

Office of Project Development New Practices

Matt Gangness, P.E.
ETS Division

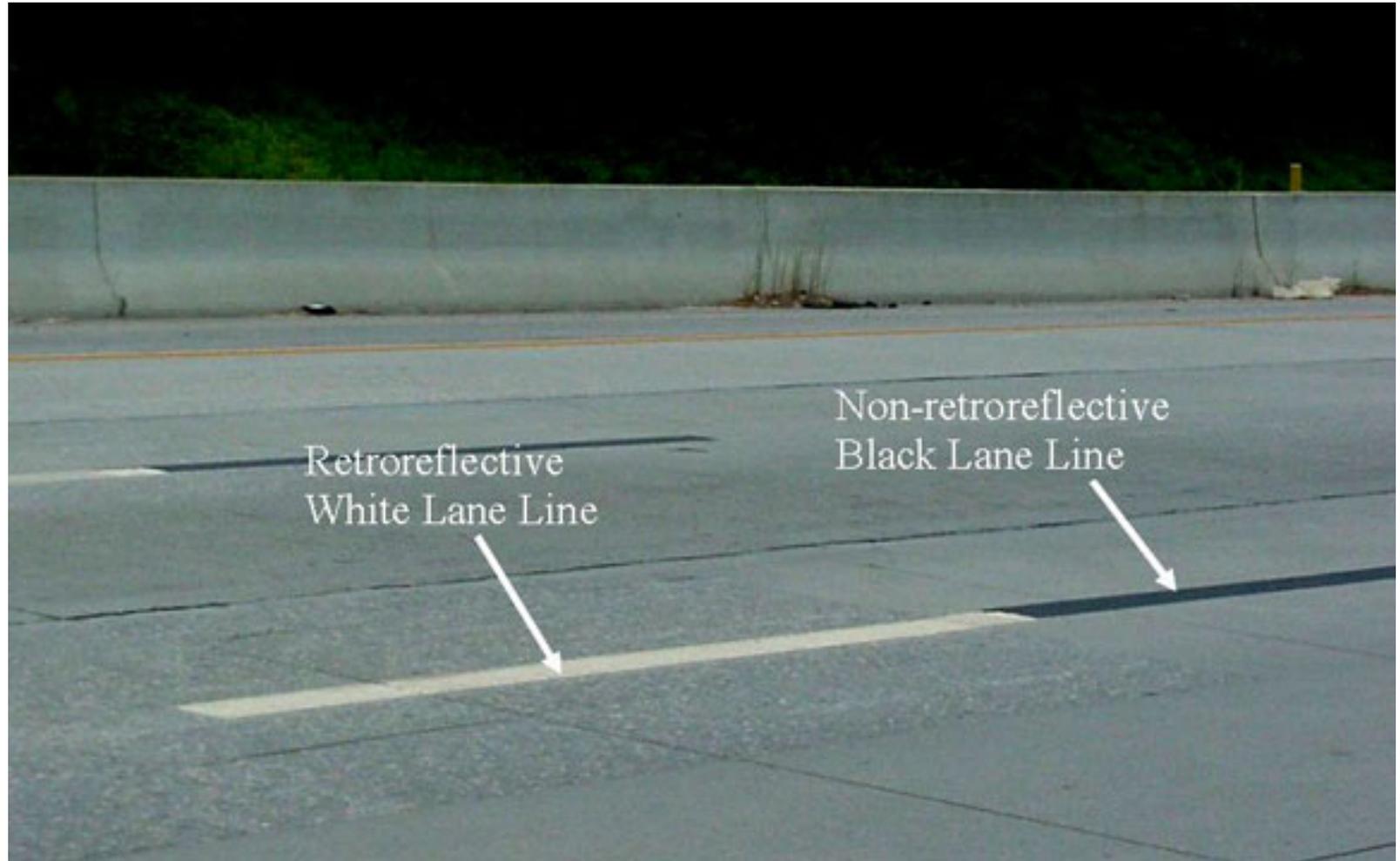
NDDOT
North Dakota
Department of Transportation

Did you know...

- ▶ The first documented auto fatality in the United States was H.H. Bliss of New York City.
- ▶ He was struck by an electric powered taxicab on September 13, 1899, while walking out of a trolley car.
- ▶ Arthur Smith, the driver of the taxicab, was arrested and charged with manslaughter, but was acquitted on the grounds that he had no malice, nor was he negligent

Shadow Contrast Pavement Marking

- ▶ 10' white, 10' black, and 20' gap



Shadow Contrast Pavement Marking



Shadow Contrast Pavement Marking

- ▶ 10' white, 10' black, and 20' gap
- ▶ Regular skip line is 10' white and 30' gap
- ▶ Improve visibility in various conditions:
 - Low light/dusk
 - White concrete “washing out” white skips
 - Nighttime? Inclement weather?
- ▶ Not a patented product, anyone can utilize it
- ▶ Don't confuse it with Contrast Pavement Marking, different than Shadow Contrast Pavement Marking

Shadow Contrast Pavement Marking



Contrast vs. Shadow Contrast Marking



Vertical Lift Road Closure Gate



Vertical Lift Road Closure Gate



Vertical Lift Road Closure Gate

NOTES:

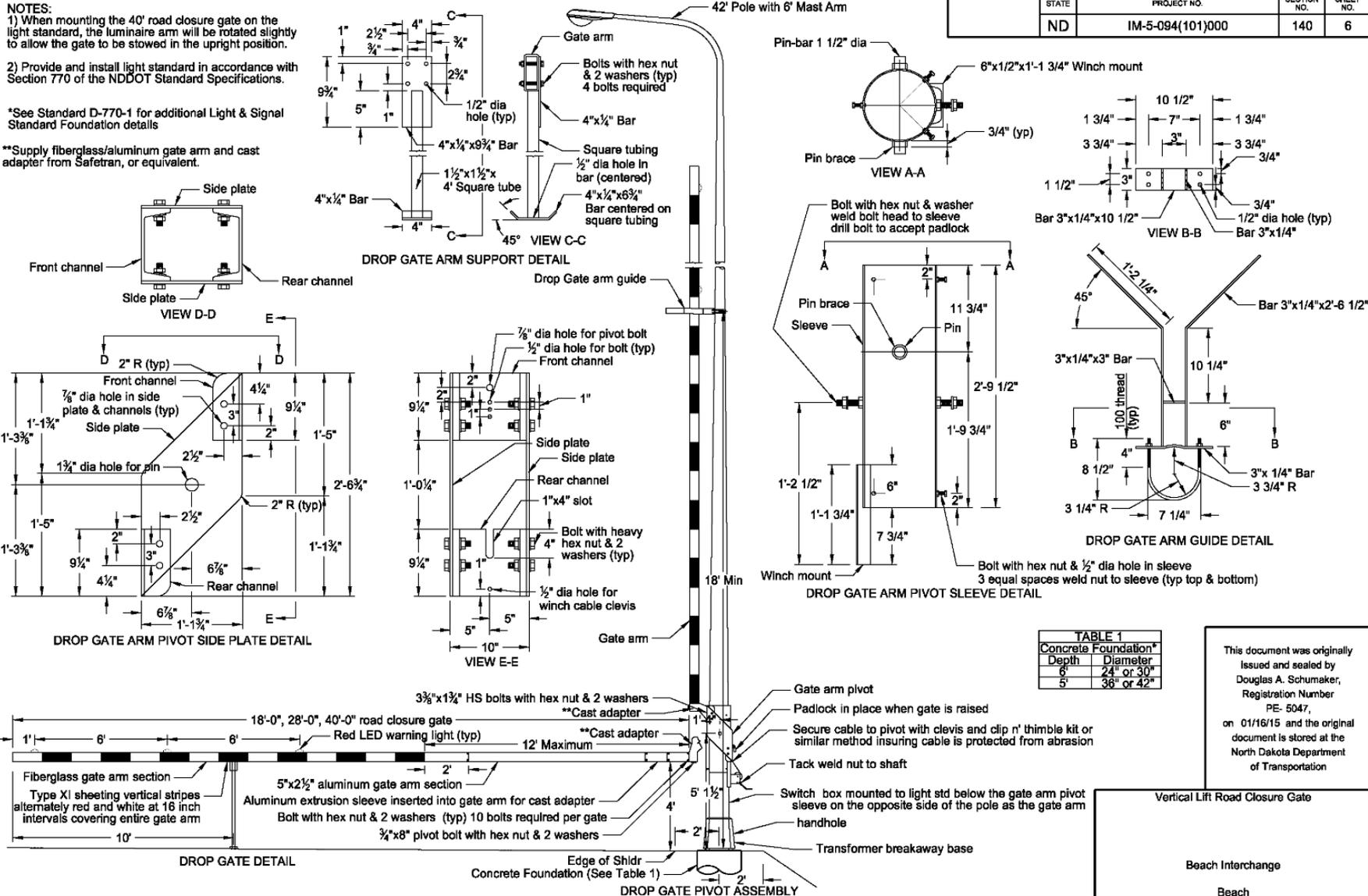
1) When mounting the 40' road closure gate on the light standard, the luminaire arm will be rotated slightly to allow the gate to be stowed in the upright position.

