

SECTION M: PAVEMENT MARKING PLANS

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	IM 0901(38)40	M1	M9

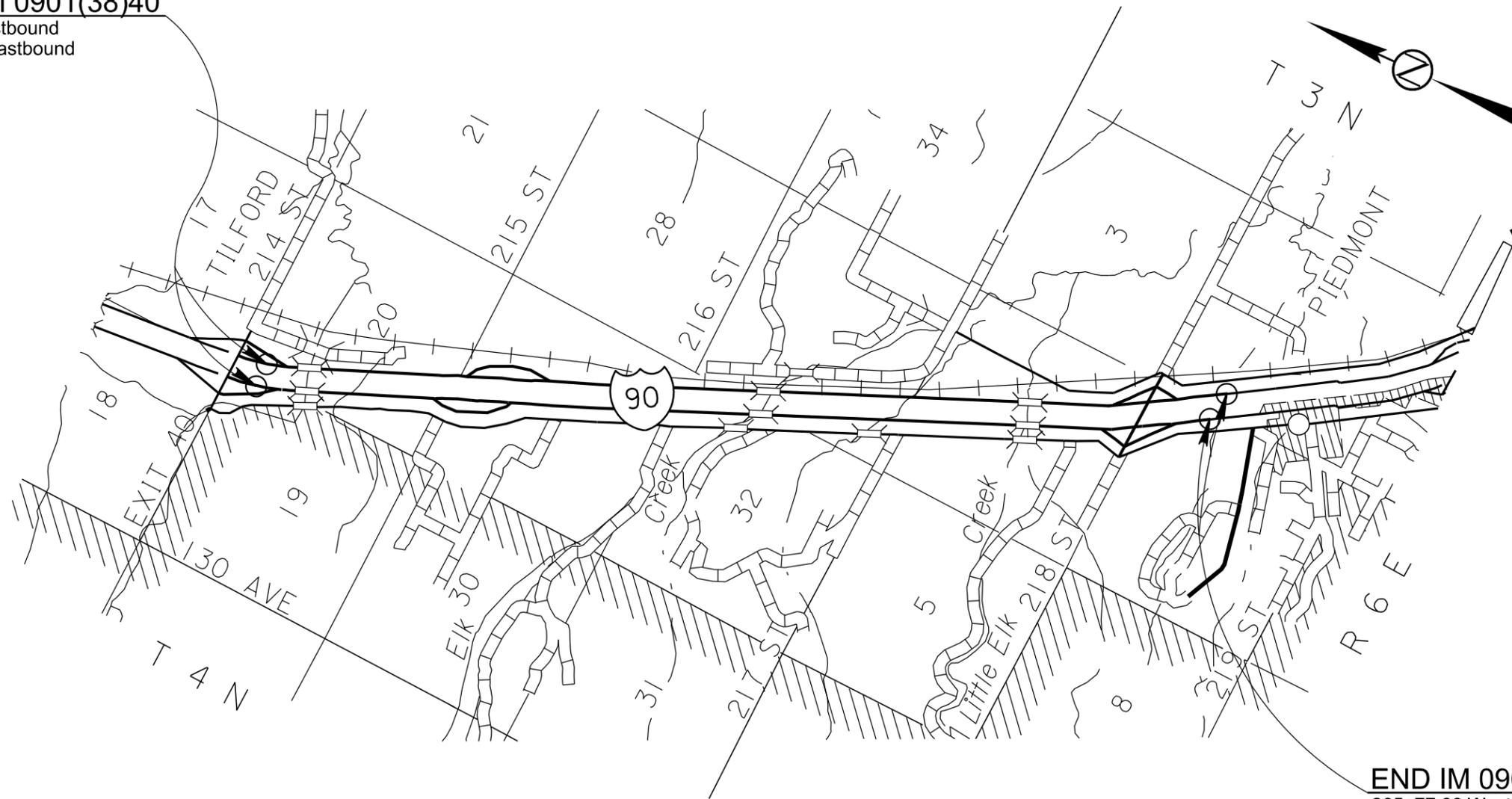
Plotting Date: 07/18/2016

INDEX OF SHEETS

- M1 General Layout W/Index
- M2-M3 Estimate w/General Notes & Tables
- M4-M5 Typical Details
- M6-7 Pavement Marking Layouts
- M8-9 Standard Plates

