintenance, all equipment and all miscellaneous parts and materials will be incidental to the contract unit price per month for "Queue Detection System".
- All costs for the portable changeable message signs (PCMS), as discussed above, including all furnishing, installation, operation, and maintenance, all equipment and all miscellaneous parts and materials will be incidental to the contract unit price per month for "Queue Detection System".

QUEUE DETECTION SYSTEM - DIGITAL SPEED LIMIT SIGN ASSEMBLY

The digital speed limit (DSL) sign (portable changeable speed sign) assemblies will operate continuously 24 hours a day, 7 days a week. The system will collect and store speed limit data and be archived into a database with time and date stamps which will be available for future documentation. Components of the

DSL Sign Assemblies will comply with the MUTCD. The DSL sign assemblies will be installed halfway between interstate exits in each zone.

The DSL Sign Assembly will consist of the following components: Signs, Mounting, Power Supply, and Controls.

Signs

The DSL Sign Assembly will include one 48"x60" Speed Limit (R2-1) sign with a two-digit numerical digital Light Emitting Diode (LED) display legend. The color of the digital display legend portion of the R2-1 sign will be a white legend on a black background. The minimum pixels per character (numeral) on the digital display legend of the R2-1 sign will be 5' wide by 7' high. Each character (numeral) will be a minimum of 18" high.

The digital display legend portion of the R2-1 sign will automatically adjust brightness under varying light conditions to maintain legibility for a distance of at least 1,000 feet. Speed limit values shown on the digital display legend will continuously display without animation.

The digital display legend of the R2-1 sign will be wired so that it can be blanked out or changed between the original posted speed and the approved reduced speed limit(s) (and between a minimum of two reduced speed limits) while using a hand control hard wired to the DSL Sign Assembly and wireless remote.

Sign mounting will be such that the bottom of the R2-1 sign will be a minimum of 5' above the roadway. The sign sheeting for the R2-1 sign will meet the requirements of ASTM D4956 Type IV.

Mounting

Each DSL Sign Assembly will be trailer mounted. No portion of the trailer or attachments will physically or visually block any portion of the sign assembly from road users approaching the sign. The mounting method will be suitably stable to prevent movement due to high winds or passage of large vehicles.

Construction will be to transport the DSL Sign Assembly and appurtenances adequately and legally as well as to support them properly during operation. The trailer will be equipped with devices to level and stabilize.

Controls

Each DSL Sign Assembly will be secured/locked so that unauthorized users cannot tamper with the power supply and hand controls.

The DSL Sign Assembly will have an on/off power switch that controls the power supply to the digital display legend portion of the Speed Limit sign.

The DSL Sign Assembly will include a hand control hard wired to the unit capable of changing the numerals on (and blanking out) the legend on the digital display legend portion of the R2-1 Speed Limit sign.

The DSL Speed Assemblies will be able to be changed remotely (wireless hand-held remote).

All costs for the DSL (portable changeable speeds signs), as discussed above, including all furnishing, installation, operation, and maintenance, all equipment and all miscellaneous parts and materials will be incidental to the contract unit price per month.

RETROREFLECTIVITY FOR PAVEMENT MARKING PAINT

The Department may take retroreflectivity readings on the pavement marking lines after 2 days and within 30 days of the line application using either a portable or mobile retroreflectometer that conforms to 30-meter geometry. If the Department chooses to take retroreflectivity readings, three retroreflectivity readings will be taken on each line at each test location. The three readings will be averaged and become the reading for that test location.

If the Department chooses to take retroreflectivity readings, three readings will be taken on the edge lines and lane lines in the direction of application. For combination solid yellow and skip yellow lines for turn lanes and for centerline markings on two-way roadways, three readings will be taken in one direction, the reflectometer will be turned 180 degrees and three more readings will be taken. The six readings for the centerline markings will be averaged and become the test reading for that test location.

If the Department chooses to take readings, the minimum retroreflectivity values will be 275 mc/m²/lux for white and 170 mc/m²/lux for yellow.

Plotting Date: 08/29/2024

Revised 8/29/2024 KH

ITEMIZED LIST FOR TRAFFIC CONTROL

Northbound I29

SIGN CODE	SIGN DESCRIPTION	EXPRESSWAY / INTERSTATE			
		NUMBER	SIGN SIZE	SQFT PER SIGN	SQFT
R1-2	YIELD	2	36"	3.9	7.8
R2-1	SPEED LIMIT 45	10	36" x 48"	12.0	120.0
R2-1	SPEED LIMIT 65	4	36" x 48"	12.0	48.0
R2-6aP	FINES DOUBLE (plaque)	4	36" x 24"	6.0	24.0
R11-2	ROAD CLOSED	1	48" x 30"	10.0	10.0
W1-4b	REVERSE CURVE (two lanes shift) (L or R)	12	48" x 48"	16.0	192.0
W3-5	SPEED REDUCTION AHEAD (45 MPH)	4	48" x 48"	16.0	64.0
W4-1	MERGE (symbol)	1	48" x 48"	16.0	16.0
W4-2	LEFT or RIGHT LANE ENDS (symbol)	4	48" x 48"	16.0	64.0
W4-3	ADDED LANE (symbol)	3	48" x 48"	16.0	48.0
W5-4	RAMP NARROWS	2	48" x 48"	16.0	32.0
W20-1	ROAD WORK AHEAD	4	48" x 48"	16.0	64.0
W20-5	LEFT or RIGHT LANE CLOSED AHEAD	4	48" x 48"	16.0	64.0
W20-7	FLAGGER (symbol)	3	48" x 48"	16.0	48.0
G20-2	END ROAD WORK	2	48" x 24"	8.0	16.0
		EXPRESSWAY / INTERSTATE TRAFFIC CONTROL SIGNS SQFT			837.3

