

| | | | | |
|-------|---------------|-------|-------------|-----------|
| STATE | PROJECT NO. | PCN | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 23421 | 1 | 1 |

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

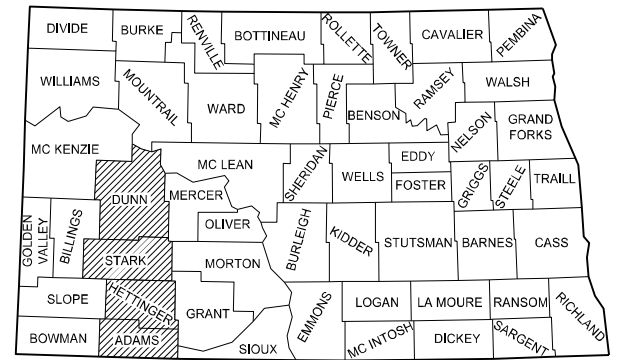
SS-5-999(029)

Adams, Dunn, Hettinger, and Stark County
Various Structures - District 5 (Dickinson District)

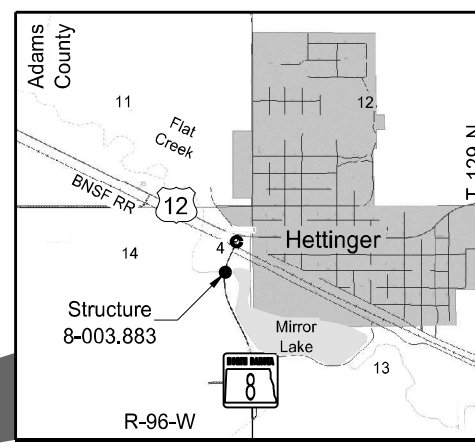
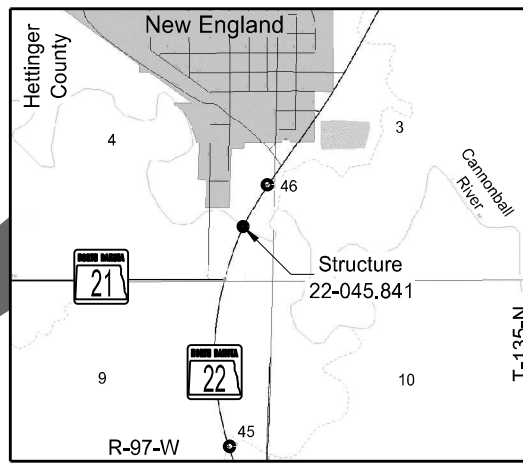
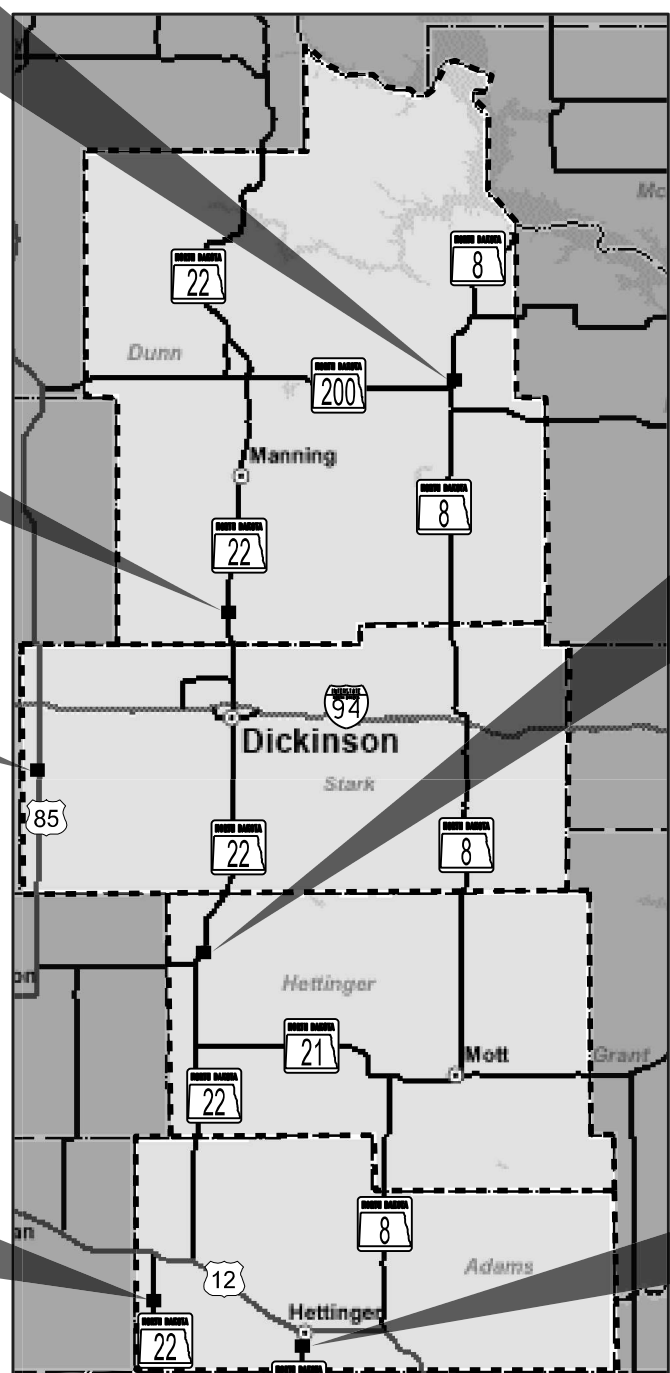
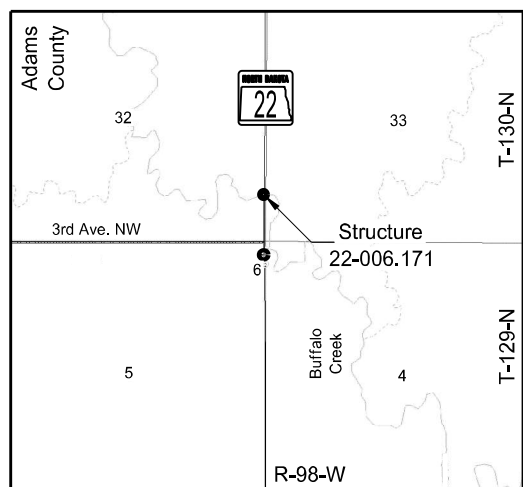
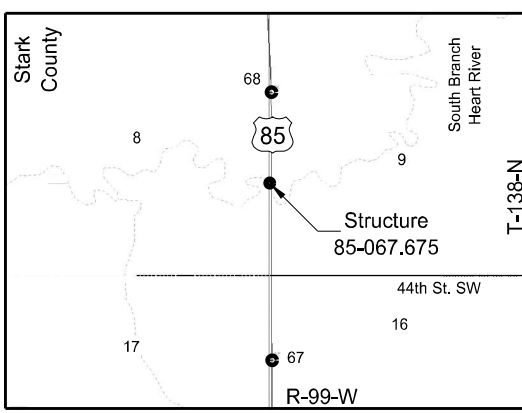
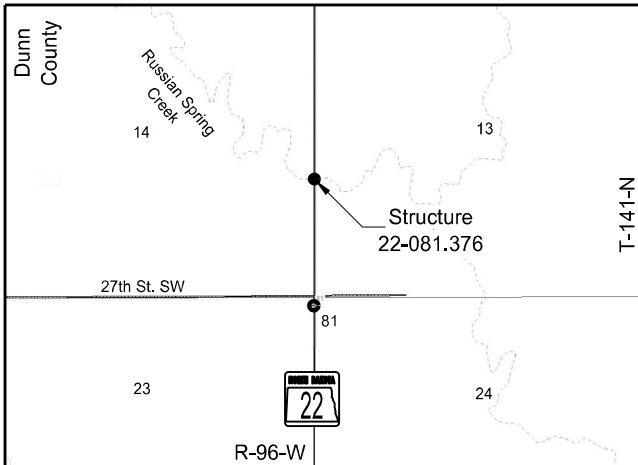
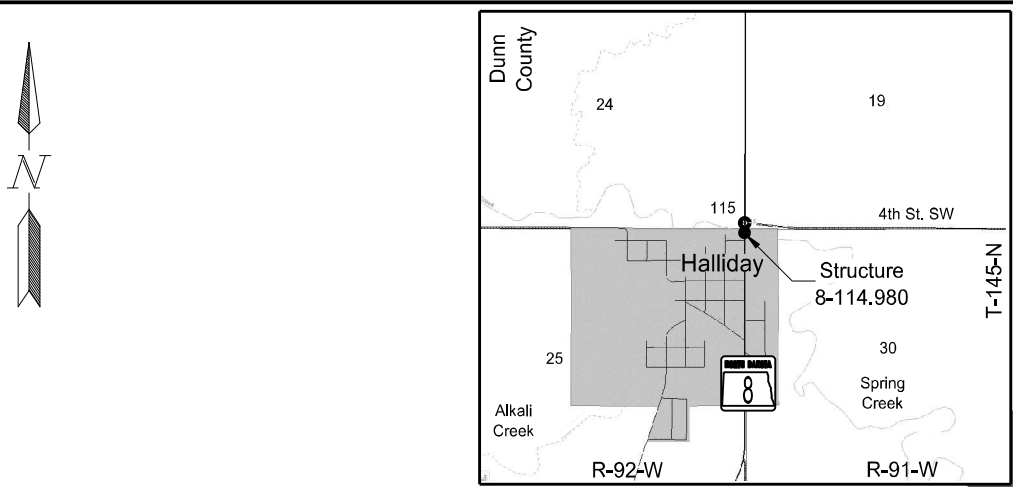
Bridge Deck Overlay, Spall Repairs, Rail Retrofit, and Guardrail

| GOVERNING SPECIFICATIONS | Date Published and Adopted by the North Dakota Department of Transportation |
|-----------------------------|---|
| Standard Specifications | 4/1/2023 |
| Supplemental Specifications | NONE |

| PROJECT NUMBER \ DESCRIPTION | NET MILES | GROSS MILES |
|------------------------------|-----------|-------------|
| SS-5-999(029) | Varies | Varies |



STATE COUNTY MAP



| |
|--|
| DESIGNER Matthew Henderson, PE |
| DESIGNER Mary Boechler, PE Charles Petersen, EIT |
| DESIGNER Mitchell Sforzini, EIT Steven Hellman, EIT |

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT

Jason Thorenson Thorenson, Jason R.
10/05/23

Ulteig Engineers, Inc.

TABLE OF CONTENTS

| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 2 | 1 |

PLAN SECTIONS

LIST OF STANDARD DRAWINGS

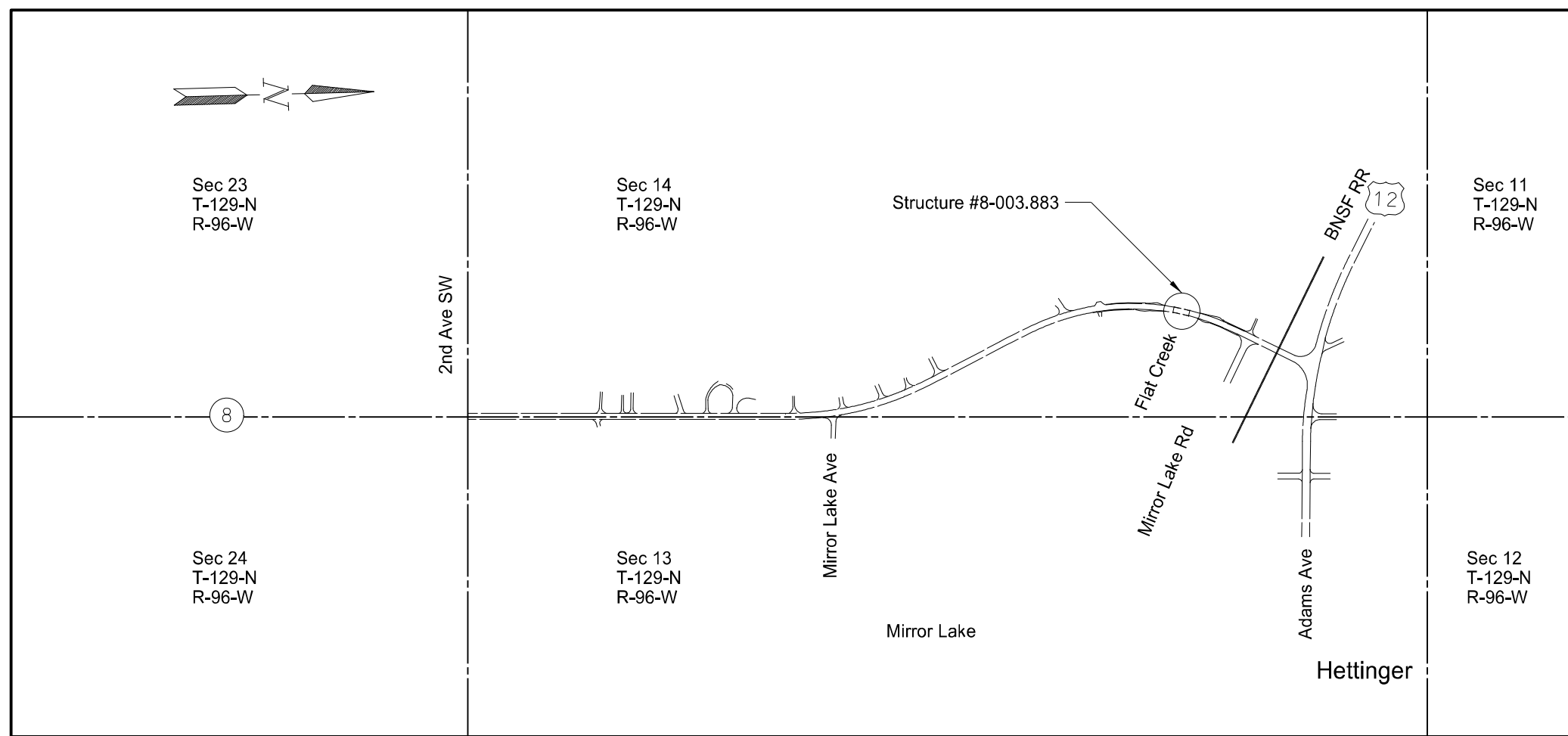
| Section | Page(s) | Description |
|---------|---------|---------------------------|
| 1 | 1 | Title Sheet |
| 2 | 1 | Table of Contents |
| 4 | 1 - 3 | Scope of Work |
| 6 | 1 - 2 | Notes |
| 6 | 3 | Environmental Notes |
| 8 | 1 | Quantities |
| 10 | 1 | Basis of Estimate |
| 20 | 1 - 3 | General Details |
| 100 | 1 - 17 | Work Zone Traffic Control |
| 120 | 1 - 6 | Pavement Marking |
| 130 | 1 - 12 | Guardrail |
| 170 | 1 - 30 | Bridges and Box Culverts |