BEGIN IM 0901(38)40

10+00.00 Westbound
1010+00.00 Eastbound



END IM 0901(38)40

265+77.66 Westbound
1262+12.95 Eastbound

Plot Scale - 1:40

Plotted From - trcs12695

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ESTIMATE OF QUANTITIES

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
633E0010	Cold Applied Plastic Pavement Marking, 4"	17,669	Ft
633E0020	Cold Applied Plastic Pavement Marking, 8"	216	Ft
633E0025	Cold Applied Plastic Pavement Marking, 12"	2,750	Ft
633E0040	Cold Applied Plastic Pavement Marking, Arrow	4	Each
633E0055	Cold Applied Plastic Pavement Marking, Railroad Crossing	2	Each
633E1200	Waterborne Pavement Marking Paint with High Grade Polymer, White	370	Gal
633E1205	Waterborne Pavement Marking Paint with High Grade Polymer, Yellow	351	Gal
633E1400	Pavement Marking Paint, 4" White	50,791	Ft
633E1405	Pavement Marking Paint, 4" Yellow	101,582	Ft
633E5000	Grooving for Cold Applied Plastic Pavement Marking, 4"	17,309	Ft
633E5005	Grooving for Cold Applied Plastic Pavement Marking, 8"	216	Ft
633E5010	Grooving for Cold Applied Plastic Pavement Marking, 12"	2,750	Ft
633E5025	Grooving for Cold Applied Plastic Pavement Marking, Arrow	4	Each
633E5040	Grooving for Cold Applied Plastic Pavement Marking, Railroad Crossing	2	Each
633E5100	Grooving for Durable Pavement Marking, 4"	136,872	Ft

GENERAL NOTES

Permanent pavement markings shall be applied from sta 1010+00.00 to 1262+13.32 on the eastbound lanes and from sta 10+00.00 to 265+77.66 on the westbound lanes. Pavement markings for both mainline edge lines shall be 4" and shall be "Waterborne Pavement Marking Paint with High Grade Polymer." Centerline skips shall be "Cold Applied Plastic Pavement Marking, 4". The centerline skips and edge lines shall be grooved-in.

At the Exit 40 westbound off-ramp and eastbound on-ramp; Exit 44 eastbound and westbound on-ramps and off-ramps; and the Tilford rest area eastbound and westbound on-ramps and off-ramps, all gore areas shall be grooved in 12" Cold Applied Plastic Pavement Markings, and ramp taper skip throats shall be grooved in 4" Cold Applied Plastic Pavement Markings. All pavement marking on the ramps beyond the gore areas shall be "Waterborne Pavement Marking Paint with High Grade Polymer" and shall be grooved in.

At the Exit 44 eastbound and westbound off-ramps and the westbound Tilford rest area off ramp, two wrong way arrows shall be placed at each ramp. The two arrows shall be placed approximately 100 ft apart at a location approved by the Engineer. Wrong way arrows shall be grooved-in, white, "Cold Applied Plastic Pavement Marking, 8".

At xr236, pavement markings for both edge lines shall be 4" "Waterborne Pavement Marking Paint with High Grade Polymer." Centerlines and lane lines shall be "Cold Applied Plastic Pavement Marking, 4". Two left turn arrows shall be placed in each left turn lane in accordance with standard plate 633.01. The centerlines, edge lines, lane lines, and left turn arrows shall be grooved-in.

Grooving, removal, and cleaning work shall be conducted in such a manner as to control and minimize airborne dust and similar debris that may become a hazard to motor vehicle operation.

PAVEMENT MARKING PAINT

All materials shall be applied as per manufacturer's recommendations.

The application of permanent pavement marking paint on asphalt surfaces may not begin until 2 calendar days following completion of the flush seal and shall be completed within 14 calendar days following completion of the flush seal. If the flush seal is eliminated, the Contractor shall complete the application of permanent pavement marking paint no sooner than two calendar days, but within 14 calendar days following completion of final surfacing.

COLD APPLIED PLASTIC PAVEMENT MARKING

All materials shall be applied as per manufacturer's recommendations.

Cold Applied Plastic Pavement Markings shall be 3M Series 380 AW or approved equal.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
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WATERBORNE PAVEMENT MARKING PAINT WITH HIGH GRADE POLYMER

All materials shall be applied as per manufacturer's recommendations.

This material shall consist of a durable high build, low VOC, fast drying, waterborne traffic paint with a 100% acrylic polymer (Dow DT-400 or DOW HD-21A or equivalent) and with reflective media adhered to the paint. The reflective media shall consist of glass beads as well as bonded core reflective elements.

The bonded core reflective elements shall contain either clear or yellow tinted microcrystalline ceramic beads bonded to the outer surface. All microcrystalline ceramic beads bonded to reflective elements shall have a minimum index of refraction of 1.8 when tested using the liquid oil immersion method.

The Department will take retroreflectivity readings on the pavement marking lines no sooner than 3 days and no later than 30 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.

Pavement markings not conforming to the retroreflectivity requirements shall be removed and replaced. If replacement of markings cannot 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.

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

Initial readings:

<u>Pavement Marking Color</u>	<u>Minimum Value</u>
White	350 mc/m ² /lux
Yellow	275 mc/m ² /lux

All pavement markings not conforming to the requirements provided in these plans will be considered deficient and shall be removed and replaced. 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 the Contractor's expense, with no cost incurred by the State.