2) Provide and install light standard in accordance with Section 770 of the NDDOT Standard Specifications.

*See Standard D-770-1 for additional Light & Signal Standard Foundation details

**Supply fiberglass/aluminum gate arm and cast adapter from Safetran, or equivalent.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(101)000	140	6



Vertical Lift Road Closure Gate

- ▶ IM-5-094(101)000 installed near Beach
- ▶ Installed on project by project basis future



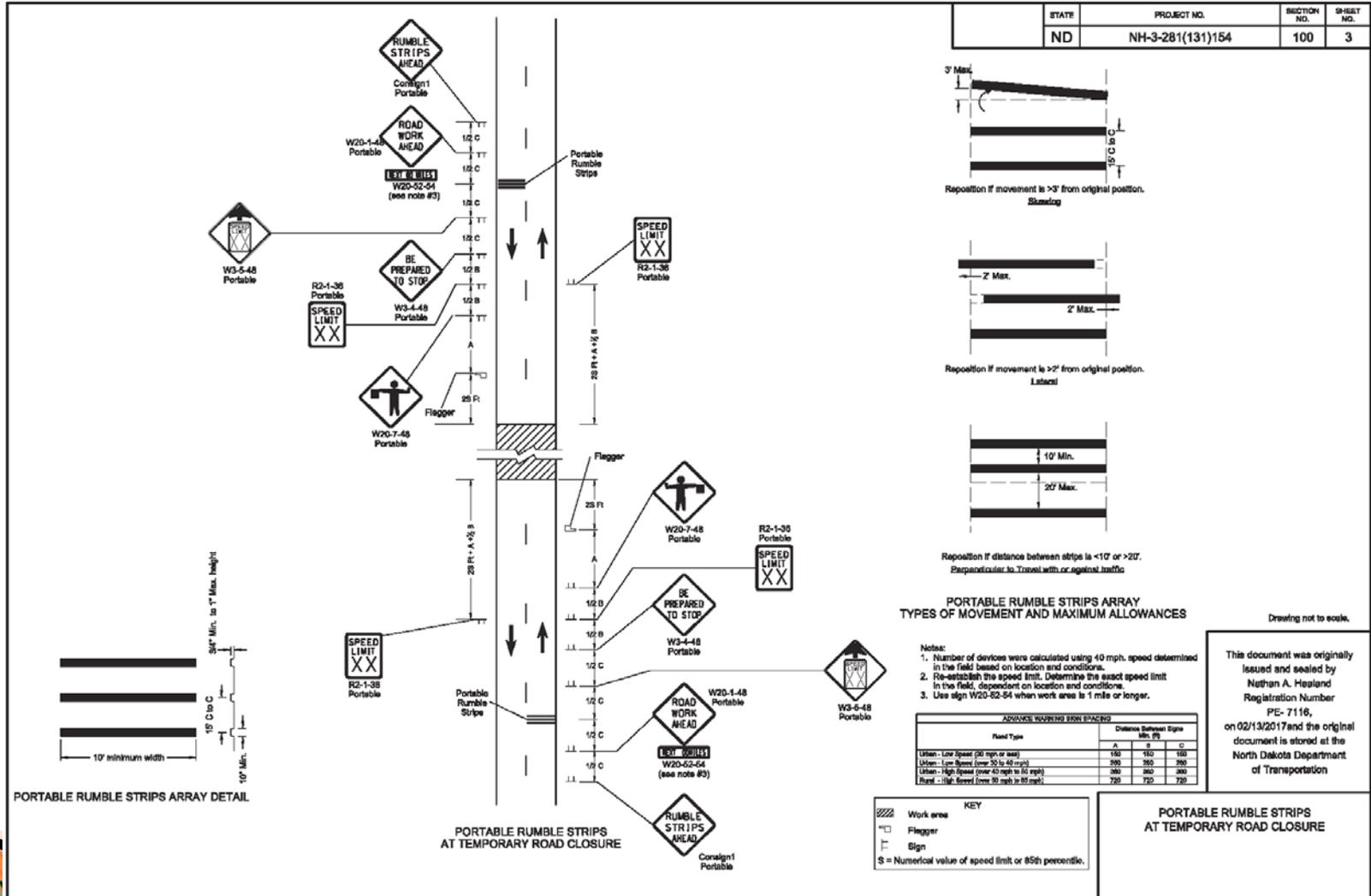
Portable Rumble Strips

- ▶ Tested portable rumble strips on a couple projects in Summer 2017



Portable Rumble Strips

▶ Project NH-3-281(131)154



Portable Rumble Strips

- ▶ The first set did not work very well



Portable Rumble Strips

- ▶ Contractor utilized a different kind that worked much better



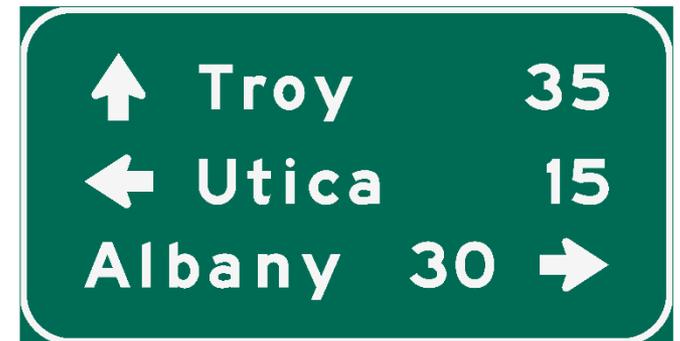
Portable Rumble Strips

- ▶ Video of Roadquake at 70mph in Texas



Highway Gothic & Clearview Font

- ▶ “Highway Gothic” Series A,B,C,D,E,&F
- ▶ Also known as FHWA Series font, or “Standard Alphabets for Highway Signs”
- ▶ Developed by the Public Roads Administration (FHWA) during World War II
- ▶ Series E–modified developed in 1950 to allow button reflectors
- ▶ It is the standard
- ▶ Free for everyone to use



series Em (prior to clearview)

Highway Gothic & Clearview Font



series Em



series Em (prior to clearview)

Highway Gothic & Clearview Font

- ▶ Clearview font developed by Donald Meeker with help of Texas and Penn. Trans. Institutes under supervision of FHWA in 1990's
- ▶ Initial research indicates better legibility, particularly with older drivers
- ▶ Larger counter spaces (spaces inside lower case letters like "e" "a") with goal to reduce "haloing" of letters at night
- ▶ Larger "x" height, relative lower to upper

Highway Gothic & Clearview Font



Highway Gothic & Clearview Font

- ▶ FHWA interim approval for use 2004 (IA-5)
- ▶ FHWA cited initial research:
 - 16% improvement in sign recognition in older drivers
 - Clearview enhanced legibility for drivers at 45mph by an extra 80 feet of reading distance
- ▶ NDDOT began using Clearview on highways signage in 2008

Highway Gothic & Clearview Font



series Em (prior to clearview)



clearview font 5W

Highway Gothic & Clearview Font



series Em



Clearview 5W

Elimination of Clearview Font

- ▶ FHWA (IA-5) approval from 2004 was rescinded in January 2016. FHWA addressed reasons:
 - Clearview fonts were less legible as they aged
 - Worse legibility for negative contrast signs (white on black, and yellow warning signs)
 - Subsequent evals showed no benefit to the narrower letter forms degraded legibility
 - New signs with Clearview were compared to old and worn signs with Highway Gothic, looked better because they were new
- ▶ Clearview copyrighted to Meeker and Associates, and requires a one time fee per workstation

Elimination of Clearview Font

- ▶ Back to the drawing board
- ▶ Prior to 2008, all NDDOT signs had used Highway Gothic Series E modified.
- ▶ Start from scratch, goal is to follow MUTCD and SHSM as closely as possible:
 - Freeways (Interstate) use Series E and E modified
 - Expressways (US divided) and Conventional (2-lane) use Series D with increase to spacing.

Series D with increased spacing



series D normal



series D +175% spacing

Last 13 years....



series Em



Clearview 5W



Series D +175% spacing

How do I know what to do?