| Number | Description |
|--------------------|--|
| D-101-1, 2,3,4 | NDDOT Abbreviations |
| D-101-10 | NDDOT Utility Company and Organization Abbreviations |
| D-101-20, 21 | Line Styles |
| D-101-30, 31,32,33 | Symbols |
| D-704-1 | Attenuation Device |
| D-704-7 | Breakaway Systems For Construction Zone Signs - Perforated Tube |
| D-704-8 | Breakaway Systems For Construction Zone Signs - U-Channel Post |
| D-704-9 | Construction Sign Details - Terminal And Guide Signs |
| D-704-10 | Construction Sign Details - Regulatory Signs |
| D-704-11, 11A | Construction Sign Details - Warning Signs |
| D-704-13 | Barricade And Channelizing Device Details |
| D-704-14 | Construction Sign Punching And Mounting Details |
| D-704-15 | Road Closure Layouts |
| D-704-16 | Lane Closure On A Two Lane Road Using Traffic Control Signals |
| D-704-17 | Sign Layout For One Lane Closure Two Lane Roadway |
| D-704-26 | Miscellaneous Sign Layouts |
| D-704-27 | Mobile Operation (Pavement Marking) |
| D-704-50 | Portable Sign Support Assembly |
| D-704-51 | Portable Precast Concrete Median Barrier (Temporary Usage) |
| D-754-48 | Sign Punching, Stringer and Support Location Details For Variable Length Signs |
| D-762-4 | Pavement Marking |
| D-762-11 | Short-Term Pavement Marking |
| D-764-1 | W-Beam Guardrail General Details |
| D-764-5 | Sequential Kinking Terminal |
| D-764-6 | Flared Energy Absorbing Terminal |
| D-764-9 | W-Beam Transition To Concrete Jersey Barrier With Approach Curb |
| D-764-10 | Thrie Beam Transition To Double Box Beam Retrofit |
| D-764-22 | Typical Grading At Bridge Ends With W-Beam Guardrail |
| D-764-38 | MGS Flared Energy Absorbing Terminal - Wood Post |
| D-764-40 | MGS W-Beam Guardrail General Details |
| D-764-48 | Typical Grading at Bridge Ends with MGS W-Beam Guardrail |
| D-764-50 | MASH SoftStop End Terminal - Steel Post |
| D-764-51 | MASH Sequential Kinking Terminal - Wood Post |

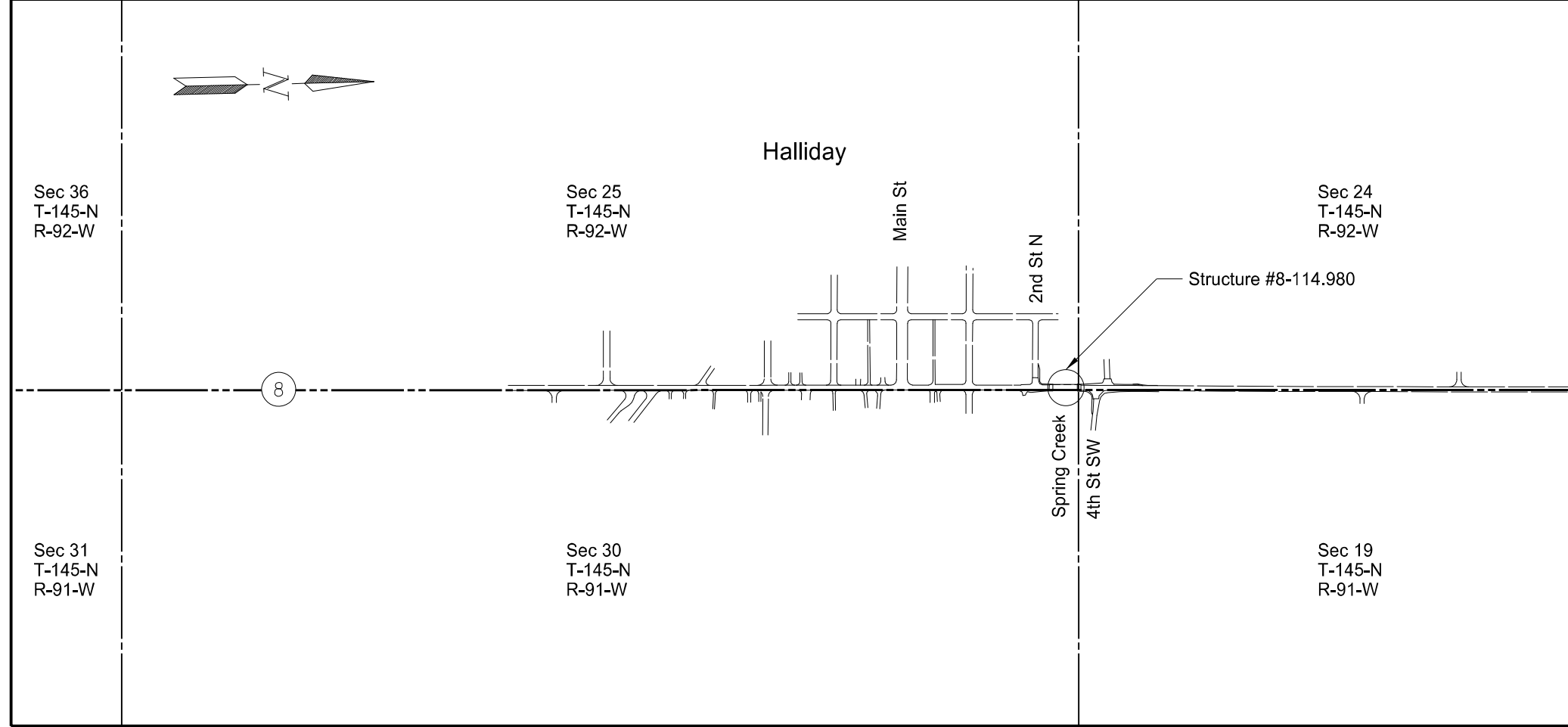
SPECIAL PROVISIONS

| Number | Description |
|------------|--|
| PSP 36(23) | Permits and Environmental Considerations |
| SSP 2 | Federal Migratory Bird Treaty Act |
| SP 135(23) | Commercial Grade Hot Mix Asphalt |

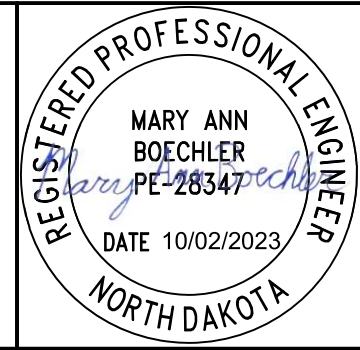
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|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 4 | 1 |



The general repairs of each structure are as follows:
 Structure #8-003.883: Deck Overlay, Spall Repair, Rail Retrofit, Guardrail Replacement
 Structure #8-114.980: Deck Overlay, Spall Repair, Modify Deck Drain

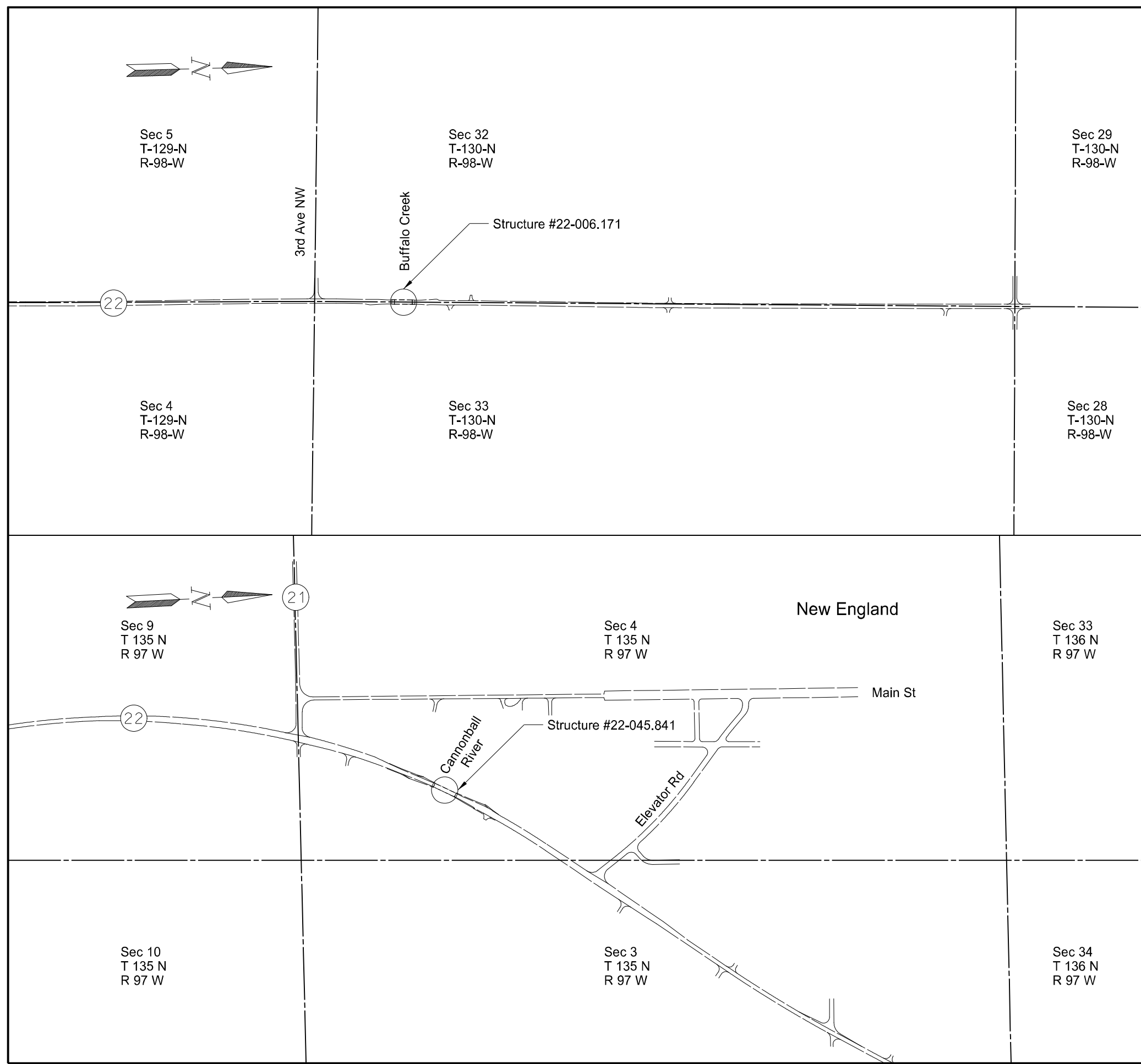


Scope of Work
 Structure #8-003.883
 Structure #8-114.980
 Various Structures - District 5
 (Dickinson District)



| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 4 | 2 |

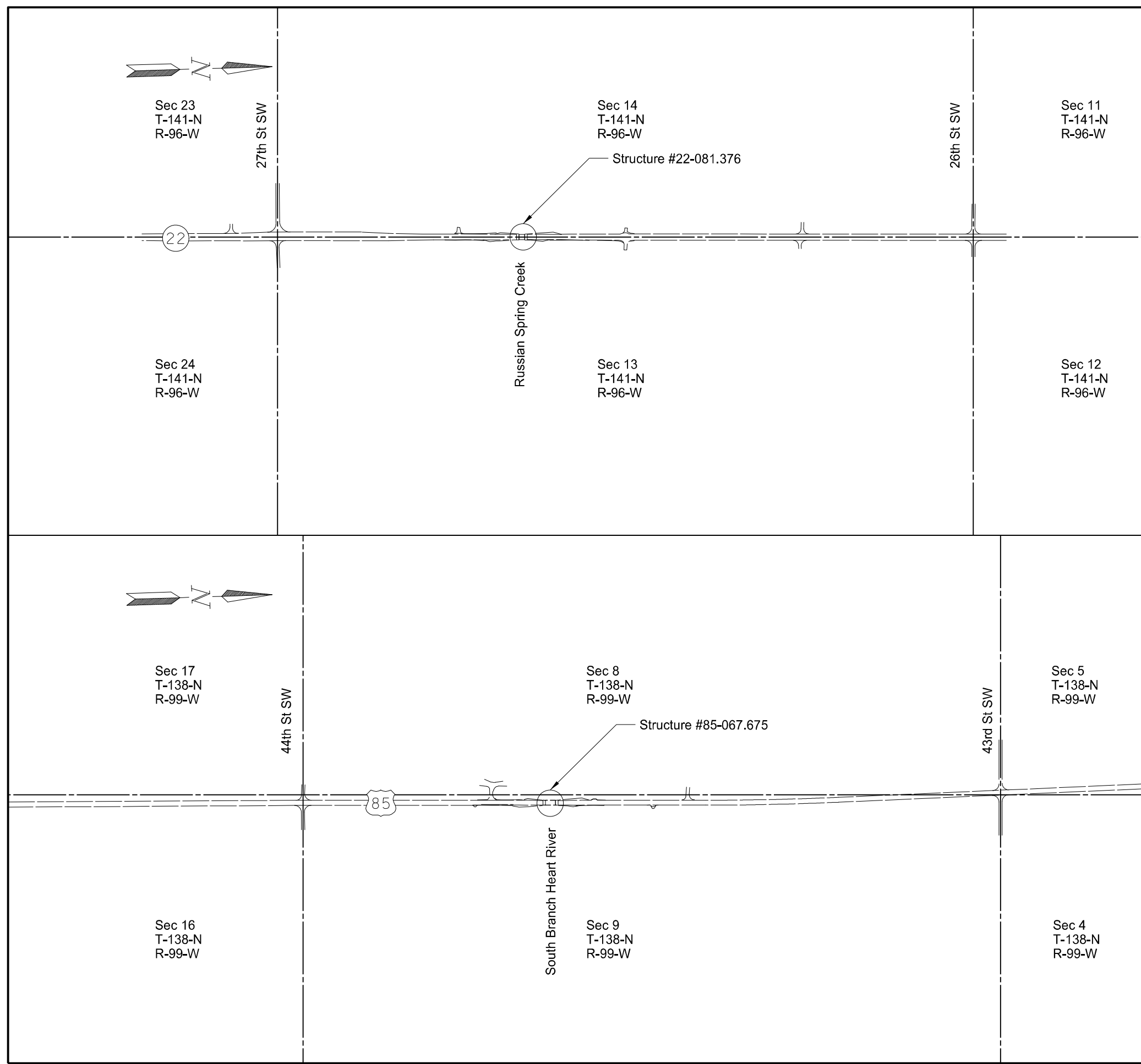
The general repairs of each structure are as follows:
 Structure #22-006.171: Pier Repair, Spall Repair, Silicone Sealant
 Structure #22-045.841: Deck Overlay, Spall Repair, Modify Deck Drain, Rail Retrofit, Guardrail Replacement, Erosion Repair