RATES OF MATERIALS FOR WATERBORNE PAVEMENT MARKING PAINT WITH HIGH GRADE POLYMER

Solid 4" line = 27.8 Gals/Mile
 Glass Beads = 5.3 Lbs/Gal.
 Composite Reflective Elements = 2.1 Lbs/Gal.

All cost for materials, labor and equipment necessary to furnish and install the pavement markings shall be incidental to the contract unit price per gallon for Waterborne Pavement Marking Paint with High Grade Polymer, White or Yellow.

GROOVING FOR COLD APPLIED PLASTIC PAVEMENT MARKING

The Contractor shall establish a positive means for the removal of the grinding and/or grooving residue. Residue from dry grooving shall be vacuumed. Solid residue shall be removed from the pavement surfaces before being blown by traffic action or wind. Residue from wet grooving shall not be permitted to flow across lanes being used by public traffic or into gutter or drainage facilities. Residue, whether in solid or slurry form, shall be disposed of in a manner that will prevent it from reaching any waterway in a concentrated state. All costs for removal of grinding and/or grooving residue shall be included in the contract unit price per foot for Grooving for Cold Applied Plastic Pavement Marking.

The groove depth shall be 100 mils with a tolerance of +10 mils.

GROOVING FOR WATERBORNE PAVEMENT MARKING PAINT WITH HIGH GRADE POLYMER

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Unless otherwise specified in the plans, the Contractor shall groove the surface for Waterborne Pavement Marking Paint with High Grade Polymer as specified in these plans and as per manufacturer's instructions.

The grooving shall be completed within the following tolerances:

Description	Specification	Tolerance
Depth of Groove	Marking Thickness* ¹ + 15 mils	+ 5 mils
Width of Groove	5 to 6 inches	
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 shall include the thickness of marking material and reflective media.

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

The equipment shall be capable of the following:

- 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.
- Provide uniform alignment and depth.
- Moving continuously to permit a mobile traffic work operation.

If damage occurs, including, but not limited to, joints, joint sealant material, and backer rod, the grooving operation shall be stopped and modifications shall 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 shall 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.

Grooving on bridge decks shall start and stop a sufficient distance from the expansion joints so no damage occurs in these areas. Markings on bridge decks shall be surface applied.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	IM 0901(38)40	M3	M9

TABLE OF PAVEMENT MARKING QUANTITIES

Description	Quantity	Unit
4" White Paint With High Grade Polymer	70254	Ft
4" Yellow Paint With High Grade Polymer	66618	Ft
4" White Cold Applied Plastic Pavement Marking	14033	Ft
4" Yellow Cold Applied Plastic Pavement Marking	3636	Ft
8" White Cold Applied Plastic Pavement Marking	216	Ft
12" White Cold Applied Plastic Pavement Marking	2750	Ft
Left Turn Arrow	4	Ea

TEMPORARY PAVEMENT MARKING

The Contractor shall install and remove Pavement Marking Paint, 4" White and Pavement Marking Paint, 4" Yellow as directed by the Engineer for traffic control for head to head traffic

Temporary pavement marking paint used for traffic control purposes shall be removed in coordination with the Grooving for Durable Pavement Marking and necessary installation of other permanent pavement markings. All costs for materials, labor, and equipment necessary to install and remove the temporary pavement markings shall be incidental to the contract unit price per foot for "Pavement Marking Paint, 4" White" or "Pavement Marking Paint, 4" Yellow", respectively.

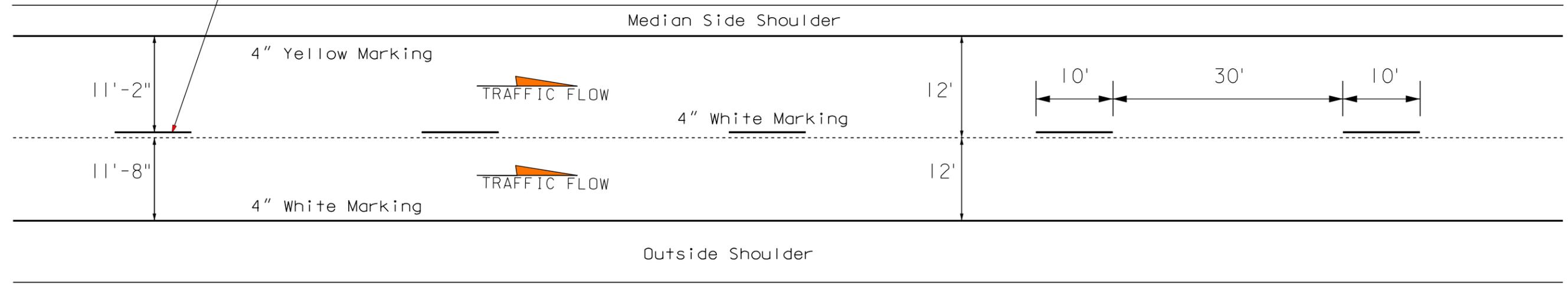
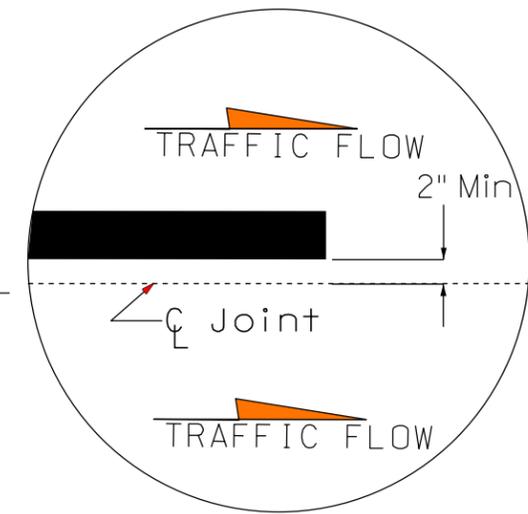
PAVEMENT MARKING LAYOUT