Southbound I29

SIGN CODE	SIGN DESCRIPTION	EXPRESSWAY / INTERSTATE			
		NUMBER	SIGN SIZE	SQFT PER SIGN	SQFT
R1-2	YIELD	2	36"	3.9	7.8
R2-1	SPEED LIMIT 45	10	36" x 48"	12.0	120.0
R2-1	SPEED LIMIT 65	4	36" x 48"	12.0	48.0
R2-6aP	FINES DOUBLE (plaque)	4	36" x 24"	6.0	24.0
R3-33	RIGHT TURN MUST EXIT	1	78" x 36"	19.5	19.5
W1-4b	REVERSE CURVE (two lanes shift) (L or R)	12	48" x 48"	16.0	192.0
W3-5	SPEED REDUCTION AHEAD (45 MPH)	4	48" x 48"	16.0	64.0
W4-1	MERGE (symbol)	1	48" x 48"	16.0	16.0
W4-2	LEFT or RIGHT LANE ENDS (symbol)	4	48" x 48"	16.0	64.0
W4-3	ADDED LANE (symbol)	2	48" x 48"	16.0	32.0
W5-4	RAMP NARROWS	2	48" x 48"	16.0	32.0
W20-1	ROAD WORK AHEAD	4	48" x 48"	16.0	64.0
W20-5	LEFT or RIGHT LANE CLOSED AHEAD	4	48" x 48"	16.0	64.0
W20-7	FLAGGER (symbol)	3	48" x 48"	16.0	48.0
G20-2	END ROAD WORK	2	48" x 24"	8.0	16.0
		EXPRESSWAY / INTERSTATE TRAFFIC CONTROL SIGNS SQFT			811.3

PLOT SCALE - 1:8820

PLOTTED FROM - TRSF12113

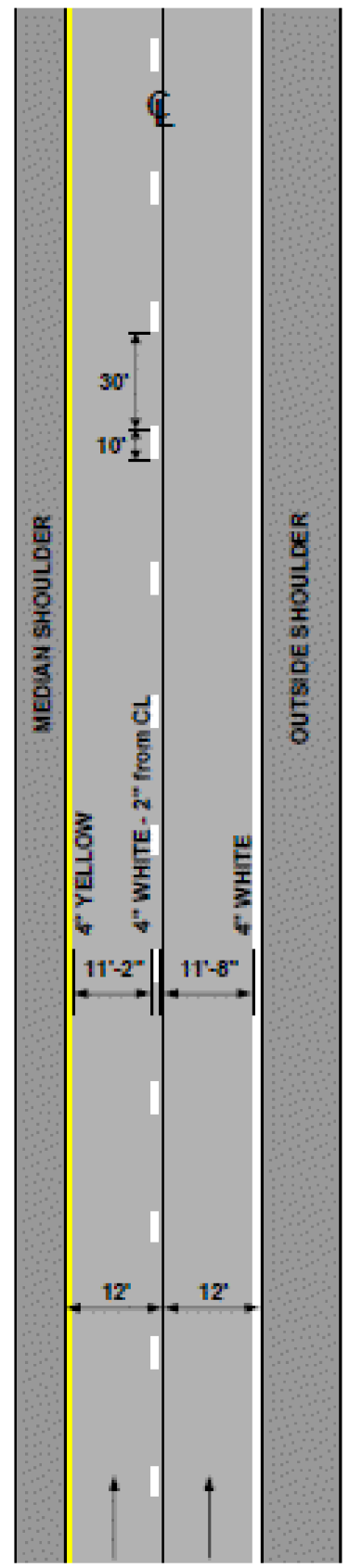
PLOT NAME - I

FILE - ... \TRAFFIC CONTROL SIGNS.DGN

Plotting Date: 08/29/2024

Revised 8/29/2024 KH

**DIVIDED ROADWAY
(ONE DIRECTION SHOWN)**



ESTIMATED QUANTITIES (BASED ON ONE APPLICATION)	
DURABLE PAVEMENT MARKING	QUANTITY
WHITE	7,000 FEET
YELLOW	8,740 FEET

ESTIMATED QUANTITIES (BASED ON ONE APPLICATION)	
GROOVING FOR DURABLE PAVEMENT MARKING, 4"	QUANTITY
WHITE	5,116 FEET
YELLOW	7,236 FEET

PLOT SCALE - 1:200

PLOTTED FROM - IRSE12113

PLOT NAME - 26

FILE - ... \TRAFFIC CONTROL\065E TC.DGN