Scope of Work
 Structure #22-006.717
 Structure #22-045.841
 Various Structures - District 5
 (Dickinson District)



| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 4 | 3 |



The general repairs of each structure are as follows:
 Structure #22-081.376: Deck Overlay, Remove and Replace Approach Slabs, Modify Deck Drain, Remove and Reset Guardrail
 Structure #85-067.675: Deck Overlay, Remove and Replace Approach Slabs, Modify Deck Drain, Rail Retrofit, Guardrail Replacement

Scope of Work
 Structure #22-081.376
 Structure #85-067.675
 Various Structures - District 5
 (Dickinson District)



NOTES

100-P01 COORDINATION OF PROJECTS: Other projects in the vicinity of this project are under contract during the 2023-2025 construction season:

PCN 23544 located on ND 22 N 34TH ST N TO RP 91

This list is not comprehensive and other projects may exist.

100-P02 ORDER OF OPERATIONS FOR STRUCTURE REPAIRS: All six of the structure site locations can be open at a time. A site will be considered open until all work requiring median barriers, including but not limited to the items listed in the table below, is complete. Use traffic control shown in Section 100 during work activities that require median barriers. Complete the work requiring median barriers within the time allotted in the table. Time charges will begin when traffic is reduced to one lane and will end when traffic is open to two lanes. See the Request for Proposal for associated liquidated damages rates.

| Structure Number | Hwy | Crossing | County | Work Requiring Median Barriers | Maximum Calendar Days |
|------------------|-------|--------------------------|-----------|---|-----------------------|
| 8-003.883 | ND 8 | Flat Creek | Adams | Deck Overlay, Spall Repair, Rail Retrofit, Guardrail | 60 |
| 8-114.980 | ND 8 | Spring Creek | Dunn | Deck Overlay, Spall Repair | 60 |
| 22-006.171 | ND 22 | Buffalo Creek | Adams | Spall Repair, Silicone Sealant | 30 |
| 22-045.841 | ND 22 | Cannonball River | Hettinger | Deck Overlay, Spall Repair, Rail Retrofit, Guardrail | 60 |
| 22-081.376 | ND 22 | Russian Spring Creek | Dunn | Deck Overlay, Remove and Replace Approach Slabs, Guardrail | 90 |
| 85-067.675 | US 85 | South Branch Heart River | Stark | Deck Overlay, Remove and Replace Approach Slabs, Rail Retrofit, Guardrail | 90 |

Complete remaining work using flagging in accordance with standard drawing D-704-15.

704-200 STATE FURNISHED MEDIAN BARRIER: Obtain (51) 18" x 19' steel barriers. Obtain (36) 22.5" x 12.5' concrete barriers. Obtain (48) 2.5' x 10' concrete barriers. They can be picked up and returned to the Sterling yard. Contact the Bismarck District office at 701-328-6950 to facilitate the exchanges.

Obtain (36) 22.5" x 12.5' concrete barriers. They can be picked up and returned to the Belfield yard. Contact the Dickinson District office at 701-227-6500 to facilitate the exchanges.

Obtain (34) 22.5" x 12.5' concrete barriers. They can be picked up and returned to the Casselton yard. Contact the Fargo District office at 701-239-8900 to facilitate the exchanges.

Section 704.04 J "Precast Concrete Median Barrier (State Furnished)" applies to the contract item "State Furnished Median Barrier".

If returning barriers with connection components, coordinate the delivery location for the connecting components with the Engineer. Some 4 inch x 4 inch boards are available at the return location. Provide any additional 4 inch x 4 inch boards necessary to stack barriers. The boards will become property of the Department.

Payment for the State Furnished Median Barrier will follow Section 704.06 D "Precast Concrete Median Barrier (State Furnished)". Each structure location is considered a project site. Payment will occur for the amount placed and removed at each structure regardless of if the barriers are transferred from NDDOT yards or another structure location. Include all costs associated with median barriers in the contract unit price for "State Furnished Median Barrier".

704-450 LANE CLOSURE - SIGNAL CONTROL/FLAGGING CONTROL: Install either the signal controlled lane closure on Standard D-704-16 or the flagging controlled land closure on Standard D-704-17.

Obtain an electrical source for traffic signals. Solar powered signals may be used. Place generators a minimum of 60 feet from the roadway centerline, unless the generator and signal are part of a trailer mounted unit.

Place utility poles and equipment a minimum of 60 feet from the roadway centerline and place power conductors a minimum of 6 inches below the ground surface. Remove poles after they are no longer necessary.

The Engineer will measure individual traffic control devices, other than the signal system and flaggers, shown on the standards. Payment will be made at the respective contract unit price. Include the cost of either a traffic signal system or flaggers in the contract unit price for "Lane Closure – Signal Control/Flagging Control".



| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 6 | 2 |

NOTES

704-P01 TRAFFIC CONTROL DEVICES: The traffic control devices list has been developed using the traffic control layout sheets and the list below:

- D-704-15, Layout Type A: Use when placing, moving and removing state furnished median barriers.
- D-704-16 or 17: Sign layout for Lane Closure on a Two Lane Road Using Traffic Control Signals

Traffic control device quantities for the six bridge locations are based on a maximum of three simultaneous locations.

Bridge 8-003.883: Deck Overlay, Spall Repair, Rail Retrofit, Guardrail
A signal-controlled lane closure has been provided for the two-lane roadway. Use 418 LF (22 EA) of 18" x 19' steel barriers, one B-25, and one B-45 attenuation device for the lane closure. Place signs and devices in accordance with Sec 100 plan sheets.

Bridge 8-114.980: Deck Overlay, Spall Repair
A signal-controlled lane closure has been provided for the two-lane roadway. Use 425 LF (34 EA) of 22.5" x 12.5' concrete barriers, one B-25, and one B-65 attenuation device for the lane closure. Place signs and devices in accordance with Sec 100 plan sheets.

Bridge 22-006.171: Spall Repair, Silicone Sealant
A signal-controlled lane closure has been provided for the two-lane roadway. Use 450 LF (36 EA) of 22.5" x 12.5' concrete barriers and two B-65 attenuation devices for the lane closure. Place signs and devices in accordance with Sec 100 plan sheets.

Bridge 22-045.841: Deck Overlay, Spall Repair, Rail Retrofit, Guardrail
A signal-controlled lane closure has been provided for the two-lane roadway. Use 551 LF (29 EA) of 18" x 19' steel barriers and two B-65 attenuation devices for the lane closure. Place signs and devices in accordance with Sec 100 plan sheets.

Bridge 22-081.376: Deck Overlay, Remove and Replace Approach Slabs, Guardrail
A signal-controlled lane closure has been provided for the two-lane roadway. Use 450 LF (36 EA) of 22.5" x 12.5' concrete barriers and two B-65 attenuation devices for the lane closure. Place signs and devices in accordance with Sec 100 plan sheets.

Bridge 85-067.675: Deck Overlay, Remove and Replace Approach Slabs, Rail Retrofit, Guardrail
A signal-controlled lane closure has been provided for the two-lane roadway. Use 480 LF (48 EA) of 2.5' x 10' concrete barriers and two B-65 attenuation devices for the lane closure. Place signs and devices in accordance with Sec 100 plan sheets.

Barriers listed for each structure represent the maximum barrier width allowable at each location.

704-P02 OBLITERATION OF CENTERLINE PAVEMENT MARKINGS: Masking of centerline pavement marking designated for obliteration is allowed. Choose to remove or mask marking as specified in Section 704.04 N, "Obliteration of Pavement Markings".

762-050 PAVEMENT MARKING: If the Engineer and Contractor agree, plan quantity will be used as the measurement for payment for pavement marking items.

764-P01 REMOVE W-BEAM GUARDRAIL & POSTS: Remove the existing w-beam guardrail, posts, end treatment, and transition at the locations shown in the plans.

Deliver all salvageable w-beam guardrail, posts, end treatment, & transitions from the Cannonball River Bridge on ND Hwy 22 at RP 45.841 to the Dickinson NDDOT Maintenance Storage Yard at 1700 3rd Ave W Ste 101, Dickinson, ND 58601. Neatly stack them at a location designated by the Engineer.

All salvageable w-beam guardrail, posts, end treatment, & transitions from the South Branch Heart River Bridge on US Hwy 85 at RP 67.675 become property of the contractor.

Include the costs for removal and disposal of all unsalvageable materials, and delivery of all salvageable materials in the contract unit price bid for "Remove W-Beam Guardrail & Posts" and "Remove End Treatment & Transition."

764-P02 REMOVE BOX BEAM GUARDRAIL: Remove the existing box beam guardrail, posts, end treatment, and transition at the location shown in the plans.

All salvageable box beam guardrail, posts, end treatment, & transitions from the Flat Creek Bridge on ND Hwy 8 at RP 3.883 become property of the contractor.

Include the costs for removal and disposal of all unsalvageable materials, and relocation of all salvageable materials in the contract unit price bid for "Remove Box Beam Guardrail" and "Remove End Treatment & Transition."



ENVIRONMENTAL NOTES

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 6 | 3 |

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation has made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-1 SPAWNING RESTRICTION: Do not work within the Buffalo Creek from April 15 to June 1.

EN-2 AQUATIC NUISANCE SPECIES (ANS): Equipment that was last used outside of North Dakota or within a Class I infested waterbody (identified on the North Dakota Game and Fish Department (NDGFD) website) requires an inspection by NDGFD. Notify the NDGFD at least 10 business days prior to pumps, watercraft, or any equipment entering a public water to allow the NDGFD sufficient time to inspect any and all such equipment for ANS. Contact the NDGFD ANS Coordinator, Ben Holen by e-mail - bholen@nd.gov for equipment inspections. Supply one of the following to the engineer as proof of compliance prior to work taking place in the water: (1) the NDGFD inspection report, (2) documented NDGFD correspondence (email or signed letter).

EN-3 CONSTRUCTION REQUIREMENTS: Take all precautions during the preparation and repair of pier 2 and pier 3 at Structure #22-006.171 to prevent any materials from falling into the water. Prevent any fuel spillage, lubricants, and chemicals from surface water using safe storage, handling procedures, and equipment maintenance.