(TYPICAL 4-LANE DIVIDED)

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	IM 0901(38)40	M4	M9
Plotting Date: 07/18/2016			

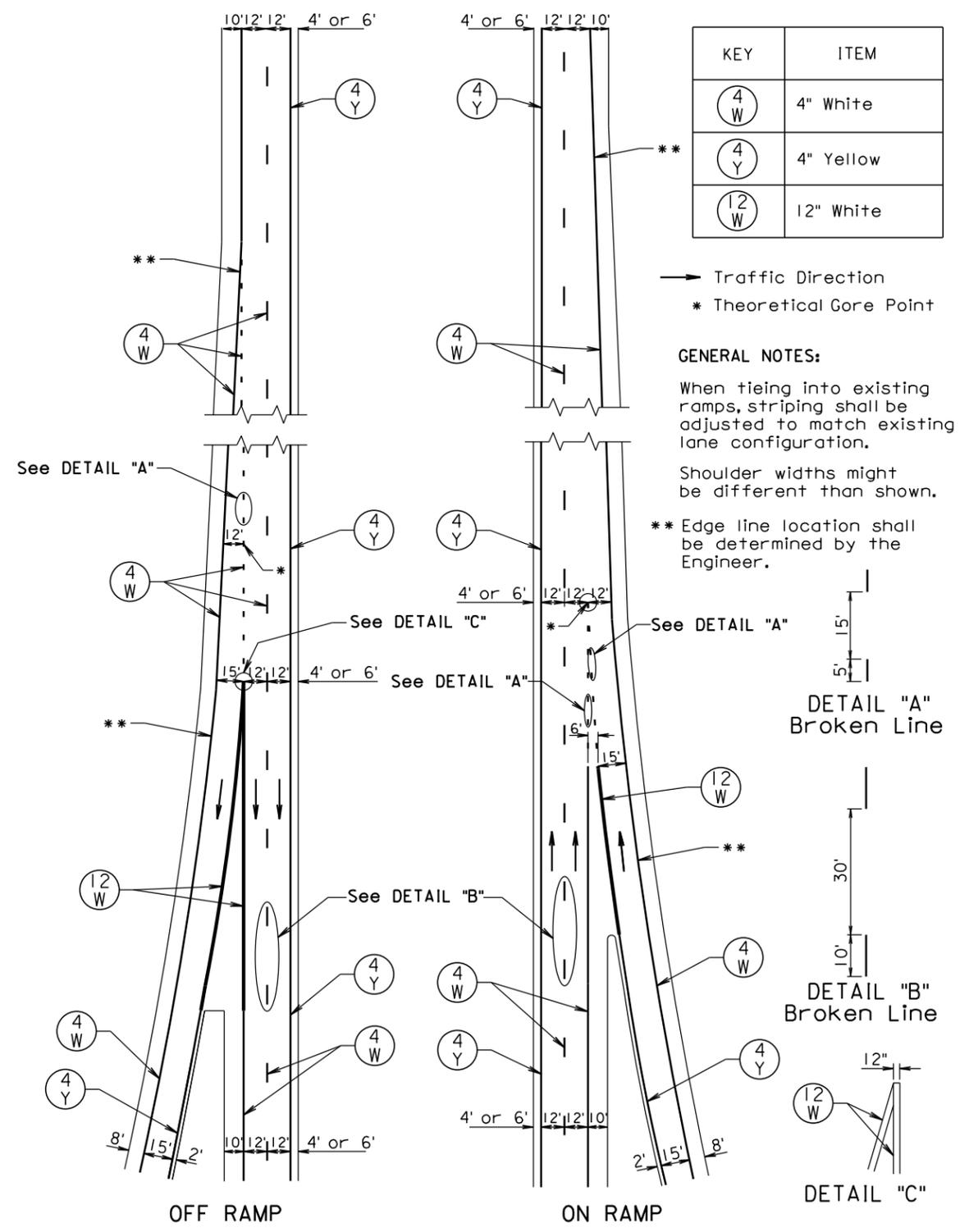
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Plotted From - trcs12695



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PAVEMENT MARKING LAYOUT FOR TAPERED RAMPS



KEY	ITEM
(4 W)	4" White
(4 Y)	4" Yellow
(12 W)	12" White

→ Traffic Direction
 * Theoretical Gore Point

GENERAL NOTES:
 When tying into existing ramps, striping shall be adjusted to match existing lane configuration.
 Shoulder widths might be different than shown.
 ** Edge line location shall be determined by the Engineer.