- ▶ NDDOT Design Division has created new templates in GuideSIGN
- ▶ Over 1600+ sign templates that covers every scenario
- ▶ Many months of manhours by the NDDOT's foremost expert in signing
- ▶ Available for download in CADD Manual under section 2.12
- ▶ **USE THEM!**

Select Template

Panel Information

Sign Type:
Guide

Panel Style:
ND_Conv_Destination

Units: inches
M.U.T.C.D.: 2009 Edition

Browse for Template:

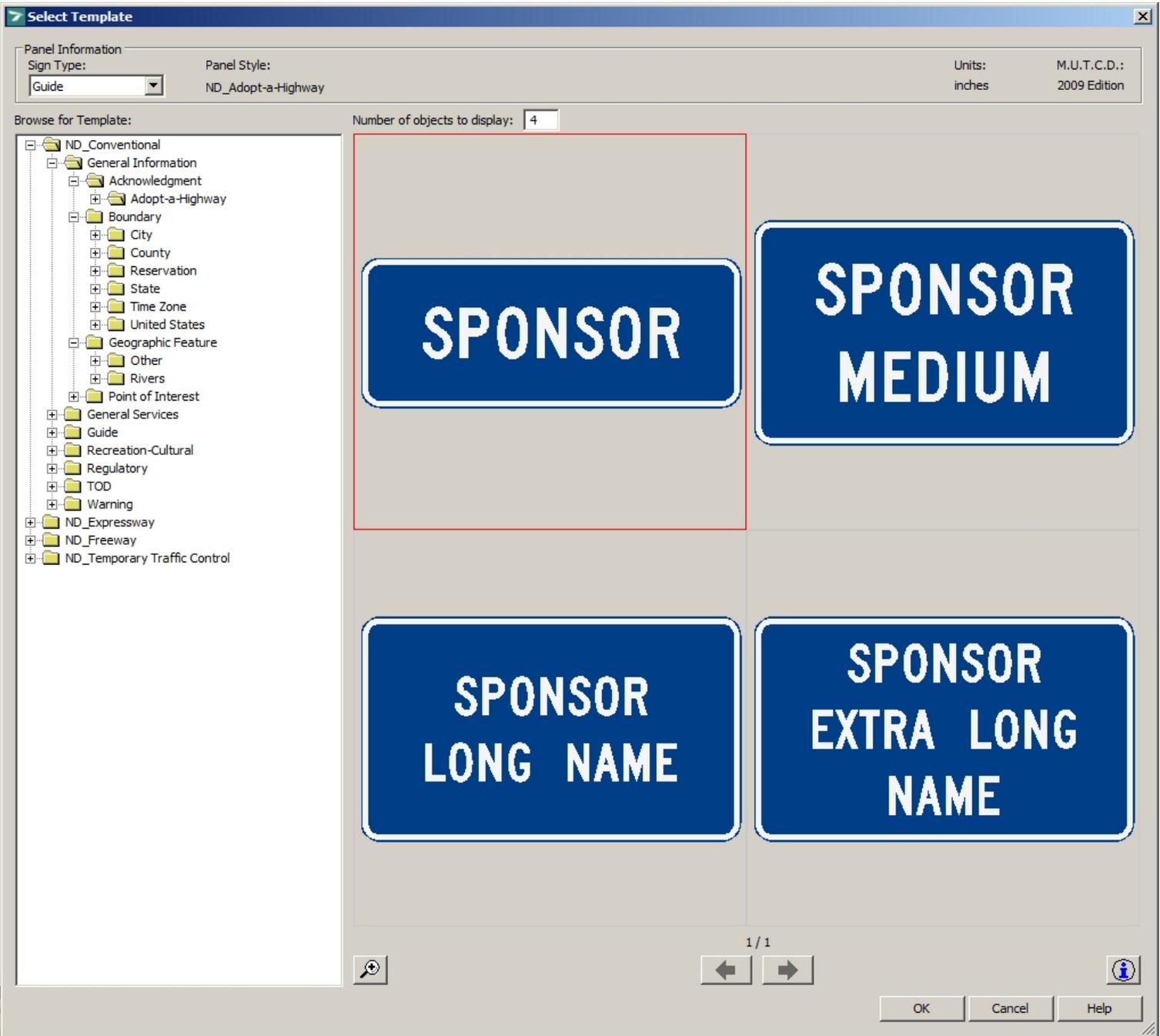
Number of objects to display: 16

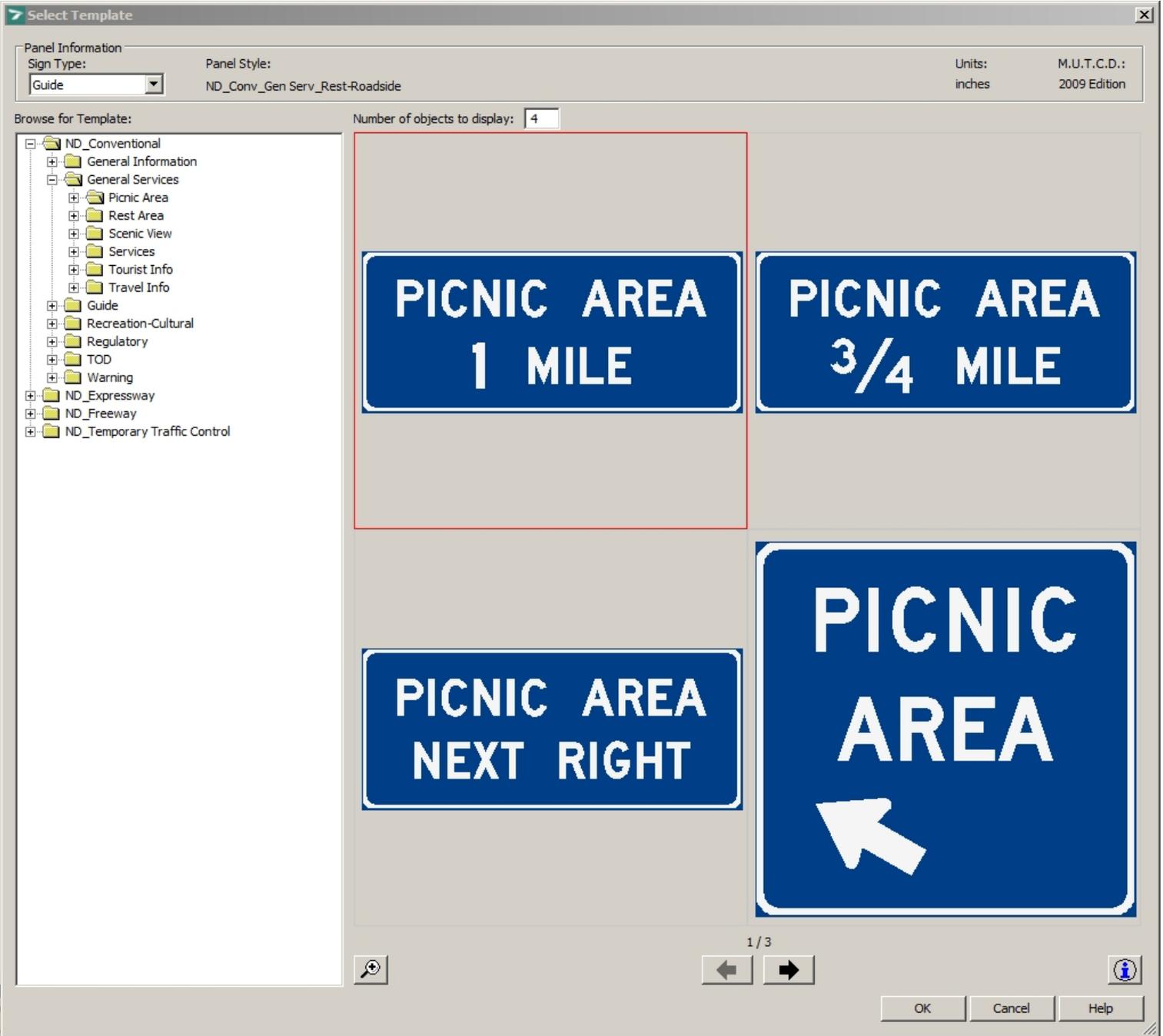
- ND_Conventional
- ND_Expressway
- ND_Freeway
- ND_Temporary Traffic Control

1 / 2



OK Cancel Help





Panel Information

Sign Type:

Guide

Panel Style:

ND_Conv_Destination_Divided

Units:

inches

M.U.T.C.D.:

2009 Edition

Browse for Template:

Number of objects to display: 16

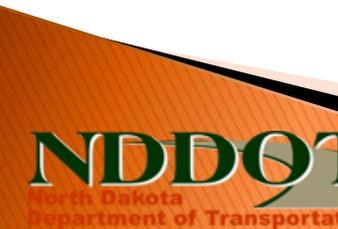
- [-] ND_Conventional
 - [+] General Information
 - [+] General Services
 - [-] Guide
 - [+] Advance Turn
 - [-] Auxiliary Lanes
 - [+] Climbing Lane
 - [+] Passing Lane
 - [+] Slow Vehicle Turn-Out
 - [+] Combination Jct
 - [-] Destination
 - [+] 1 Destination
 - [+] 2 Destinations
 - [+] 3 Destinations
 - [+] 4 Destinations
 - [+] Business District
 - [-] Destination and Distance
 - [+] 1 Destination
 - [+] 2 Destinations
 - [+] 3 Destinations
 - [+] 4 Destinations
 - [+] Distance
 - [+] Frontage Road
 - [-] Interchange Xrd
 - [+] 1_Single Lane Approach
 - [+] 2_Multi-Lane Approach
 - [-] Overhead
 - [+] Advance
 - [-] Combo Lane-Use_Destination
 - [+] Left
 - [+] Right
 - [+] Thru
 - [+] Directional
 - [+] Exit Direction
 - [+] Pull-Through
 - [-] Roundabout
 - [+] Destination
 - [+] Destination and Distance
 - [+] Exit Destination
 - [-] Street Name
 - [+] 1_Ground
 - [+] 2_Overhead
 - [+] 3_Advance
 - [+] Fargo
 - [+] Truck Inspection
 - [+] Weigh Station
 - [+] Recreation-Cultural