Estimated Quantities

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 8 | 1 |

| SPEC | CODE | ITEM DESCRIPTION | UNIT | Mainline: | | TOTAL |
|------|------|--|-------|-----------|--|-------|
| | | | | | | |
| 103 | 0100 | CONTRACT BOND | L SUM | 1 | | 1 |
| 202 | 0132 | REMOVAL OF BITUMINOUS SURFACING | SY | 2247 | | 2247 |
| 203 | 0119 | TOPSOIL-IMPORTED | CY | 105 | | 105 |
| 256 | 0200 | RIPRAP GRADE II | CY | 6 | | 6 |
| 262 | 0100 | FLOTATION SILT CURTAIN | LF | 152 | | 152 |
| 262 | 0101 | REMOVE FLOTATION SILT CURTAIN | LF | 152 | | 152 |
| 302 | 0120 | AGGREGATE BASE COURSE CL 5 | TON | 952 | | 952 |
| 411 | 0105 | MILLING PAVEMENT SURFACE | SY | 1067 | | 1067 |
| 430 | 0500 | COMMERCIAL GRADE HOT MIX ASPHALT | TON | 383 | | 383 |
| 602 | 1135 | BRIDGE APPROACH SLAB-REMOVE & REPLACE | SY | 348 | | 348 |
| 602 | 1210 | BRIDGE END POST MODIFICATION | EA | 4 | | 4 |
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 2860 | | 2860 |
| 602 | 1260 | BRIDGE DECK CRACK SEALING | LF | 41 | | 41 |
| 602 | 7000 | SPECIAL SURFACE FINISH | SF | 5163 | | 5163 |
| 624 | 3001 | DOUBLE BOX BEAM RAIL RETROFIT-FREE STANDING | LF | 530 | | 530 |
| 624 | 3002 | DOUBLE BOX BEAM RAIL RETROFIT - E-RAIL | LF | 154 | | 154 |
| 650 | 0704 | OVERLAY CONCRETE | CY | 97.9 | | 97.9 |
| 650 | 0707 | DECK CONCRETE | CY | 29.6 | | 29.6 |
| 650 | 0710 | CLASS 1-H REMOVAL | SY | 1851 | | 1851 |
| 650 | 0711 | CLASS 2-H REMOVAL | SY | 426 | | 426 |
| 650 | 0712 | CLASS 3-H REMOVAL | SY | 108 | | 108 |
| 650 | 0720 | CLASS 1 REMOVAL | SY | 667 | | 667 |
| 702 | 0100 | MOBILIZATION | L SUM | 1 | | 1 |
| 704 | 0100 | FLAGGING | MHR | 240 | | 240 |
| 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | 5411 | | 5411 |
| 704 | 1018 | LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL | EA | 6 | | 6 |
| 704 | 1035 | ATTENUATION DEVICE-TYPE B-25 | EA | 2 | | 2 |
| 704 | 1039 | ATTENUATION DEVICE-TYPE B-45 | EA | 1 | | 1 |
| 704 | 1043 | ATTENUATION DEVICE-TYPE B-65 | EA | 9 | | 9 |
| 704 | 1052 | TYPE III BARRICADE | EA | 18 | | 18 |
| 704 | 1060 | DELINEATOR DRUMS | EA | 89 | | 89 |
| 704 | 1500 | OBLITERATION OF PAVEMENT MARKING | SF | 1992 | | 1992 |
| 704 | 3511 | STATE FURNISHED MEDIAN BARRIER | LF | 2774 | | 2774 |
| 762 | 0420 | SHORT TERM 4IN LINE-TYPE R | LF | 17726 | | 17726 |
| 762 | 0426 | SHORT TERM 24IN LINE-TYPE R | LF | 156 | | 156 |
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | LF | 8929 | | 8929 |
| 764 | 0131 | W-BEAM GUARDRAIL | LF | 1399 | | 1399 |
| 764 | 0145 | W-BEAM GUARDRAIL END TERMINAL | EA | 12 | | 12 |
| 764 | 0150 | REMOVE & RESET GUARDRAIL | LF | 158 | | 158 |
| 764 | 0151 | REMOVE W-BEAM GUARDRAIL & POSTS | LF | 970 | | 970 |
| 764 | 2080 | REMOVE BOX BEAM GUARDRAIL | LF | 368 | | 368 |
| 764 | 2081 | REMOVE END TREATMENT & TRANSITION | EA | 12 | | 12 |
| 930 | 8230 | SHORING | EA | 1 | | 1 |
| 930 | 8644 | SILICONE SEALANT | LF | 66 | | 66 |
| 930 | 9534 | MODIFY DECK DRAIN | EA | 20 | | 20 |
| 930 | 9612 | SPALL REPAIR | SF | 66 | | 66 |
| 930 | 9630 | PIER REPAIR | L SUM | 1 | | 1 |

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 10 | 1 |

| ESTIMATED QUANTITIES FOR BRIDGE TRANSITIONS SURFACING | | | | | | | | | | |
|---|------|---|------|---|------------|---|------------|--|------------|--------|
| | | | | Structure #8-003.883: ND Hwy 8 over Flat Creek | | Structure #22-045.84: ND Hwy 22 over Cannonball River | | Structure #85-067.675: US Hwy 85 over South Branch Heart River | | |
| | | | | North | South | North | South | North | South | |
| | | | | 30 FT Wide | 30 FT Wide | 30 FT Wide | 30 FT Wide | 36 FT Wide | 36 FT Wide | |
| Spec | Code | Bid item | UNIT | Quantity at Location | | | | | | Total |
| 411 | 0105 | MILLING PAVEMENT SURFACE | SY | 166.7 | 166.7 | 166.7 | 166.7 | 200.0 | 200.0 | 1066.8 |
| 430 | 0500 | COMMERCIAL GRADE HOT MIX ASPHALT @ 2 TON/CY | TON | 18.5 | 18.5 | 18.5 | 18.5 | 22.2 | 22.2 | 118.4 |
| * | * | TACK COAT @ 0.05 Gal/SY | GAL | 8.3 | 8.3 | 8.3 | 8.3 | 10.0 | 10.0 | 53.2 |
| * | * | PG 58S-28 ASPHALT CEMENT @ 6% | TON | 1.1 | 1.1 | 1.1 | 1.1 | 1.3 | 1.3 | 7.0 |

* Not a pay item. Included in the contract unit price bid for 430 0500 Commercial Grade Hot Mix Asphalt.

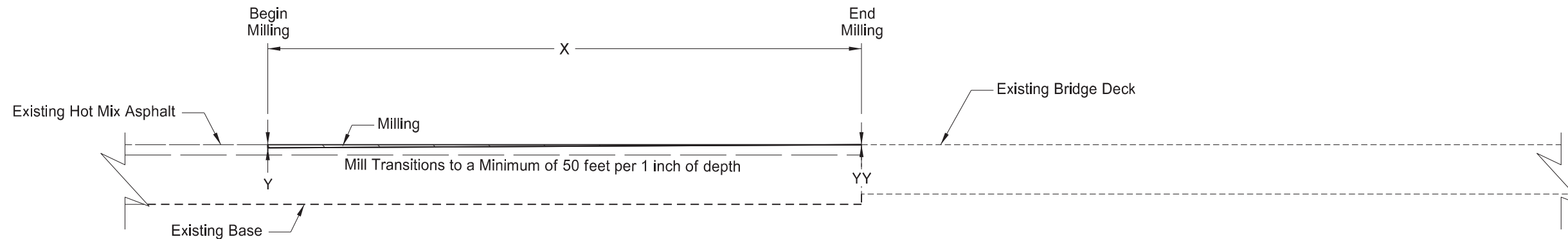
| ESTIMATED QUANTITIES FOR GUARDRAIL EMBANKMENT SURFACING | | | | | | | | | | | | | | | | | | | | | |
|---|------|---|------|---|-------|------------|-------|---|-------|------------|-------|--|-----|------------|-----|--|-------|------------|-------|--------|--|
| | | | | Structure #8-003.883: ND Hwy 8 over Flat Creek | | | | Structure #22-045.841: ND Hwy 22 over Cannonball River | | | | Structure #22-081.376: ND Hwy 22 over Russian Spring Creek | | | | Structure #85-067.675: US Hwy 85 over South Branch Heart River | | | | | |
| | | | | Begin Bridge | | End Bridge | | Begin Bridge | | End Bridge | | Begin Bridge | | End Bridge | | Begin Bridge | | End Bridge | | | |
| Spec | Code | Bid Item | UNIT | RT | LT | RT | LT | RT | LT | RT | LT | RT | LT | RT | LT | RT | LT | RT | LT | Total | |
| 203 | 0119 | TOPSOIL - IMPORTED | CY | 14.8 | 8.3 | 7.4 | 13.5 | 8.7 | 3.8 | 13.4 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 9.4 | 6.4 | 3.5 | 13.5 | 105.0 | |
| | | Assume 8" depth | | | | | | | | | | | | | | | | | | | |
| ** | ** | SEEDING CLASS II | SF | 600.9 | 337.2 | 299.1 | 547.9 | 353.6 | 154.5 | 542.3 | 92.9 | 0.0 | 0.0 | 0.0 | 0.0 | 379.5 | 260.4 | 141.2 | 548.2 | 4257.7 | |
| 202 | 0132 | REMOVAL OF BITUMINOUS SURFACING | SY | 152.4 | 71.7 | 60.4 | 122.2 | 251.5 | 103.3 | 188.5 | 320.9 | 2.3 | 4.3 | 4.1 | 4.4 | 313.4 | 163.8 | 156.7 | 326.6 | 2246.5 | |
| | | Assume 2" Bituminous with 6" Aggregate Base | | | | | | | | | | | | | | | | | | | |
| 302 | 0120 | AGGREGATE BASE COURSE CL 5 | TON | 54.3 | 30.3 | 27.4 | 46.6 | 118.7 | 77.8 | 59.1 | 143.2 | 4.2 | 4.2 | 4.2 | 4.2 | 124.2 | 67.8 | 67.6 | 118.1 | 951.9 | |
| * | * | TACK COAT @ 0.05 Gal/SY | GAL | 6.0 | 2.9 | 2.6 | 4.7 | 14.3 | 8.9 | 6.5 | 17.6 | 0.3 | 0.3 | 0.3 | 0.3 | 15.3 | 7.8 | 7.7 | 14.7 | 110.2 | |
| * | * | PRIME COAT @ 0.25 Gal/SY | GAL | 29.9 | 14.6 | 13.0 | 23.7 | 71.5 | 44.7 | 32.5 | 88.2 | 1.6 | 1.6 | 1.6 | 1.6 | 76.6 | 38.8 | 38.7 | 73.6 | 552.2 | |
| 430 | 0500 | COMMERCIAL GRADE HOT MIX ASPHALT @ 2 Ton/CY | TON | 14.5 | 7.4 | 6.6 | 11.7 | 33.8 | 21.4 | 15.8 | 41.5 | 0.9 | 0.9 | 0.9 | 0.9 | 36.1 | 18.6 | 18.6 | 34.6 | 264.2 | |
| * | * | PG 58S-28 ASPHALT CEMENT @ 6% | TON | 0.9 | 0.4 | 0.4 | 0.7 | 2.0 | 1.3 | 0.9 | 2.5 | 0.1 | 0.1 | 0.1 | 0.1 | 2.2 | 1.1 | 1.1 | 2.1 | 16.0 | |

* Not a pay item. Included in the contract unit price bid for 430 0500 Commercial Grade Hot Mix Asphalt.

** Not a pay item. Include in the contract unit price bid for 203 0119 Topsoil - Imported.

See Section 130, Standard Drawing D-764-22, and Standard Drawing D-764-48 for details.

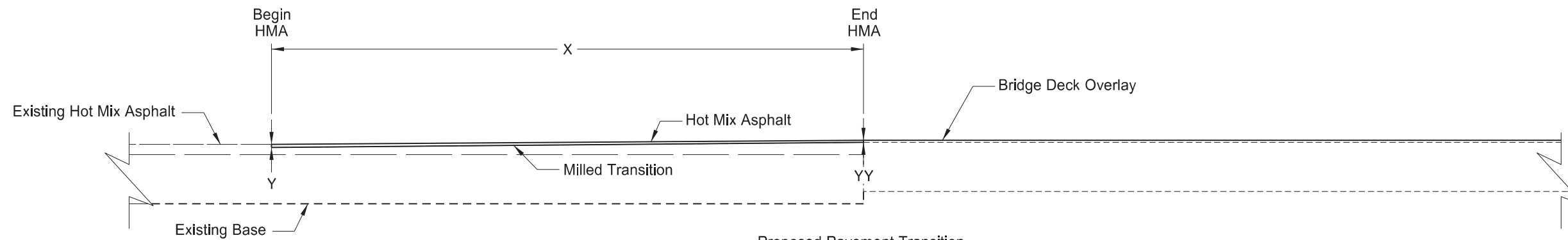
| | |
|--|--|
| <p>Basis of Estimate</p> <p>Removals & Surfacing</p> <p>Various Structures - District 5 (Dickinson District)</p> | |
|--|--|



Proposed Milling Transition

Milling Transitions

| Location | X | Begin Milling Station | Y | YY | End Milling Station |
|-------------------|-------|-----------------------|--------|--------|---------------------|
| Bridge 8-003.883 | 50 ft | 204+07.49 | 2.0 in | 1.0 in | 204+57.49 |
| Bridge 8-003.883 | 50 ft | 205+97.14 | 2.0 in | 1.0 in | 205+47.14 |
| Bridge 22-045.841 | 50 ft | 2419+16.09 | 2.0 in | 1.0 in | 2419+66.09 |
| Bridge 22-045.841 | 50 ft | 2421+90.92 | 2.0 in | 1.0 in | 2421+40.92 |