DETAIL "A"
Broken Line

DETAIL "B"
Broken Line

DETAIL "C"

PAVEMENT MARKING LAYOUT

XR236 with Ramps C & D

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	IM 0901(38)40	M6	M9

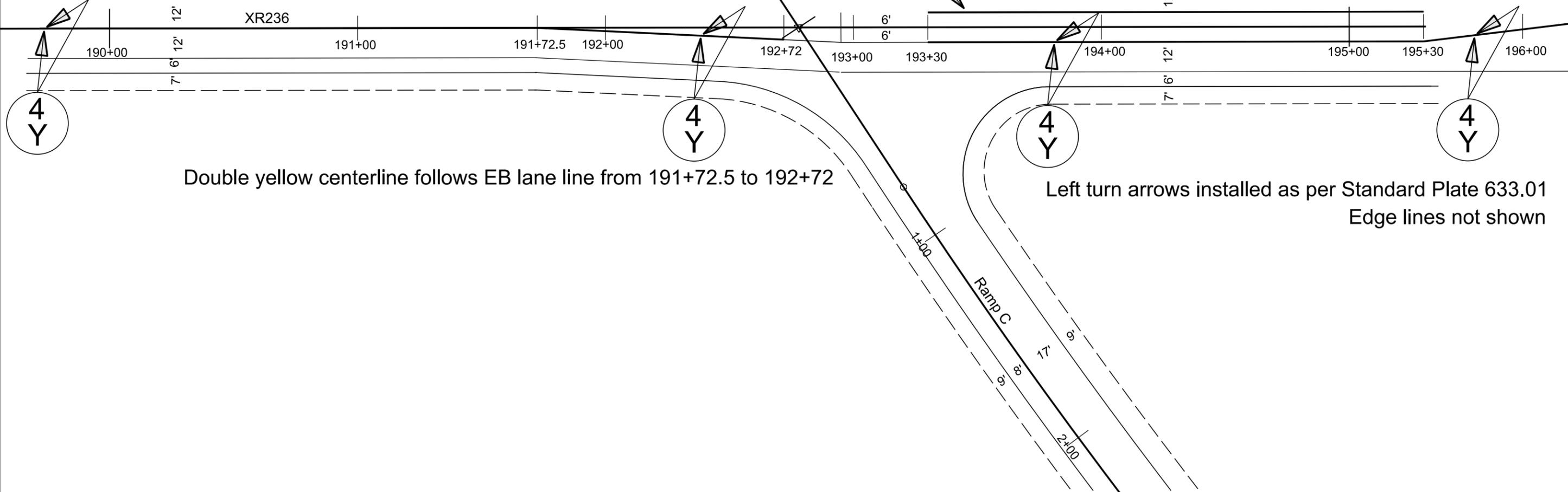
Plotting Date: 07/18/2016



Plot Scale - 1:40

Begin pavement marking at 187+82

Double yellow centerline transitions across center lane from 195+30 to 196+30



Double yellow centerline follows EB lane line from 191+72.5 to 192+72

Left turn arrows installed as per Standard Plate 633.01
Edge lines not shown

Plotted From - trcs12695

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PAVEMENT MARKING LAYOUT

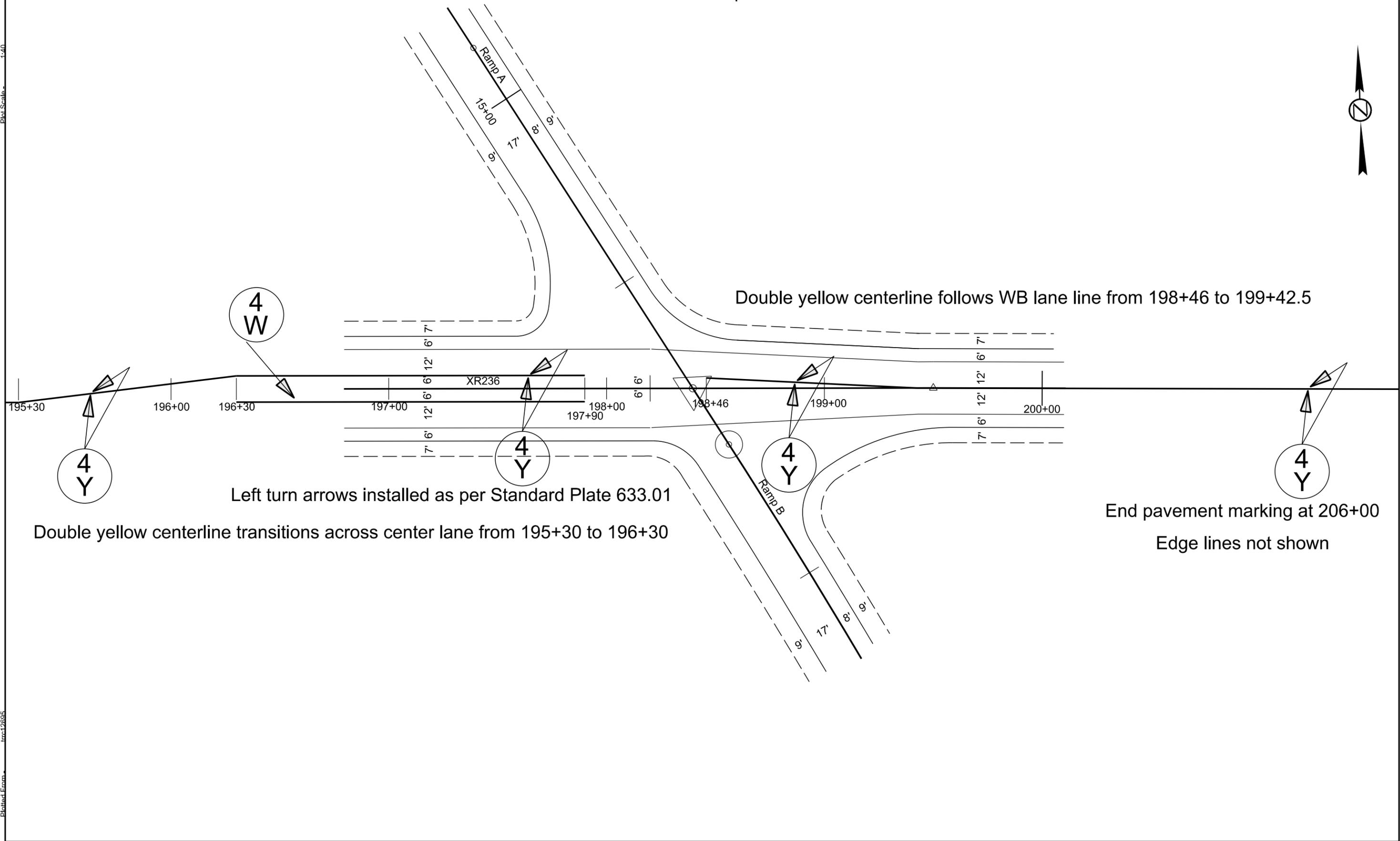
XR236 with Ramps A & B

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	IM 0901(38)40	M7	M9

Plotting Date: 07/18/2016



Plot Scale: 1/4" = 10'