Panel Information
Sign Type: Guide Panel Style: ND_Conv_Recreation_Cultural Units: inches M.U.T.C.D.: 2009 Edition

Browse for Template: Number of objects to display: 16

- ND_Conventional
 - General Information
 - General Services
 - Guide
 - Recreation-Cultural
 - City Park
 - Destination
 - Destination and Distance
 - Distance
 - Historic
 - Memorial-Dedication
 - National Grassland
 - Access-No Destination
 - Advance Turn
 - Boundary
 - Destination
 - Destination and Distance
 - Distance
 - Ranger Station
 - Recreation Area
 - Symbols
 - Common
 - Destination
 - Destination and Distance
 - Theodore Roosevelt
 - WMA - Wildlife Management Area
 - Regulatory
 - TOD
 - Warning
 - ND_Expressway
 - ND_Freeway
 - ND_Temporary Traffic Control



Panel Information

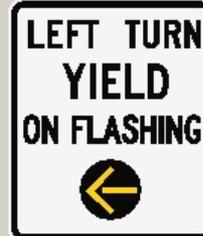
Sign Type: Guide
Panel Style: ND_Reg_48x48

Units: inches
M.U.T.C.D.: 2009 Edition

Browse for Template:

Number of objects to display: 16

- ND_Conventional
 - General Information
 - General Services
 - Guide
 - Recreation-Cultural
 - Regulatory
 - Adv Lane Control
 - Other
 - Parking
 - Seat Belt
 - Signals
 - Snow Emergency
 - Truck Inspection
 - Weigh Station
 - TOD
 - Warning
- ND_Expressway
- ND_Freeway
- ND_Temporary Traffic Control



1 / 1



OK Cancel Help

Panel Information

Sign Type:

Guide

Panel Style:

ND_Fwy_Advance_Int

Units:

inches

M.U.T.C.D.:

2009 Edition

Browse for Template:

Number of objects to display: 16

- [-] ND_Conventional
- [-] ND_Expressway
- [-] ND_Freeway
 - [-] General Information
 - [-] General Services
 - [-] Guide
 - [-] Advance
 - [+] 1_Minor Intchg
 - [+] 2_Intermediate Intchg
 - [+] 3_Major B Intchg
 - [+] 4_Major A Intchg
 - [-] Destination
 - [-] Destination and Distance
 - [-] Exit Direction
 - [+] 1_Minor Intchg
 - [+] 2_Intermediate Intchg
 - [+] 3_Major B Intchg
 - [+] 4_Major A Intchg
 - [-] Exit Panel
 - [-] Gore
 - [-] Overhead
 - [-] Advance
 - [-] Combo Lane-Use_Destination
 - [-] Exit Direction
 - [-] Lane Drop
 - [-] Pull Through
 - [-] Weigh Station
 - [+] Recreational-Cultural
 - [+] Regulatory
 - [+] Warning
 - [-] ND_Temporary Traffic Control



High Mast LED Lighting

- ▶ NDDOT officially began designing all new lighting system installations as LED back in January, 2016.
- ▶ New installations only, existing lighting systems remained as is
- ▶ High Mast Lighting conversion to LED projects in 11/25/2016 & 12/2/2016
- ▶ Project IM-NH-9-999(369) GF, Fargo, VC
- ▶ Project IM-NH-9-999(369) Bismarck, Minot

High Mast LED Lighting

- ▶ Old high pressure sodium luminaire (yellow-light)
- ▶ ~1080 Watts



High Mast LED Lighting

- ▶ New LED luminaire (Holophane HMAO LED II)
- ▶ ~500 Watts

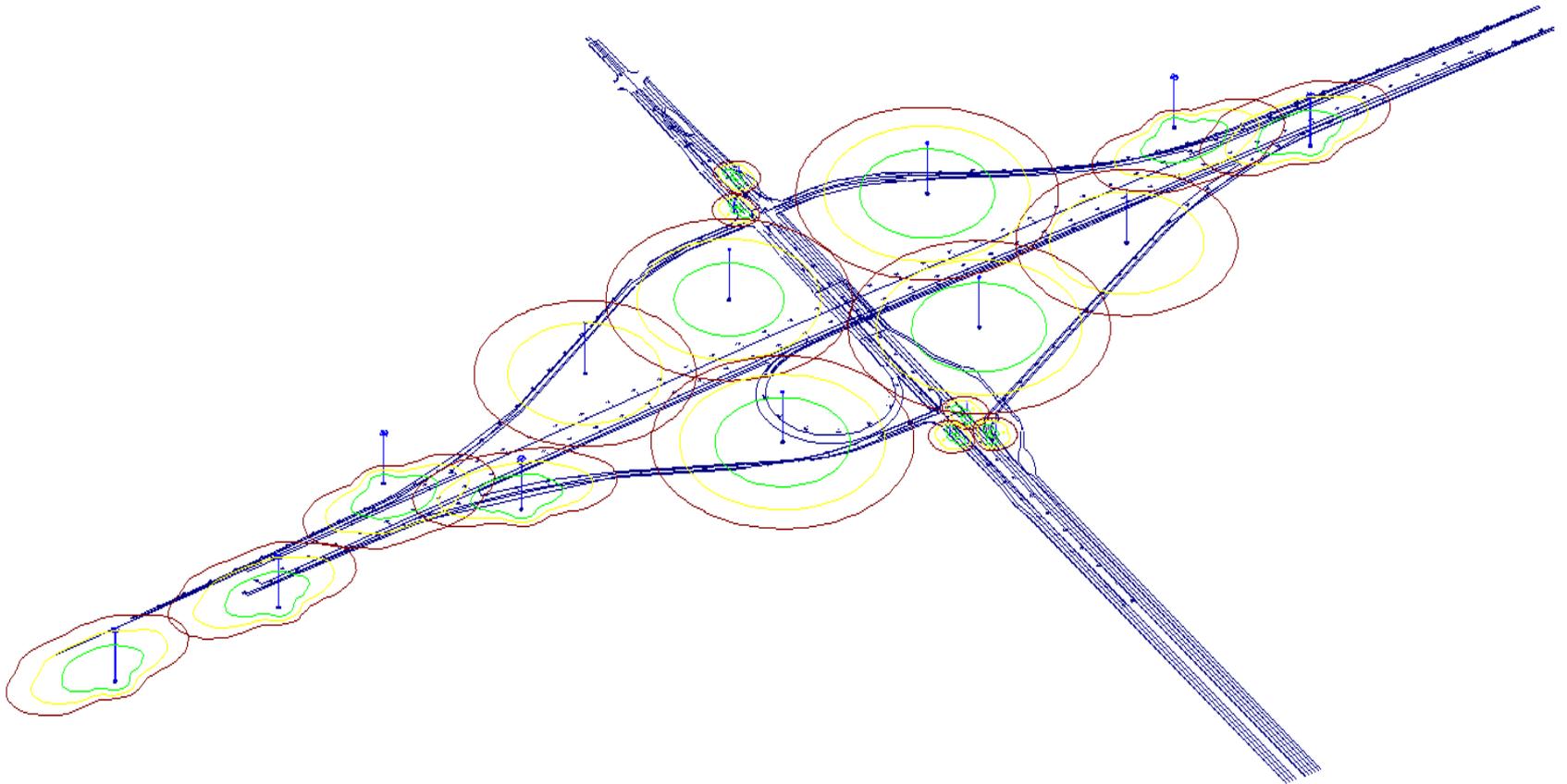


High Mast LED Lighting

- ▶ Just change a light bulb, easy right?
- ▶ Existing systems where installed at different times, with different spacings, and different # of luminaires
- ▶ Every system was revised/redesigned to meet current standards–AASHTO Roadway Lighting Guide 2005 ed.
- ▶ In all cases, the LED luminaires lit the roadway and ramps better than existing
- ▶ 3000K color temp on LED
- ▶ Design life high pressure sodium approx. 3 yrs
- ▶ Design life LED light approx. 22 yrs