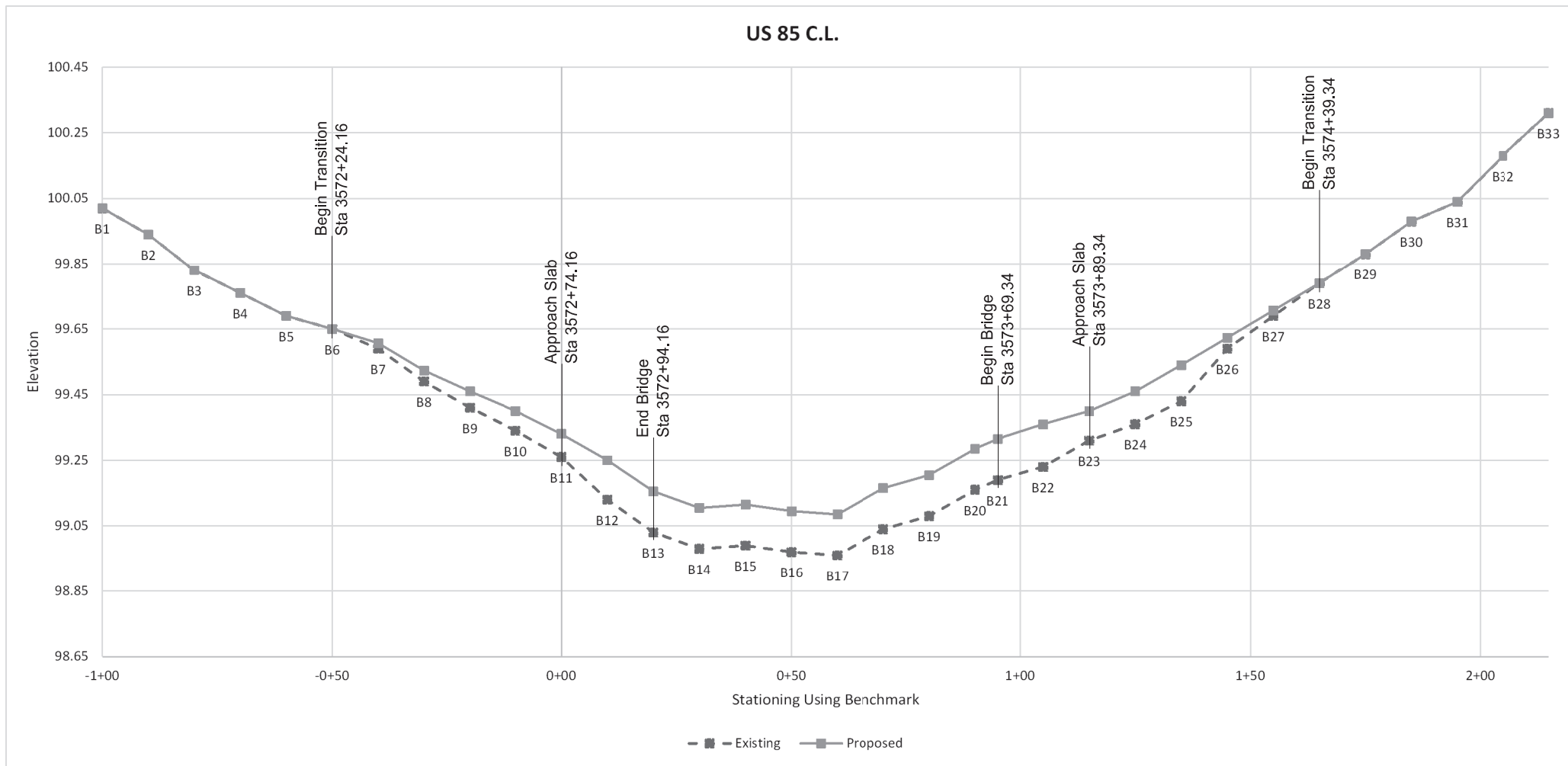
Proposed Paving Transition

Paving Transitions

| Location | X | Begin Milling Station | Y | YY | End Milling Station |
|-------------------|-------|-----------------------|--------|--------|---------------------|
| Bridge 8-003.883 | 50 ft | 204+07.49 | 2.0 in | 2.0 in | 204+57.49 |
| Bridge 8-003.883 | 50 ft | 205+97.14 | 2.0 in | 2.0 in | 205+47.14 |
| Bridge 22-045.841 | 50 ft | 2419+16.09 | 2.0 in | 2.0 in | 2419+66.09 |
| Bridge 22-045.841 | 50 ft | 2421+90.92 | 2.0 in | 2.0 in | 2421+40.92 |

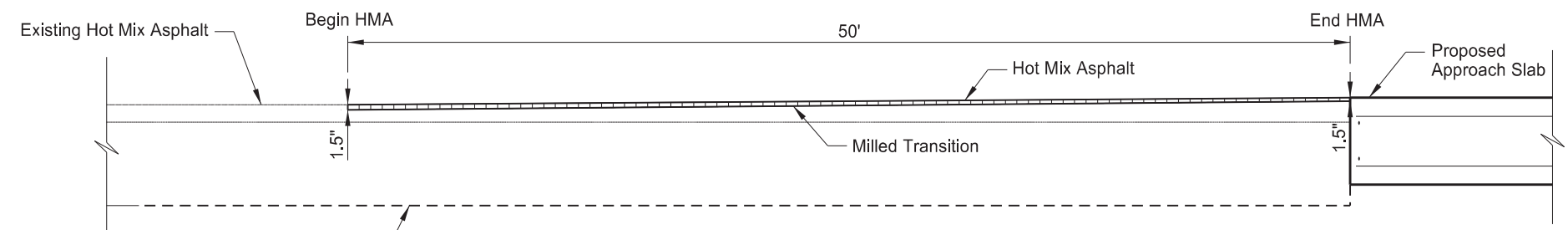
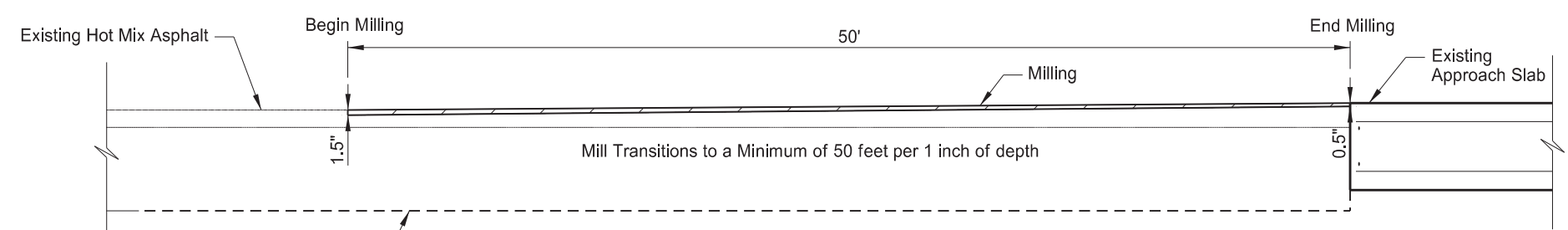
Drawing is not to scale

| | |
|--|--|
| <p>Milling and Paving Transitions</p> <p>ND Hwy 8, ND Hwy 22</p> <p>Various Structures - District 5 (Dickinson District)</p> | |
|--|--|



| POINTS | STATION | EXISTING ELEVATION | PROPOSED ELEVATION |
|--------|---------|--------------------|--------------------|
| B1 | -1+00 | 100.02 | 100.02 |
| B2 | -0+90 | 99.94 | 99.94 |
| B3 | -0+80 | 99.83 | 99.83 |
| B4 | -0+70 | 99.76 | 99.76 |
| B5 | -0+60 | 99.69 | 99.69 |
| B6 | -0+50 | 99.65 | 99.65 |
| B7 | -0+40 | 99.59 | 99.61 |
| B8 | -0+30 | 99.49 | 99.52 |
| B9 | -0+20 | 99.41 | 99.46 |
| B10 | -0+10 | 99.34 | 99.40 |
| B11 | 0+00 | 99.26 | 99.33 |
| B12 | 0+10 | 99.13 | 99.25 |
| B13 | 0+20 | 99.03 | 99.16 |
| B14 | 0+30 | 98.98 | 99.11 |
| B15 | 0+40 | 98.99 | 99.12 |
| B16 | 0+50 | 98.97 | 99.10 |
| B17 | 0+60 | 98.96 | 99.09 |
| B18 | 0+70 | 99.04 | 99.17 |
| B19 | 0+80 | 99.08 | 99.21 |
| B20 | 0+90 | 99.16 | 99.29 |
| B21 | 0+95 | 99.19 | 99.32 |
| B22 | 1+05 | 99.23 | 99.36 |
| B23 | 1+15 | 99.31 | 99.40 |
| B24 | 1+25 | 99.36 | 99.46 |
| B25 | 1+35 | 99.43 | 99.54 |
| B26 | 1+45 | 99.59 | 99.62 |
| B27 | 1+55 | 99.69 | 99.71 |
| B28 | 1+65 | 99.79 | 99.79 |
| B29 | 1+75 | 99.88 | 99.88 |
| B30 | 1+85 | 99.98 | 99.98 |
| B31 | 1+95 | 100.04 | 100.04 |
| B32 | 2+05 | 100.18 | 100.18 |
| B33 | 2+15 | 100.31 | 100.31 |

*Graph includes proposed bridge deck overlay shown in section 170



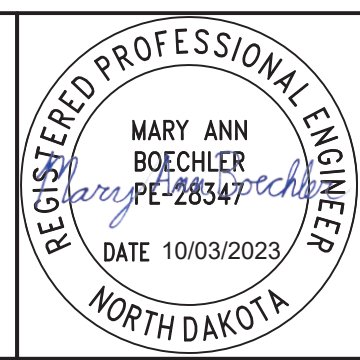
Proposed Milling and Paving Transitions

Drawing is not to scale

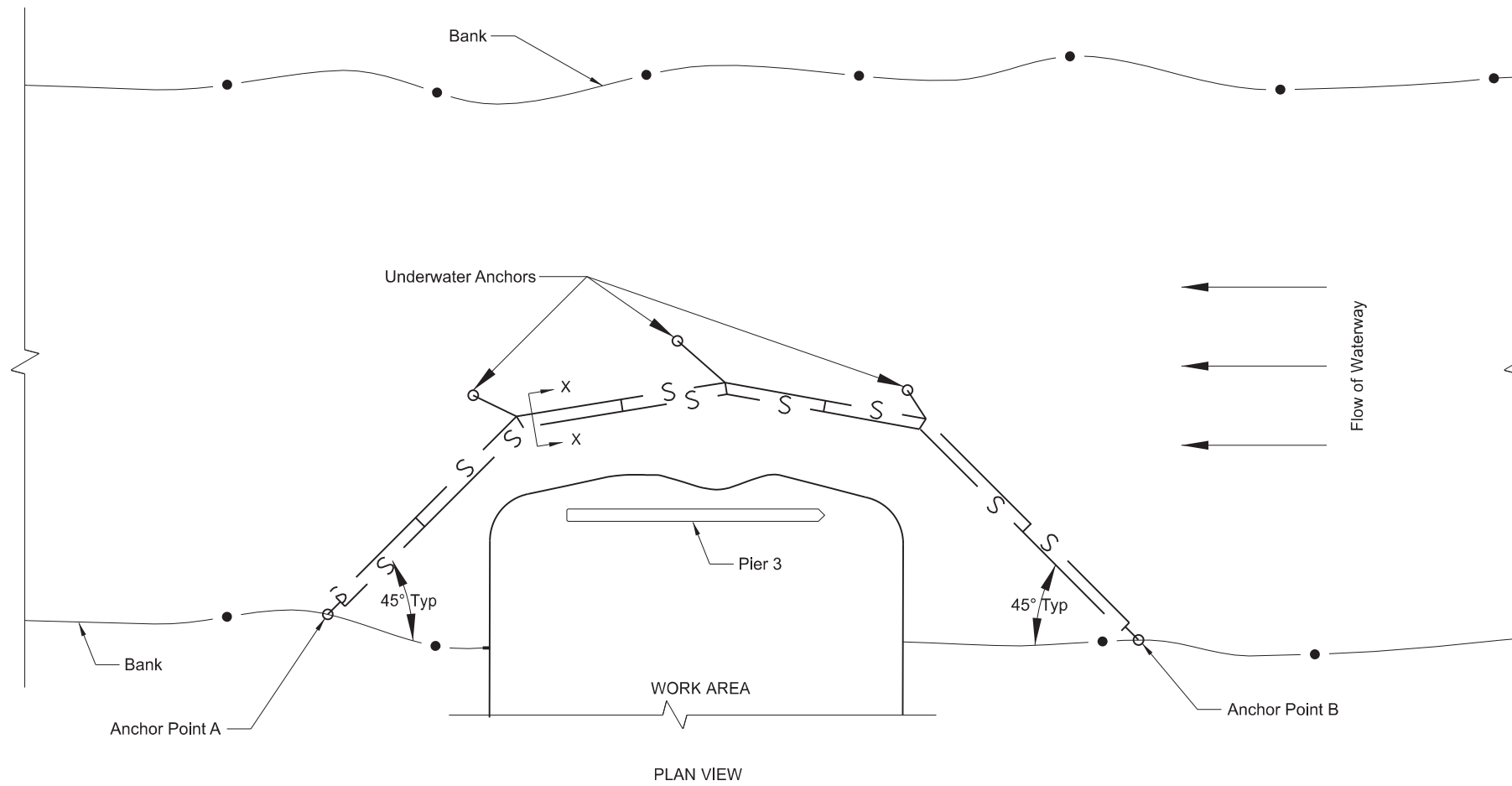
NOTE: Stations and elevations in this table and graph are based on a benchmark (Bolt on SE corner of bridge abutment) recorded on 5/16/2022 and do not represent surveyed existing conditions.

Milling and Paving Transitions
Centerline Profile (Top of Pavement)

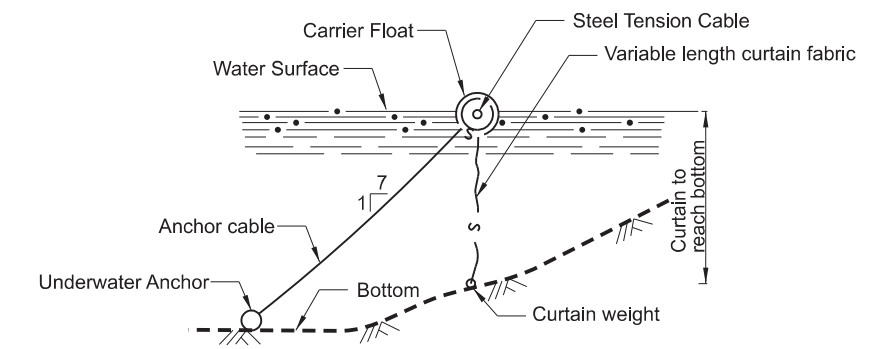
US Hwy 85
South Branch Heart River - District 5
(Dickinson District)



| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 20 | 3 |



PLAN VIEW
FLOTATION SILT CURTAIN



SECTION X-X
FLOTATION SILT CURTAINS

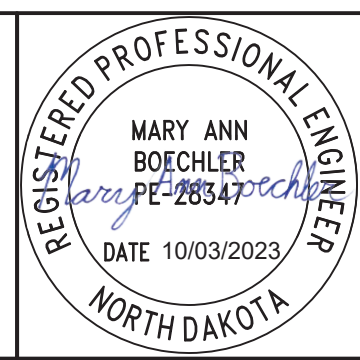
Note:
Install flotation silt curtain prior to the formwork being installed for the pier repair on pier 3 at Structure #22-006.171. Remove flotation silt curtain after formwork has been removed and repair is complete. Adjust quantities related to flotation silt based on water levels at the time of construction.

| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|--------------------------------|-----|------|
| 262 | 0100 | FLOTATION SILT CURTAIN | | |
| | | Structure #22-006.171 - Pier 3 | 152 | LF |
| 262 | 0101 | REMOVE FLOTATION SILT CURTAIN | | |
| | | Structure #22-006.171 - Pier 3 | 152 | LF |