Double yellow centerline transitions across center lane from 195+30 to 196+30

Left turn arrows installed as per Standard Plate 633.01

Double yellow centerline follows WB lane line from 198+46 to 199+42.5

End pavement marking at 206+00

Edge lines not shown

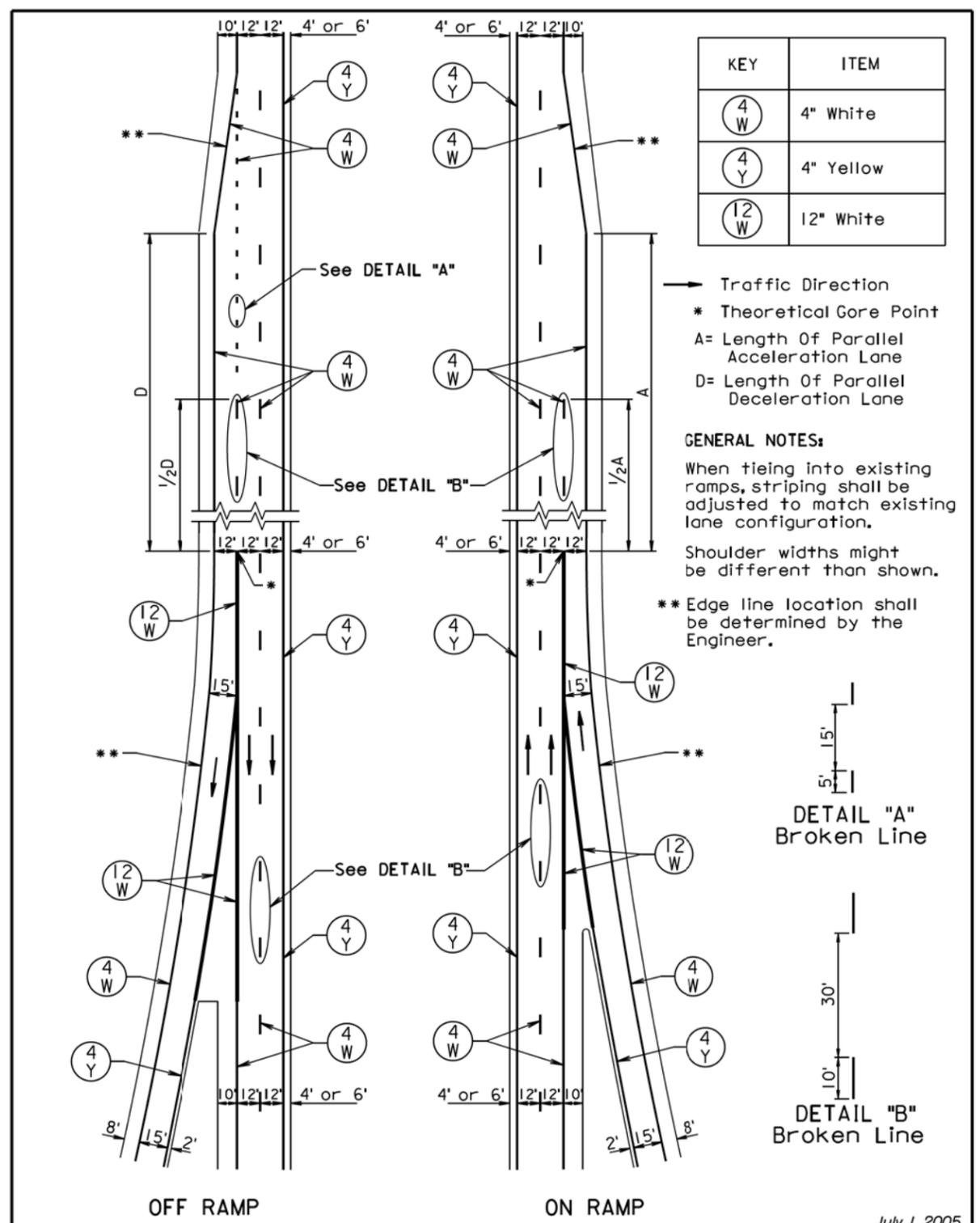
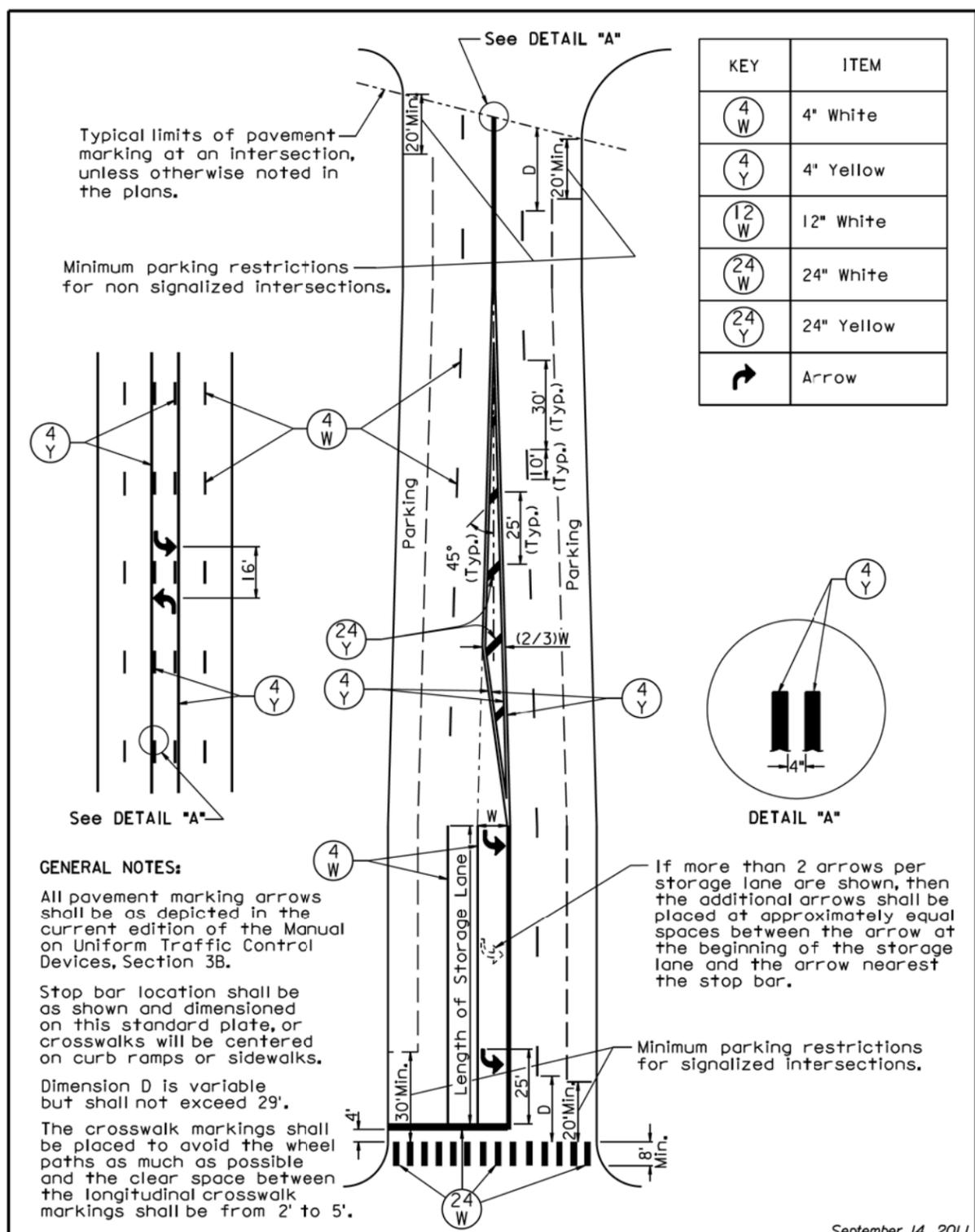
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Plotting Date: 07/18/2016