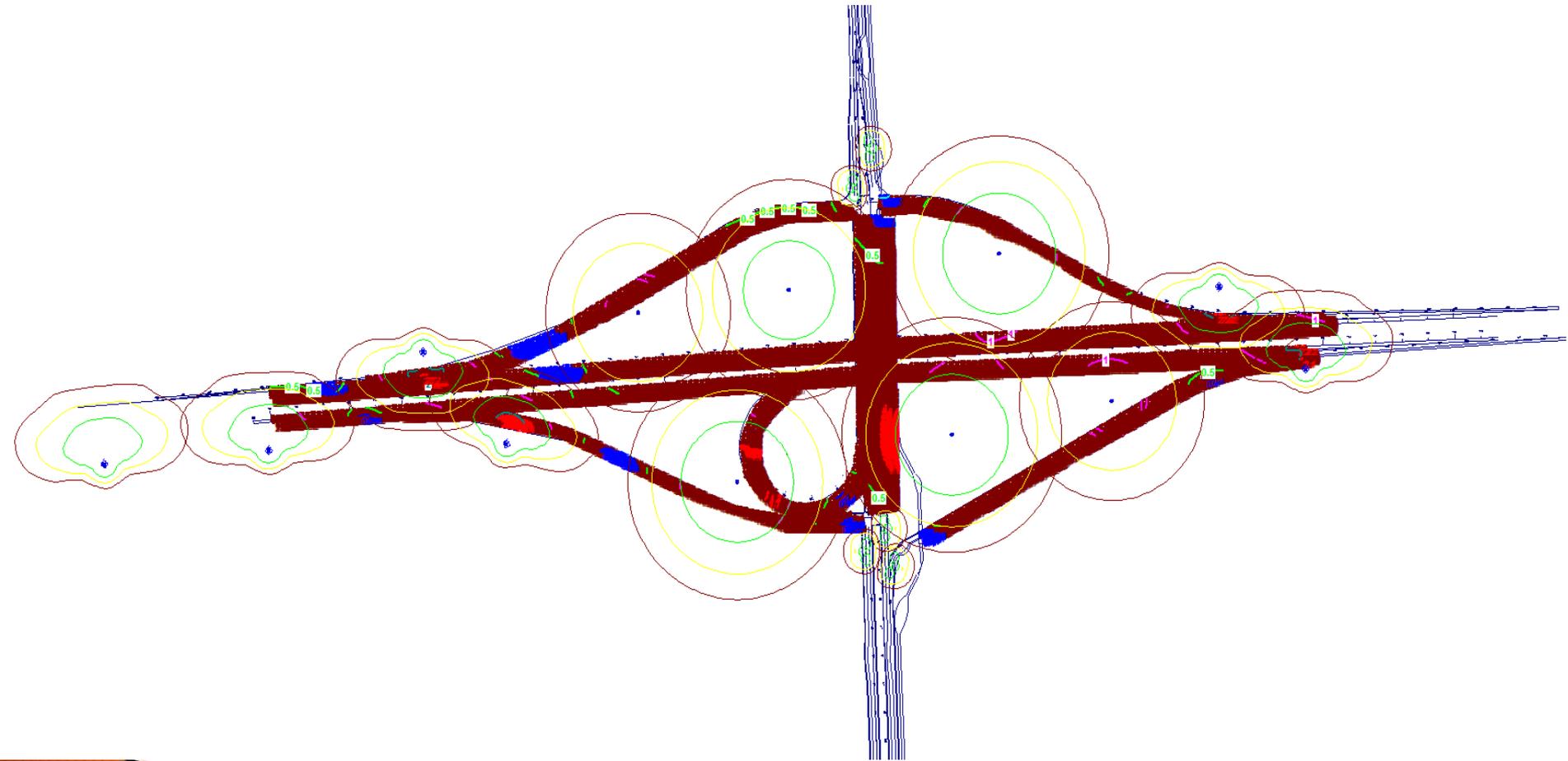
High Mast LED Lighting

- ▶ 9th St & I-94 (West Fargo)



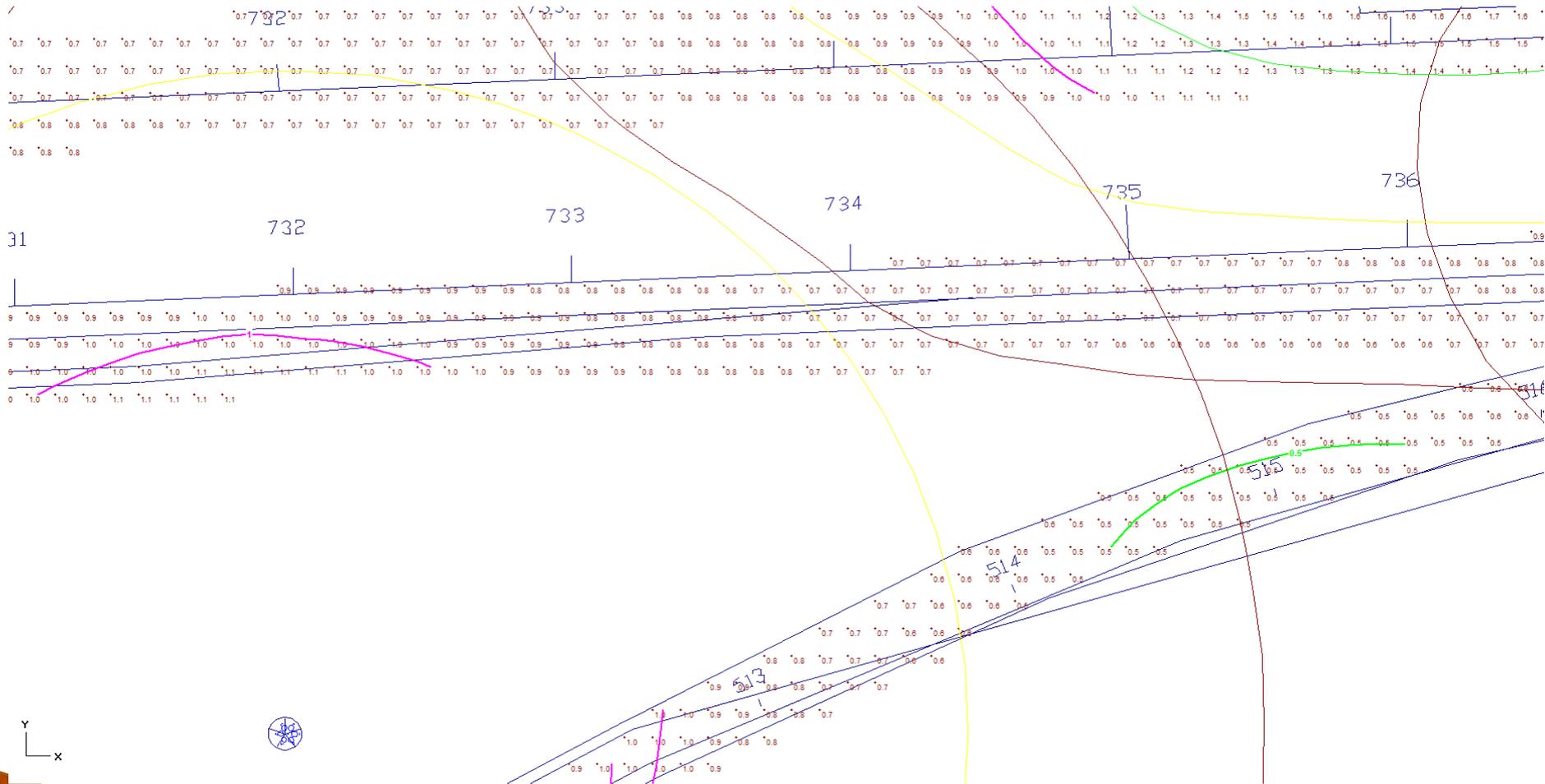
High Mast LED Lighting

- ▶ 9th St & I-94 (West Fargo)



High Mast LED Lighting

▶ 9th St & I-94 (West Fargo)



High Mast LED Lighting

▶ 9th St & I-94 (West Fargo)

STATISTICS						
Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
9th St combined	+	0.9 fc	2.2 fc	0.2 fc	11.0:1	4.5:1
crossroad	+	0.6 fc	0.8 fc	0.3 fc	2.7:1	2.0:1
eastbound	+	0.9 fc	2.2 fc	0.4 fc	5.5:1	2.3:1
NE ramp	+	1.0 fc	2.2 fc	0.2 fc	11.0:1	5.0:1
NW ramp	+	1.0 fc	2.1 fc	0.3 fc	7.0:1	3.3:1
SE ramp	+	0.8 fc	2.1 fc	0.4 fc	5.3:1	2.0:1
SW loop	+	1.0 fc	1.7 fc	0.4 fc	4.3:1	2.5:1
SW ramp	+	0.8 fc	2.2 fc	0.3 fc	7.3:1	2.7:1
westbound	+	0.9 fc	2.2 fc	0.4 fc	5.5:1	2.3:1

High Mast LED Lighting

Sheyenne St West Fargo I-94

required	existing high mast	Holophane HM LED II		GE Evolve HM			Phillips Highfocus	
Interstate	140' ht, 1000w HPS	9, 1000mA, 376w	12, 1000mA, 500w	40, 332w	50, 426w	60, 500w	92L, 1050mA, 320w	184L, 1050mA, 645w
.6 to .8	0.9	0.7	0.9	0.5	0.6	0.8	0.5	0.9
3:1 to 4:1	3.2:1	3.3:1	4.3:1	5.4:1	6.4:1	3.8:1	2.4:1	3.2:1
0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.3
cross-MA-1	1.3	0.7	0.9	0.7	0.8	0.9	0.5	0.9

Proposed - 9th St West Fargo I-94 with 2-6 lum

required	existing high mast	Holophane HM LED II		GE Evolve HM			Phillips Highfocus	
Interstate	140' ht, 1000w HPS	9, 1000mA, 376w	12, 1000mA, 500w	40, 332w	50, 426w	60, 500w	92L, 1050mA, 320w	184L, 1050mA, 645w
.6 to .8	1.	0.7	0.9	0.5	0.6	0.7	0.5	1
3:1 to 4:1	2.6:1	3.4:1	4.5:1	5.3:1	3.2:1	3.7:1	4.9:1	3.2:1
0.2	0.4	0.2	0.2	0.1	0.2	0.2	0.1	0.3
cross-MA-1	0.8	0.4	0.6	0.3	0.4	0.4	0.3	0.7