Temporary Erosion Control
Flotation Silt Curtain

ND Hwy 22

Buffalo Creek - District 5
(Dickinson District)



| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | | TOTAL AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|-------------------|----------------|---|-----------------|-----------|-----------------------|------------------|-----------------|
| | | | 1 | 2 | | | |
| E5-1-48 | 48"x48" | EXIT GORE | | | | 35 | |
| G20-1-60 | 60"x24" | ROAD WORK NEXT MILES | | | | 28 | |
| G20-1b-60 | 60"x24" | NO WORK IN PROGRESS (Sign and installation only) | | | | 18 | |
| G20-2-48 | 48"x24" | END ROAD WORK | 12 | 12 | 12 | 26 | 312 |
| G20-4-36 | 36"x18" | PILOT CAR FOLLOW ME (Mounted to back of pilot car) | | | | 18 | |
| G20-4b-36 | 36"x30" | WAIT FOR PILOT CAR | | | | 18 | |
| G20-50a-72 | 72"x36" | ROAD WORK NEXT MILES RT & LT ARROWS | | | | 43 | |
| G20-52a-72 | 72"x24" | ROAD WORK NEXT MILES RT or LT ARROW | 4 | 4 | 4 | 36 | 144 |
| G20-55-96 | 96"x48" | SPEED LIMIT ENFORCED - MINIMUM FEE \$80 WHEN WORKERS PRESENT | 13 | 13 | 13 | 59 | 767 |
| M1-1-36 | 36"x36" | INTERSTATE ROUTE MARKER (Post and installation only) | | | | 11 | |
| M1-4-24 | 24"x24" | U.S. ROUTE MARKER (Post and installation only) | | | | 10 | |
| M1-5-24 | 24"x24" | STATE ROUTE MARKER (Post and installation only) | | | | 10 | |
| M3-1-24 | 24"x12" | NORTH (Mounted on route marker post) | | | | 7 | |
| M3-2-24 | 24"x12" | EAST (Mounted on route marker post) | | | | 7 | |
| M3-3-24 | 24"x12" | SOUTH (Mounted on route marker post) | | | | 7 | |
| M3-4-24 | 24"x12" | WEST (Mounted on route marker post) | | | | 7 | |
| M4-8-24 | 24"x12" | DETOUR (Mounted on route marker post) | | | | 7 | |
| M4-9-30 | 30"x24" | DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT | | | | 15 | |
| M4-10-48 | 48"x18" | DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade) | | | | 7 | |
| M5-1-21 | 21"x15" | ADVANCE TURN ARROW RT or LT (Mounted on route marker post) | | | | 7 | |
| M5-1-30 | 30"x21" | ADVANCE TURN ARROW RT or LT (Mounted on route marker post) | | | | 9 | |
| M6-1-21 | 21"x15" | DIRECTIONAL ARROW RT or LT (Mounted on route marker post) | | | | 7 | |
| M6-1-30 | 30"x21" | DIRECTIONAL ARROW RT or LT (Mounted on route marker post) | | | | 9 | |
| M6-3-21 | 21"x15" | DIRECTIONAL ARROW UP (Mounted on route marker post) | | | | 7 | |
| R1-1-48 | 48"x48" | STOP | | | | 32 | |
| R1-2-60 | 60"x60" | YIELD | | | | 29 | |
| R2-1-36 | 36"x48" | SPEED LIMIT (Portable only) | | | | 30 | |
| R2-1-48 | 48"x60" | SPEED LIMIT | 24 | 24 | 24 | 39 | 936 |
| R2-1aP-24 | 24"x18" | MINIMUM FEE \$80 (Mounted on Speed Limit post) | 12 | 12 | 12 | 10 | 120 |
| R3-2-48 | 48"x48" | NO LEFT TURN | | | | 35 | |
| R4-1-48 | 48"x60" | DO NOT PASS | | | | 39 | |
| R4-7-48 | 48"x60" | KEEP RIGHT | | | | 39 | |
| R5-1-48 | 48"x48" | DO NOT ENTER | | | | 35 | |
| R6-1-54 | 54"x18" | ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post) | | | | 14 | |
| R7-1-12 | 12"x18" | NO PARKING ANY TIME | | | | 11 | |
| R10-6-24 | 24"x36" | STOP HERE ON RED | 13 | 13 | 13 | 16 | 208 |
| R11-2-48 | 48"x30" | ROAD CLOSED (Mounted on barricade) | | | | 12 | |
| R11-2a-48 | 48"x30" | STREET CLOSED (Mounted on barricade) | 2 | 2 | 2 | 12 | 24 |
| R11-3a-60 | 60"x30" | ROAD CLOSED MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade) | | | | 15 | |
| R11-3c-60 | 60"x30" | STREET CLOSED MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade) | | | | 15 | |
| R11-4a-60 | 60"x30" | STREET CLOSED TO THRU TRAFFIC (Mounted on barricade) | 1 | 1 | 1 | 15 | 15 |
| W1-3-48 | 48"x48" | REVERSE TURN RIGHT or LEFT | | | | 35 | |
| W1-4-48 | 48"x48" | REVERSE CURVE RIGHT or LEFT | 6 | 6 | 6 | 35 | 210 |
| W1-4b-48 | 48"x48" | TWO LANE REVERSE CURVE RIGHT or LEFT | | | | 35 | |
| W1-6-48 | 48"x24" | ONE DIRECTION LARGE ARROW | | | | 26 | |
| W3-1-48 | 48"x48" | STOP AHEAD | | | | 35 | |
| W3-3-48 | 48"x48" | SIGNAL AHEAD | 12 | 12 | 12 | 35 | 420 |
| W3-4-48 | 48"x48" | BE PREPARED TO STOP | | | | 35 | |
| W3-5-48 | 48"x48" | SPEED REDUCTION AHEAD | 9 | 9 | 9 | 35 | 315 |
| W4-2-48 | 48"x48" | LANE ENDS RIGHT or LEFT | | | | 35 | |
| W5-1-48 | 48"x48" | ROAD NARROWS | | | | 35 | |
| W5-8-48 | 48"x48" | THRU TRAFFIC RIGHT LANE | | | | 35 | |
| W5-9-48 | 48"x48" | ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW | | | | 35 | |
| W6-3-48 | 48"x48" | TWO WAY TRAFFIC | | | | 35 | |
| W8-1-48 | 48"x48" | BUMP | | | | 35 | |
| W8-3-48 | 48"x48" | PAVEMENT ENDS | | | | 35 | |
| W8-7-48 | 48"x48" | LOOSE GRAVEL | | | | 35 | |
| W8-11-48 | 48"x48" | UNEVEN LANES | | | | 35 | |
| W8-12-48 | 48"x48" | NO CENTER LINE | | | | 35 | |
| W8-17-48 | 48"x48" | SHOULDER DROP-OFF SYMBOL | | | | 35 | |
| W8-53-48 | 48"x48" | TRUCKS ENTERING HIGHWAY | | | | 35 | |
| W8-54-48 | 48"x48" | TRUCKS ENTERING AHEAD or FT or MILE | | | | 35 | |
| W8-55-48 | 48"x48" | TRUCKS CROSSING AHEAD or FT or MILE | | | | 35 | |
| W8-56-48 | 48"x48" | TRUCKS EXITING HIGHWAY | | | | 35 | |
| W9-3a-48 | 48"x48" | CENTER LANE CLOSED SYMBOL | | | | 35 | |
| W13-1P-30 | 30"x30" | MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post) | | | | 14 | |
| W14-3-64 | 64"x48" | NO PASSING ZONE | | | | 28 | |
| W16-2P-30 | 30"x24" | FEET PLAQUE (Mounted on warning sign post) | | | | 10 | |
| W20-1-48 | 48"x48" | ROAD WORK AHEAD or FT or MILE | 16 | 16 | 16 | 35 | 560 |
| W20-2-48 | 48"x48" | DETOUR AHEAD or FT or MILE | | | | 35 | |
| W20-3-48 | 48"x48" | ROAD or STREET CLOSED AHEAD or FT or MILE | | | | 35 | |
| W20-4-48 | 48"x48" | ONE LANE ROAD AHEAD or FT or MILE | 12 | 12 | 12 | 35 | 420 |
| W20-5-48 | 48"x48" | RIGHT or CENTER or LEFT LANE CLOSED AHEAD or FT or MILE | | | | 35 | |
| W20-7-48 | 48"x48" | FLAGGER | 13 | 13 | 13 | 35 | 455 |
| W20-8-18 | 18"x18" | STOP - SLOW PADDLE Back to Back | 13 | 13 | 13 | 5 | 65 |
| W20-52P-54 | 54"x12" | NEXT MILES (Mounted on warning sign post) | | | | 12 | |
| W21-1-48 | 48"x48" | WORKERS | | | | 35 | |
| W21-2-48 | 48"x48" | FRESH OIL | | | | 35 | |
| W21-3-48 | 48"x48" | ROAD MACHINERY AHEAD or FT or MILE | | | | 35 | |
| W21-5-48 | 48"x48" | SHOULDER WORK | | | | 35 | |
| W21-5a-48 | 48"x48" | RIGHT or LEFT SHOULDER CLOSED | | | | 35 | |
| W21-5b-48 | 48"x48" | RIGHT or LEFT SHOULDER CLOSED AHEAD or FT or MILE | | | | 35 | |

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | | TOTAL AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|-------------|-----------|-----------------------------|-----------------|---|-----------------------|------------------|-----------------|
| | | | 1 | 2 | | | |
| W21-6-48 | 48"x48" | SURVEY CREW | | | | 35 | |
| W21-50-48 | 48"x48" | BRIDGE PAINTING AHEAD or FT | | | | 35 | |
| W21-51-48 | 48"x48" | MATERIAL ON ROADWAY | | | | 35 | |
| W21-52-48 | 48"x48" | PAVEMENT BREAKS | | | | 35 | |
| W21-53-48 | 48"x48" | RUMBLE STRIPS AHEAD | | | | 35 | |
| W22-8-48 | 48"x48" | FRESH OIL LOOSE ROCK | | | | 35 | |
| W24-1-48 | 48"x48" | DOUBLE REVERSE CURVE | | | | 35 | |

| SPECIAL SIGNS | | | | | | | |
|---------------|-----------|--|---|---|-----------------------|------------------|-----------------|
| CONSIGN | SIGN SIZE | DESCRIPTION | 1 | 2 | TOTAL AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
| Consign 1 | 48"x48" | XXFT WIDTH AHEAD | 4 | 4 | 4 | 35 | 140 |
| Consign 2 | 114"x48" | 12 FT LANE WIDE VEHICLES USE ALTERNATE ROUTE | 5 | 5 | 5 | 60 | 300 |

| 704-1000 | TRAFFIC CONTROL SIGNS | TOTAL UNITS | 5411 |
|----------|-----------------------|-------------|------|
|----------|-----------------------|-------------|------|

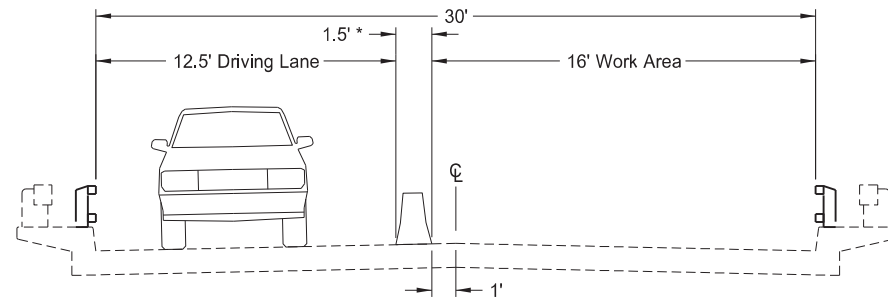
| SPEC & CODE | DESCRIPTION | UNIT | QUANTITY | | TOTAL QUANTITY |
|-------------|--|------|----------|------|----------------|
| | | | 1 | 2 | |
| 704-0100 | FLAGGING | MHR | 120 | 120 | 240 |
| 704-1018 | LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL | EA | 6 | 6 | 6 |
| 704-1035 | ATTENUATION DEVICE-TYPE B-25 | EA | 2 | 2 | 2 |
| 704-1039 | ATTENUATION DEVICE-TYPE B-45 | EA | 1 | 1 | 1 |
| 704-1043 | ATTENUATION DEVICE-TYPE B-65 | EA | 9 | 9 | 9 |
| 704-1048 | PORTABLE RUMBLE STRIPS | EACH | | | |
| 704-1050 | TYPE I BARRICADES | EACH | | | |
| 704-1052 | TYPE III BARRICADES | EACH | 18 | 15 | 18 |
| 704-1060 | DELINEATOR DRUMS | EACH | 89 | 72 | 89 |
| 704-1065 | TRAFFIC CONES | EACH | | | |
| 704-1067 | TUBULAR MARKERS | EACH | | | |
| 704-1070 | DELINEATOR | EACH | | | |
| 704-1072 | FLEXIBLE DELINEATORS | EACH | | | |
| 704-1080 | STACKABLE VERTICAL PANELS | EACH | | | |
| 704-1081 | VERTICAL PANELS - BACK TO BACK | EACH | | | |
| 704-1085 | SEQUENCING ARROW PANEL - TYPE A | EACH | | | |
| 704-1086 | SEQUENCING ARROW PANEL - TYPE B | EACH | | | |
| 704-1087 | SEQUENCING ARROW PANEL - TYPE C | EACH | | | |
| 704-1500 | OBLITERATION OF PVMT MK | SF | 1992 | | 1992 |
| 704-3501 | PORTABLE PRECAST CONCRETE MED BARRIER | LF | | | |
| 704-3510 | PRECAST CONCRETE MED BARRIER - STATE FURNISHED | EACH | | | |
| 704-3511 | STATE FURNISHED MEDIAN BARRIER | LF | 2624 | 2774 | 2774 |
| 762-0200 | RAISED PAVEMENT MARKERS | EACH | | | |
| 762-0420 | SHORT TERM 4IN LINE - TYPE R | LF | 13282 | 4444 | 17726 |
| 762-0426 | SHORT TERM 24IN LINE-TYPE R | LF | 156 | | 156 |
| 762-0430 | SHORT TERM 4IN LINE - TYPE NR | LF | | | |