PLOT SCALE - 1:200

PLOT NAME - 6



S D D O T	PAVEMENT MARKINGS FOR ADJACENT INTERSECTIONS AND CENTER TURN LANE	PLATE NUMBER 633.01
		September 14, 2011
	Published Date: 2nd Qtr. 2016	Sheet 1 of 1

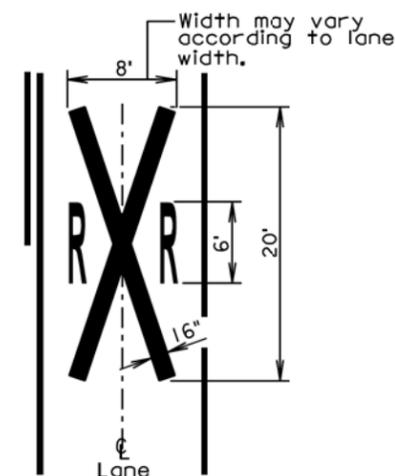
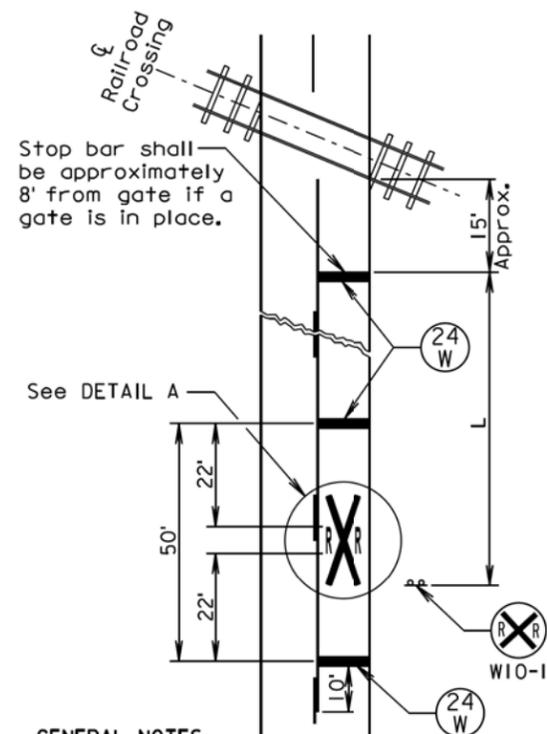
S D D O T	PAVEMENT MARKING LAYOUT FOR PARALLEL INTERSTATE RAMPS	PLATE NUMBER 633.06
		July 1, 2005
	Published Date: 2nd Qtr. 2016	Sheet 1 of 1

PLOTTED FROM - TRRC12695

FILE - ... \5580- STANDARD PLATE1.DGN

KEY	ITEM
	24" White
	White

Posted Speed Limit (M.P.H.)	L (Ft.)
≤ 30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550



DETAIL A

GENERAL NOTES:

The railroad crossing pavement markings shall be placed symmetrically about the centerline of the railroad crossing.

When pavement markings are used, a portion of the RXR symbol shall be placed directly opposite of the advance warning sign W10-1.

On multi-lane roads the transverse bands shall extend across all approach lanes and individual RXR symbols shall be placed in each approach lane.

The railroad crossing pavement markings shall consist of all the transverse bands, stop bars, and RXR symbols.

When pavement marking paint is used for marking the railroad crossing, all costs for furnishing and painting the markings, materials, labor, and necessary equipment shall be incidental to the contract unit price per gallon for "Pavement Marking Paint, White".

When pavement marking tape is used for marking the railroad crossing, all costs for furnishing and placing the markings, materials, labor, and necessary equipment shall be incidental to the contract unit price per each for "Cold Applied Plastic Pavement Marking, Railroad Crossing".

June 26, 2013

S D D O T	PAVEMENT MARKINGS AT RAILROAD CROSSING	PLATE NUMBER 633.10
	Published Date: 2nd Qtr. 2016	Sheet 1 of 1