Proposed 45th St Fargo I-94 with 3-8 lum

required	existing high mast	Holophane HM LED II		GE Evolve HM			Phillips Highfocus	
Interstate	140' ht, 1000w HPS	9, 1000mA, 376w	12, 1000mA, 500w	40, 332w	50, 426w	60, 500w	92L, 1050mA, 320w	184L, 1050mA, 645w
.6 to .8	0.8	0.5	0.7	0.4	0.5	0.6	0.4	0.7
3:1 to 4:1	4.0:1	5.4:1	7.2:1	4.1:1	5.1:1	5.6:1	.	7.3:1
0.2	0.2	0.1	0.1	0.1	0.1	0.1	.	0.1
cross-PA-1.2	1	0.5	0.7	0.5	0.6	0.6	0.4	0.8

25 St Fargo I-94

required	existing high mast	Holophane HM LED II		GE Evolve HM			Phillips Highfocus	
Interstate	140' ht, 1000w HPS	9, 1000mA, 376w	12, 1000mA, 500w	40, 332w	50, 426w	60, 500w	92L, 1050mA, 320w	184L, 1050mA, 645w
.6 to .8	0.7	0.5	0.6	0.4	0.5	0.5	0.3	0.7
3:1 to 4:1	7.0:1	.	.	.	.	5.5:1	.	6.8:1
0.2	0.1	.	.	.	.	0.1	.	0.1
cross-MA-1	0.7	0.5	0.6	0.4	0.5	0.5	0.4	0.7

Univ. Dr Fargo I-94

required	existing high mast	Holophane HM LED II		GE Evolve HM			Phillips Highfocus	
Interstate	140' ht, 1000w HPS	9, 1000mA, 376w	12, 1000mA, 500w	40, 332w	50, 426w	60, 500w	92L, 1050mA, 320w	184L, 1050mA, 645w
.6 to .8	0.8	0.5	0.7	0.4	0.5	0.6	0.4	0.7
3:1 to 4:1	4.0:1	.	.	.	5.4:1	5.8:1	.	7.4:1
0.2	0.2	.	.	.	0.1	0.1	.	0.1
cross-PA-1.2	0.9	0.5	0.7	0.5	0.6	0.6	0.4	0.8

High Mast LED Lighting

- ▶ Old mast pole being removed and replaced



High Mast LED Lighting

- ▶ Same pole as they are lowering it



High Mast LED Lighting

- ▶ New pole being installed



High Mast LED Lighting

- ▶ New pole being installed



High Mast LED Lighting

- ▶ View of new LED Luminaires



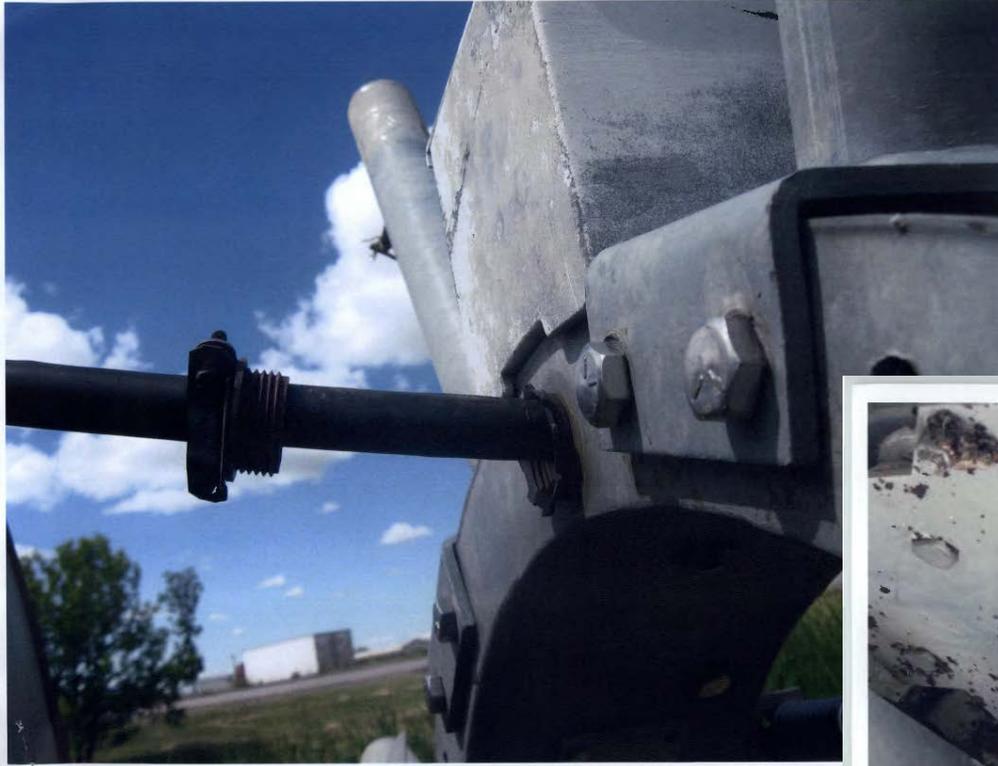
High Mast LED Lighting

- ▶ Lowering device



High Mast LED Lighting

- ▶ Some poles needed replacement



High Mast LED Lighting

- ▶and some needed a good cleaning!



Rural Approachs

- ▶ D-203-8 revisions
- ▶ PPG Detail revisions

DECISION DOCUMENT

RURAL APPROACHES

Standard Drawing D-203-8 & Approach Paving
Standard Details



Prepared by

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
BISMARCK, NORTH DAKOTA

<http://www.dot.nd.gov/>

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PROJECT DEVELOPMENT DIRECTOR
Robert A. Fode, P.E.

Principal Author: Matt Gangness, P.E.
Design Division
March 2017

23 USC § 409
NDDOT Reserves All Objections

Rural Approach Standard

- ▶ D-203-8 revisions
 - Radius increased
 - Storage platform increased
 - No changes to width and max grade
- ▶ Minor Rehab Sliver Grading projects will now address approach geometric (D-203-8)
- ▶ Revised paving/gravel limits for approaches, details (Section 20 sheets) on PPG website