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
<http://www.dot.nd.gov/>

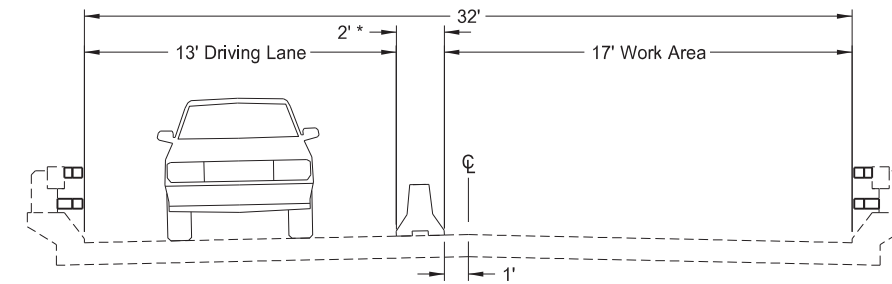


Traffic Control Devices List
Various Structures - District 5
(Dickinson District)

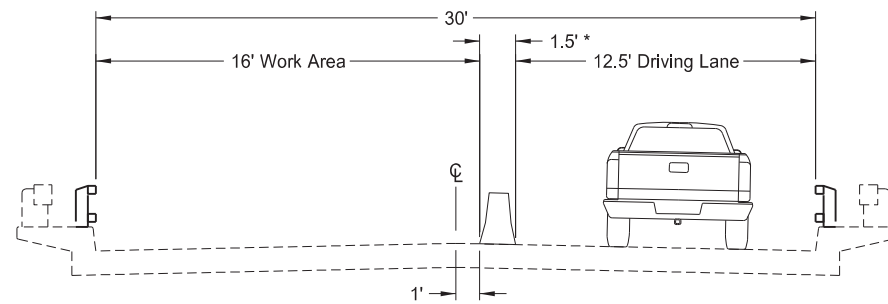
| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 100 | 2 |



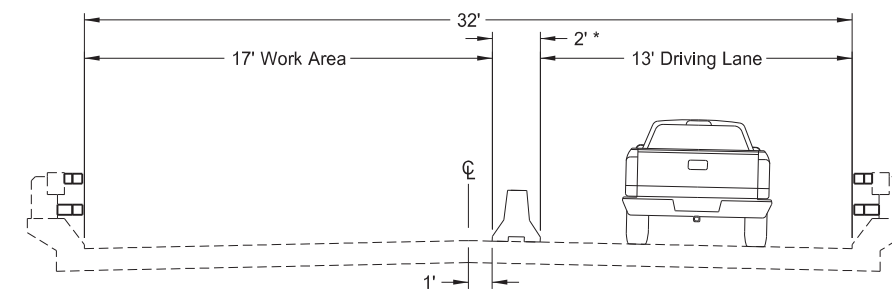
Structure #8-003.883 - Phase 1
Structure #22-045.841 - Phase 1



Structure #8-114.980 - Phase 1



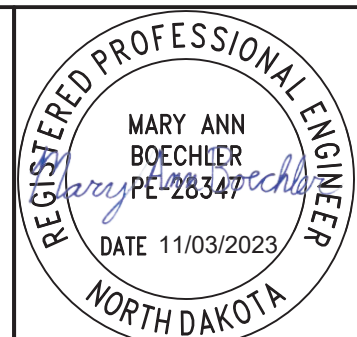
Structure #8-003.883 - Phase 2
Structure #22-045.841 - Phase 2



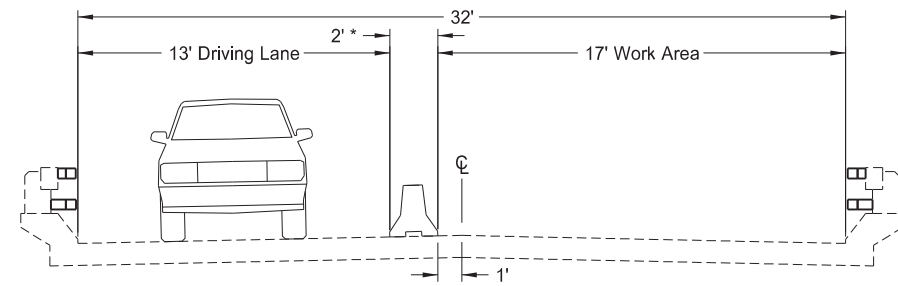
Structure #8-114.980 - Phase 2

* Maximum width of median barrier

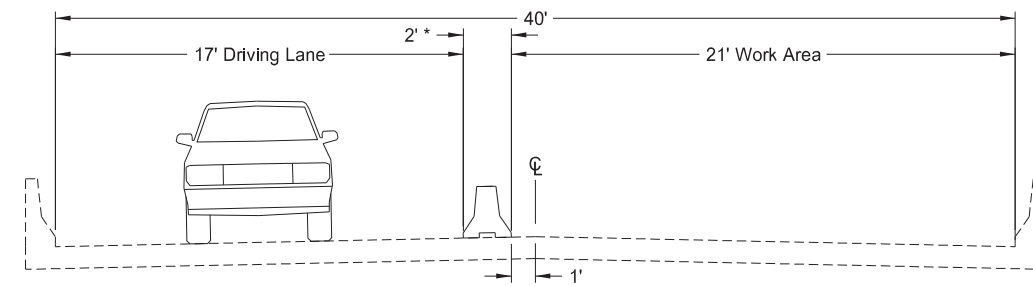
Work Zone Traffic Control
Typical Sections
ND Hwy 8, ND Hwy 22
Various Structures - District 5
(Dickinson District)



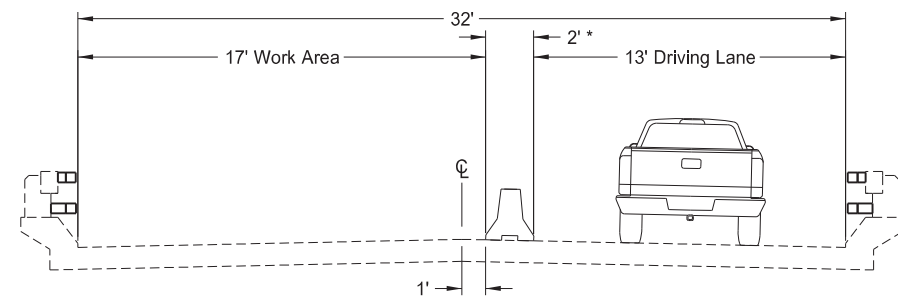
| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 100 | 3 |



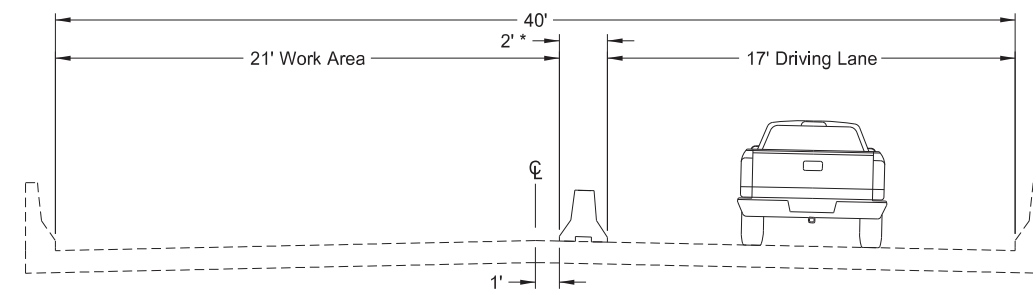
Structure #22-006.171 - Phase 1



Structure #22-081.376 - Phase 1



Structure #22-006.171 - Phase 2



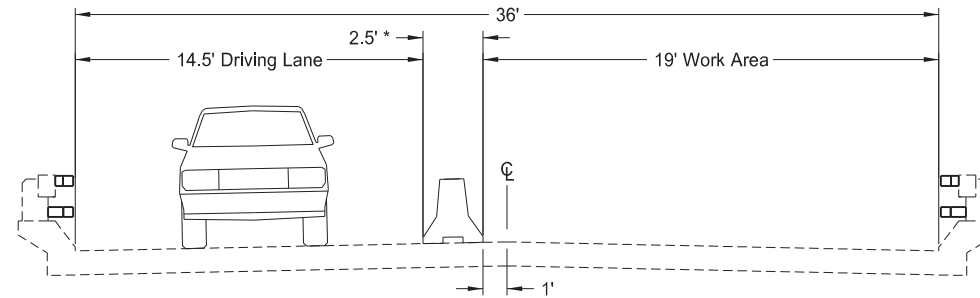
Structure #22-081.376 - Phase 2

* Maximum width of median barrier

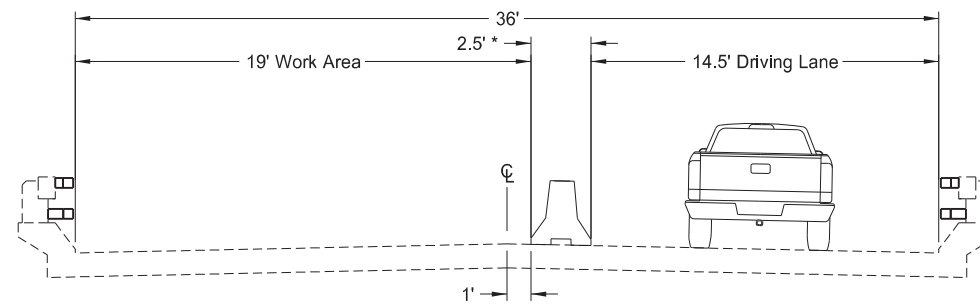
Work Zone Traffic Control
 Typical Sections
 ND Hwy 22
 Various Structures - District 5
 (Dickinson District)



| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 100 | 4 |



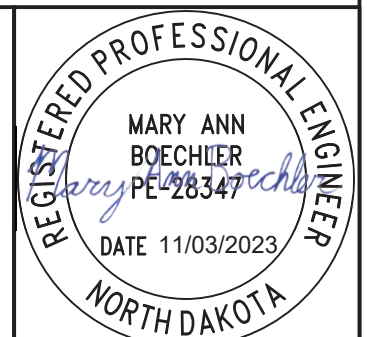
Structure #85-067.675 - Phase 1



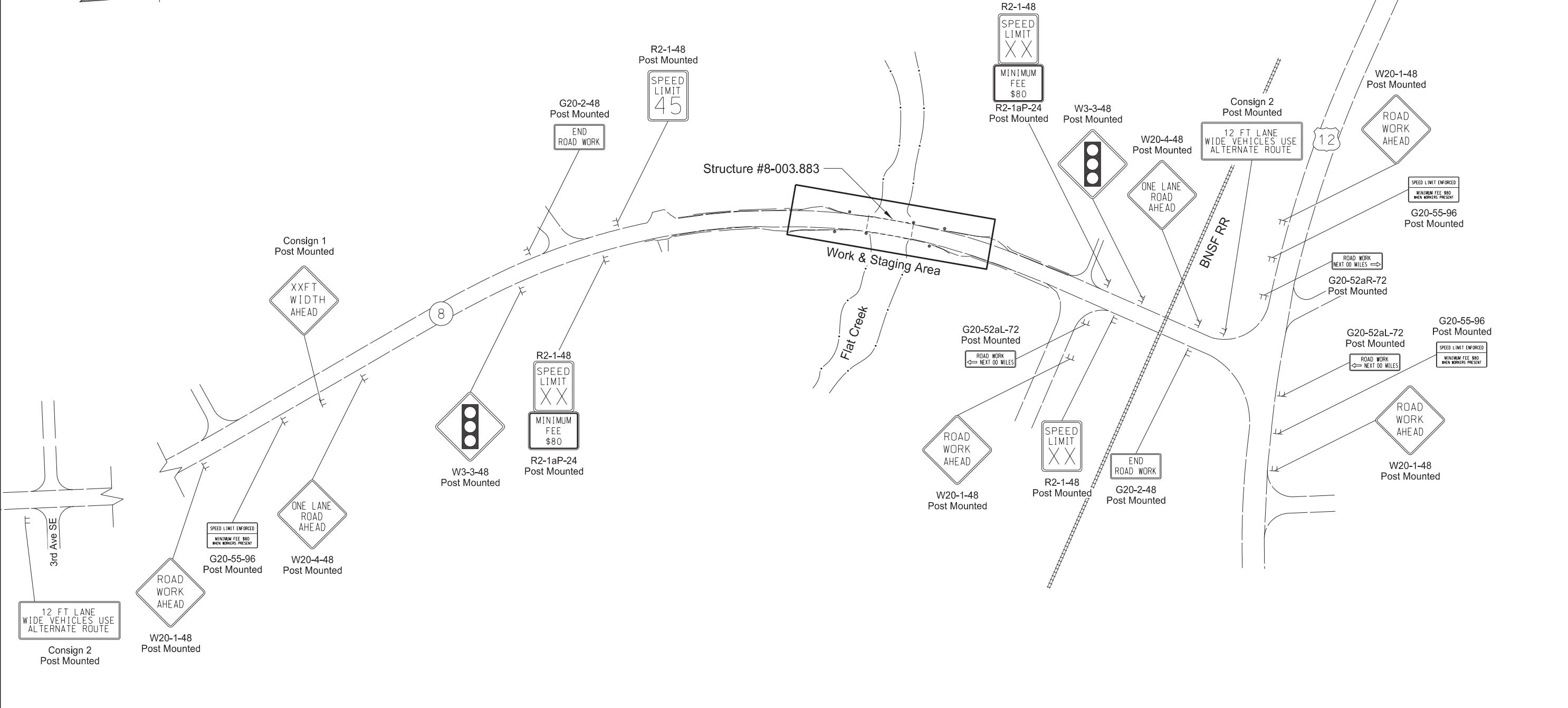
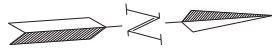
Structure #85-067.675 - Phase 2