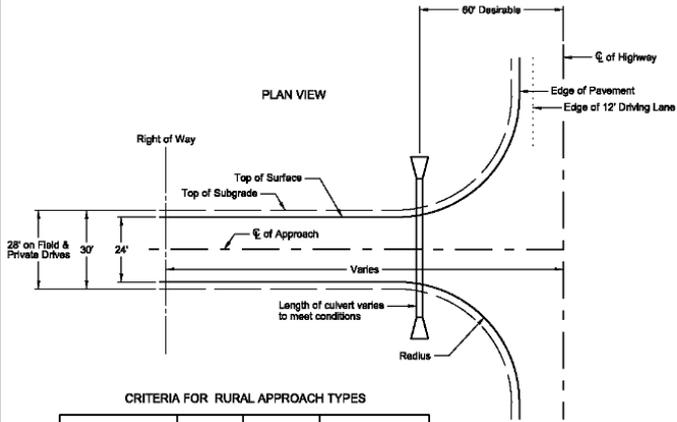
Rural Approach Standard

STANDARD RURAL APPROACHES

D-203-8

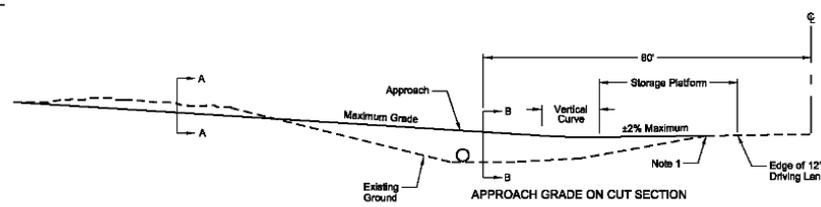
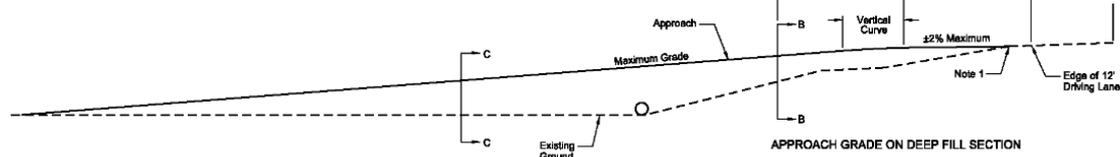
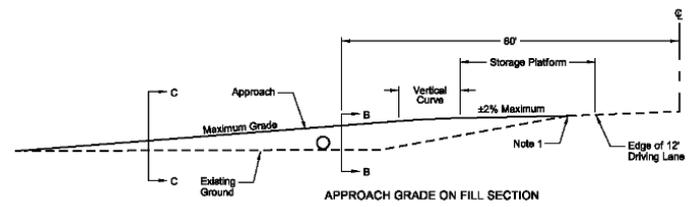
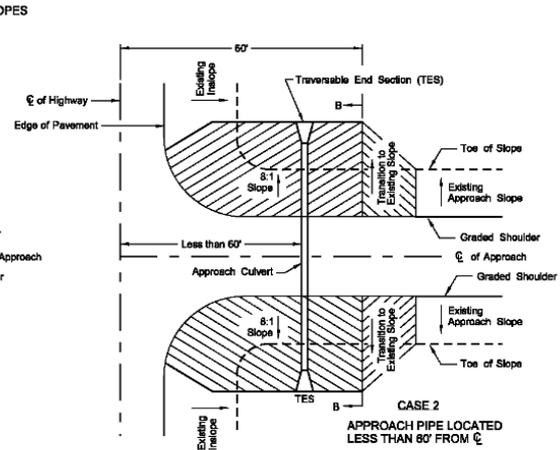
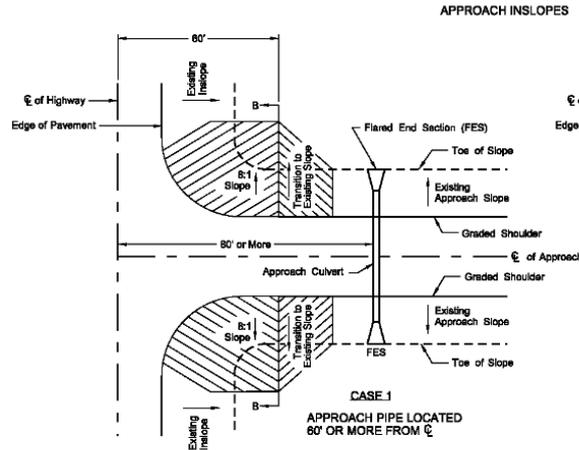
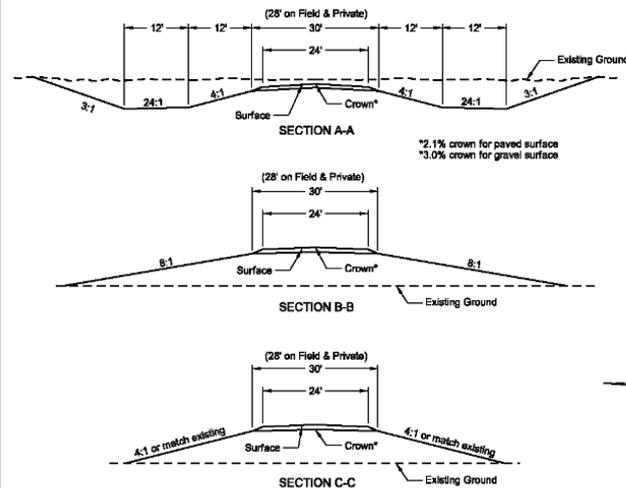
NOTES:

- 5% Max Roll-over between approach storage platform and highway.



CRITERIA FOR RURAL APPROACH TYPES

	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=40 ft	R=40 ft	R=50 ft
Maximum Grade	10%	7%	7%
Storage Platform	24 ft	24 ft	50 ft
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)



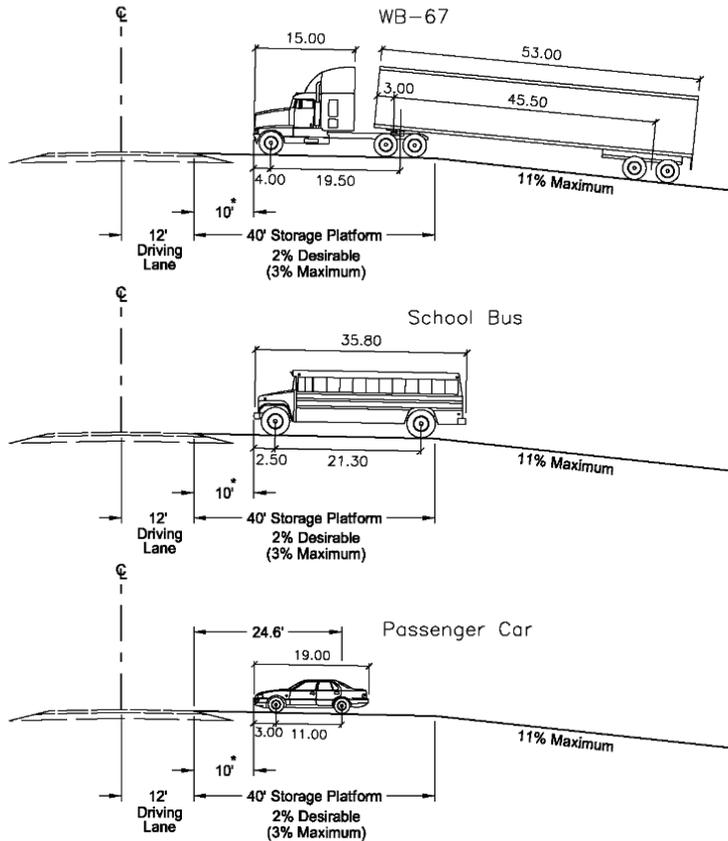
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-36-14	
REVISIONS	
DATE	CHANGE
8-30-2017	Revised Radius, Storage Platform, inslope dimensions, and Note 1.

This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930, on 06/30/17 and the original document is stored at the North Dakota Department of Transportation

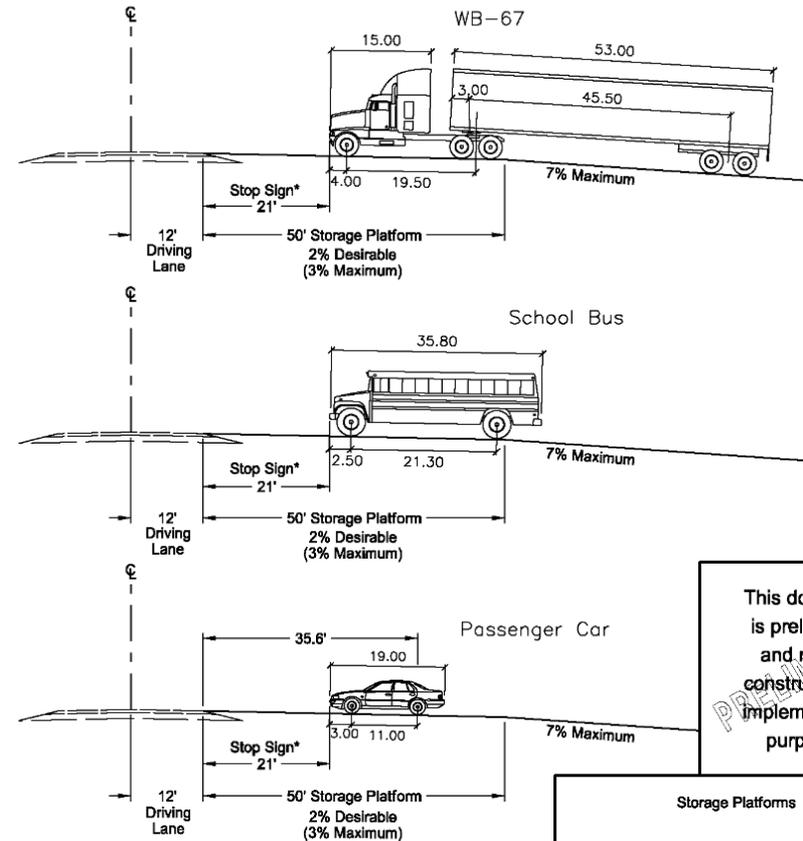
Storage Platform

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	Storage Platform		9

40' Storage Platform with no stop sign
 *AASHTO 2011 Green Book page 9-36. Vehicle stopped 10' from edge of major-road traveled roadway



50' Storage Platform with stop sign
 *Stop Sign location from D-754-23. 21' from edge of driving lane for 50' Radius Intersection

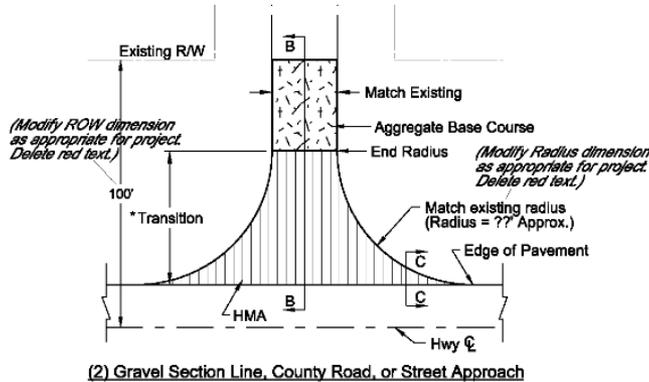
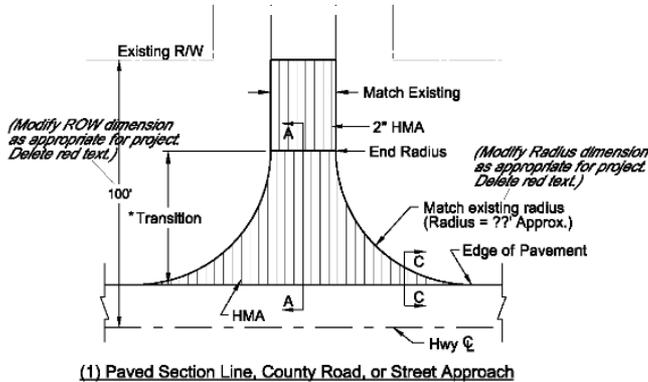


This document is preliminary and not for construction or implementation purposes.

Storage Platforms

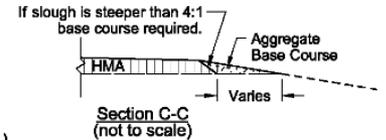
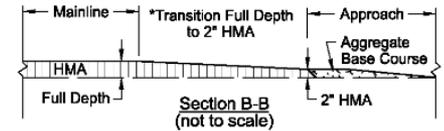
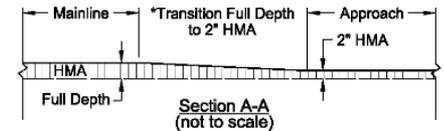
Rural Approach Detail

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	project number	20	page

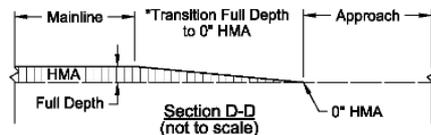
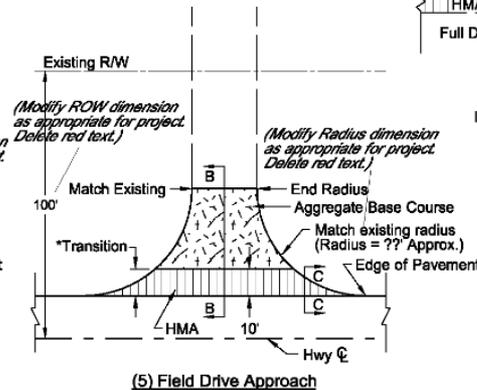
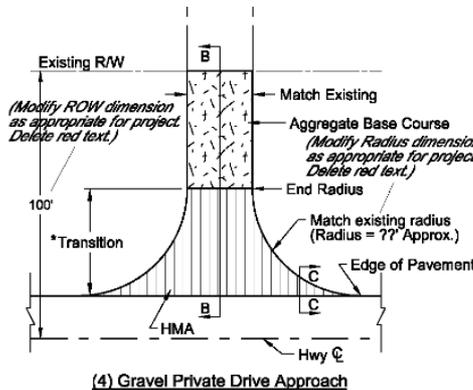
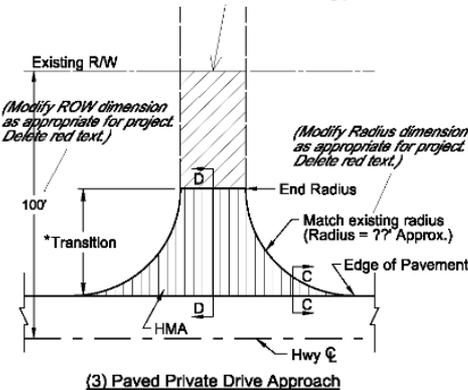


Notes:

- Actual HMA paving and aggregate base course locations may vary in the field, as approved by the Engineer.
- Quantity totals have been included in the bid items of the "Estimate of Quantities" of the plans.
- Aggregate base course has been provided in the quantities to fill in around the radii. This material will be required when sloughs are steeper than 4:1 (see section C-C)



NOTE: (Modify detail below to pave HMA to ROW for Major Rehab and New/Recon projects. All other projects pave to radius as shown. Delete red text and red hatching.)



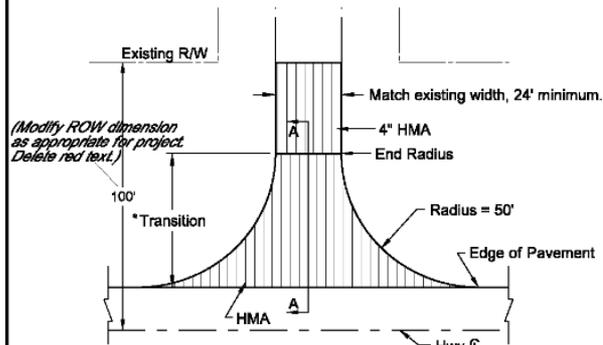
BASIS OF ESTIMATE		(1)	(2)	(3)	(4)	(5)	TOTALS
ITEM	UNIT	Paved Section Line	Gravel Section Line	Paved Private Drive	Gravel Private Drive	Field Drive	
Number of Locations	#	?	?	?	?	?	
Aggregate Base Course CL 5	TON	N/A	?	N/A	?	?	
Tack Coat	GAL	?	?	?	?	?	
Superpave FAA ??	TON	?	?	?	?	?	
PG ?? Asphalt Cement	TON	?	?	?	?	?	

This document is preliminary and not for construction or implementation purposes.

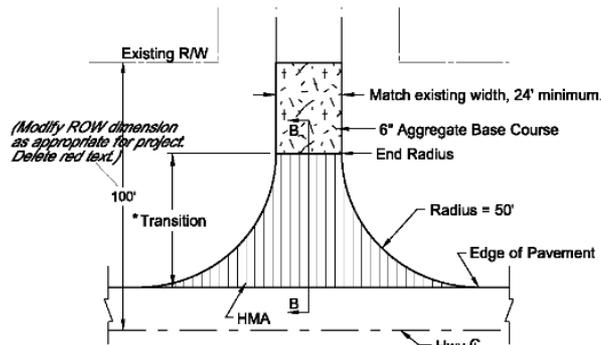
Approach Paving Details for Existing Rural Approaches
(No Approach Grading)

Rural Approach Detail

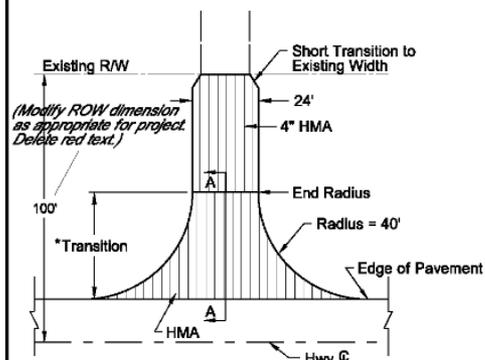
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	project number	20	page



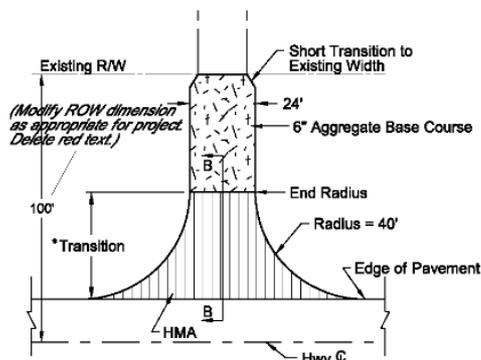
(1) Paved Section Line, County Road, or Street Approach



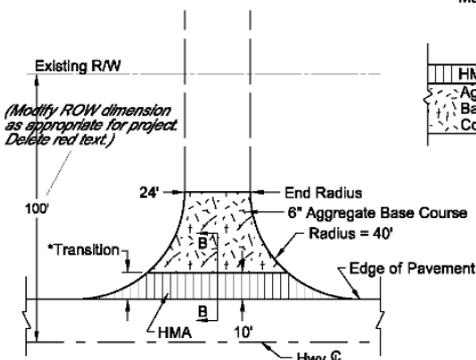
(2) Gravel Section Line, County Road, or Street Approach



(3) Paved Private Drive Approach



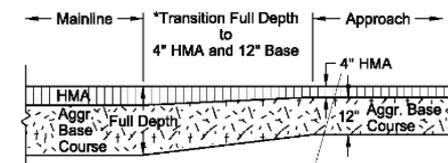
(4) Gravel Private Drive Approach



(5) Field Drive Approach

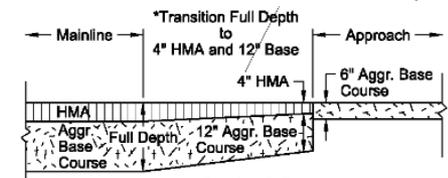
Notes:

- Actual HMA paving and aggregate base course locations may vary in the field, as approved by the Engineer.
- Quantity totals have been included in the bid items of the "Estimate of Quantities" of the plans.



Section A-A (not to scale)

(Modify approach HMA depth as applicable for project. Limit 3" min. to 4" max.)



Section B-B (not to scale)

This document is preliminary and not for construction or implementation purposes.

BASIS OF ESTIMATE		(1)	(2)	(3)	(4)	(5)	TOTALS
ITEM	UNIT	Paved Section Line	Gravel Section Line	Paved Private Drive	Gravel Private Drive	Field Drive	
Number of Locations	#	?	?	?	?	?	
Aggregate Base Course CL 5	TON	N/A	?	N/A	?	?	
Tack Coat	GAL	?	?	?	?	?	
Superpave FAA ??	TON	?	?	?	?	?	
PG ?? Asphalt Cement	TON	?	?	?	?	?	

Approach Paving Details for New or Regrading Rural Approaches (Approach Grading)

Thank you!

- ▶ Matt Gangness, PE
 - ~~Design Division~~ → ETS Division
 - NDDOT