* Maximum width of median barrier

Work Zone Traffic Control
 Typical Sections
 US Hwy 85
 Various Structures - District 5
 (Dickinson District)



| | | | |
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 5 |

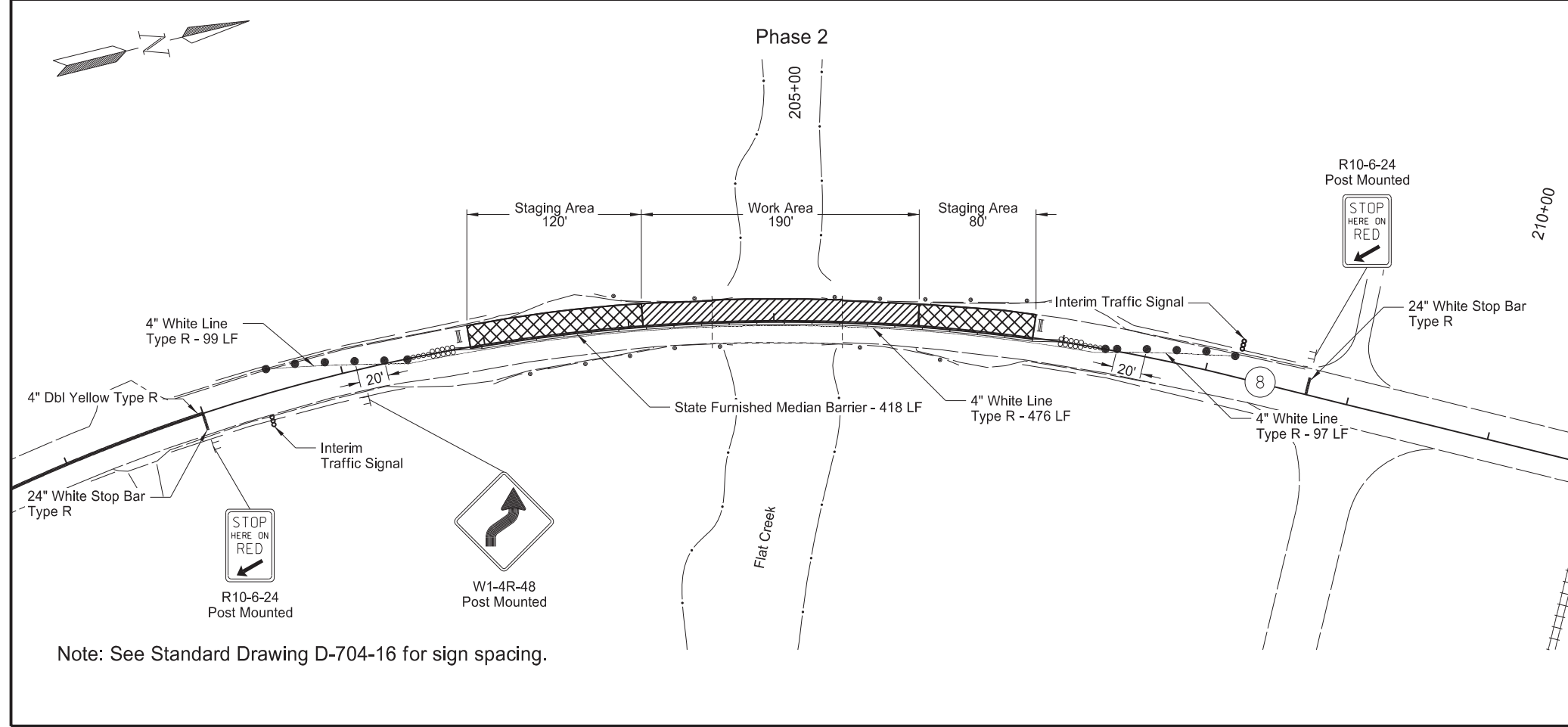
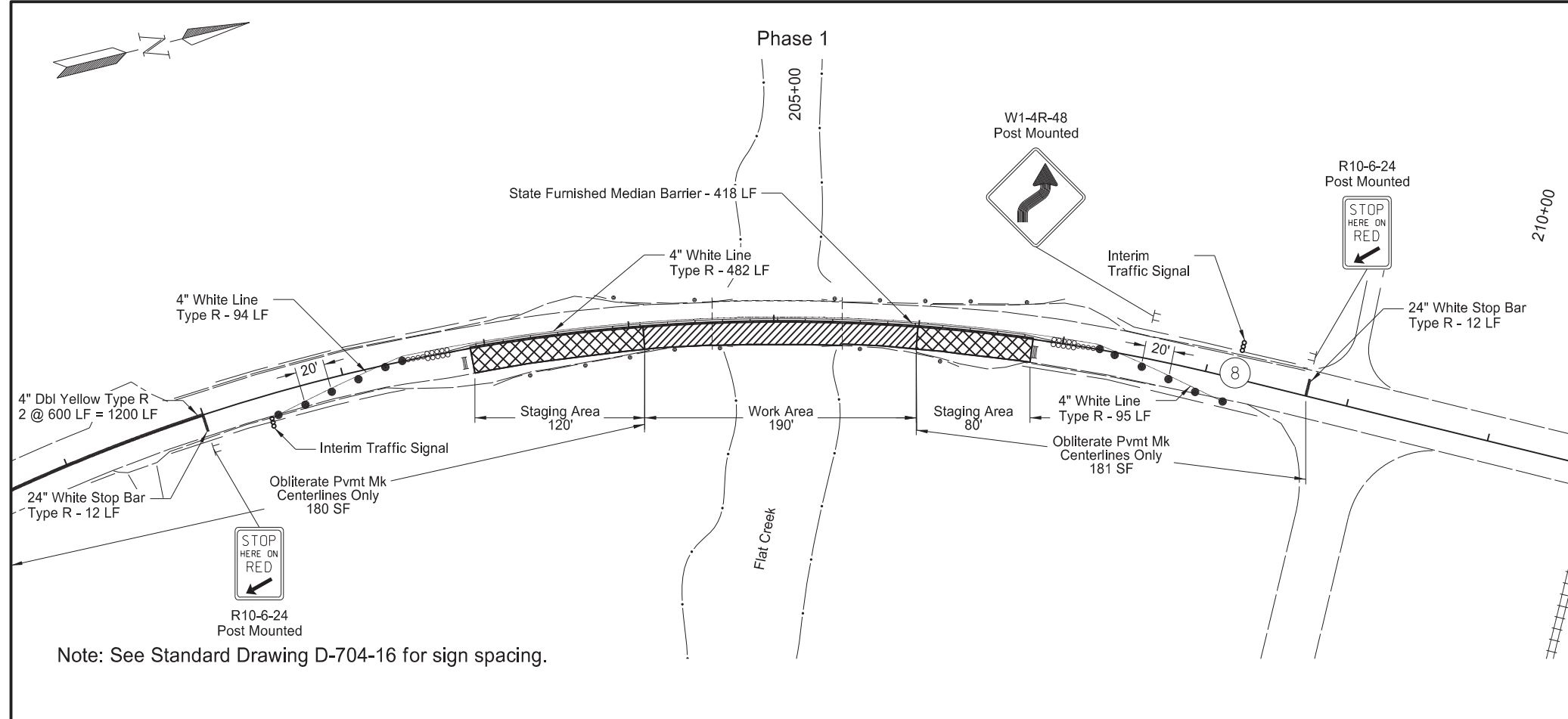


Note: See Standard Drawing D-704-16 for sign spacing.

Work Zone Traffic Control
 Sign Layout
 ND Hwy 8
 Structure #8-003.883 - District 5
 (Dickinson District)

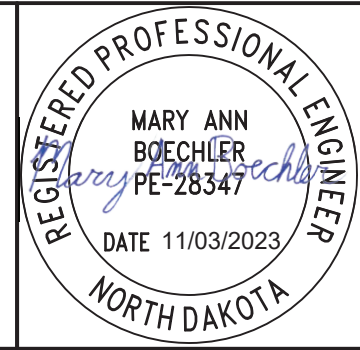


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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 6 |

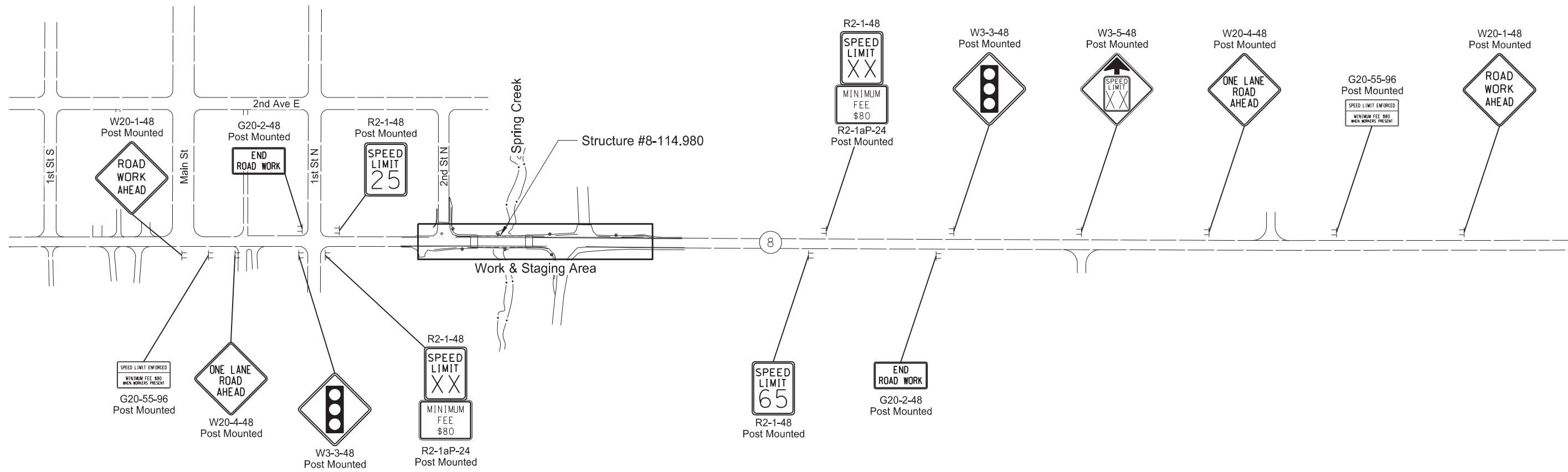
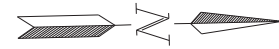


- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - State Furnished Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

Work Zone Traffic Control
Phase 1 & Phase 2
ND Hwy 8
Structure #8-003.883 - District 5
(Dickinson District)



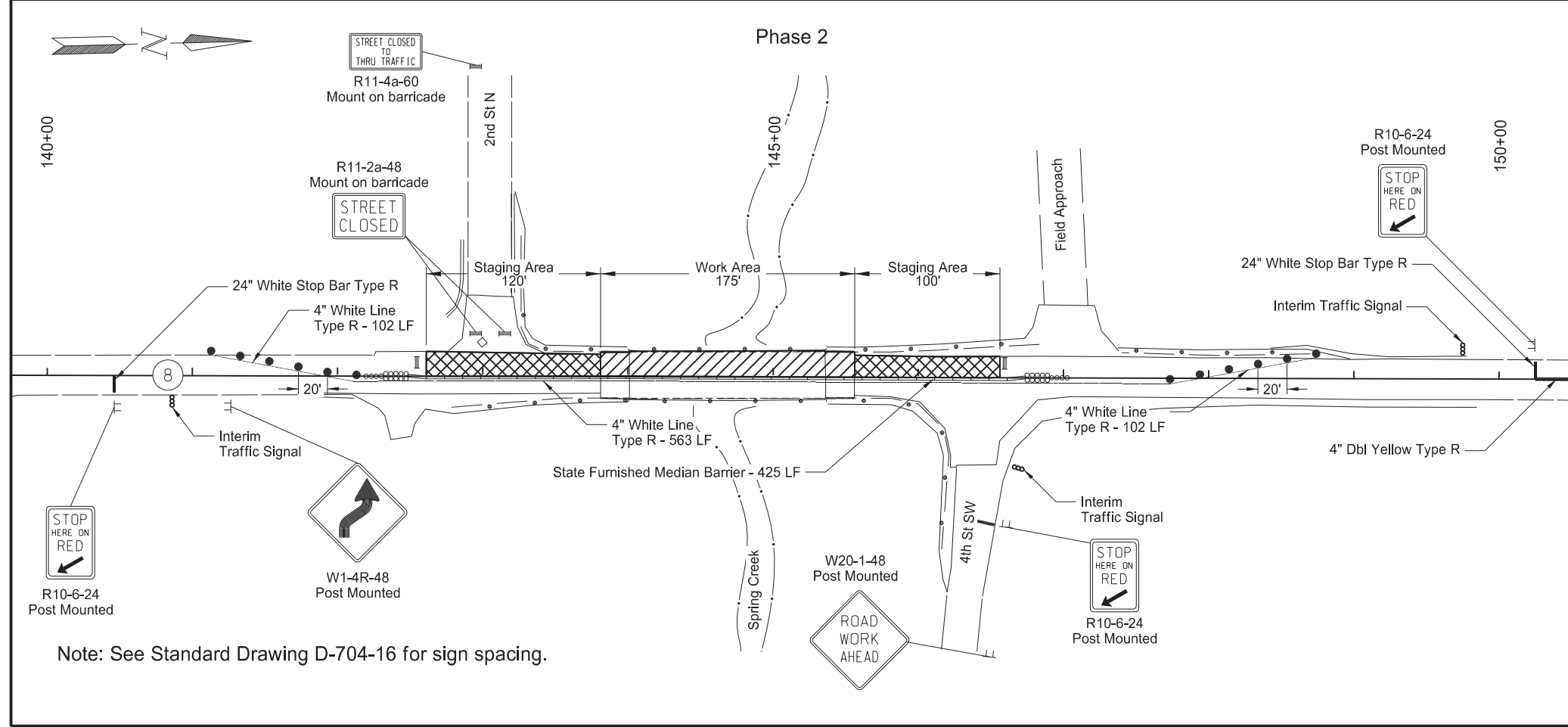
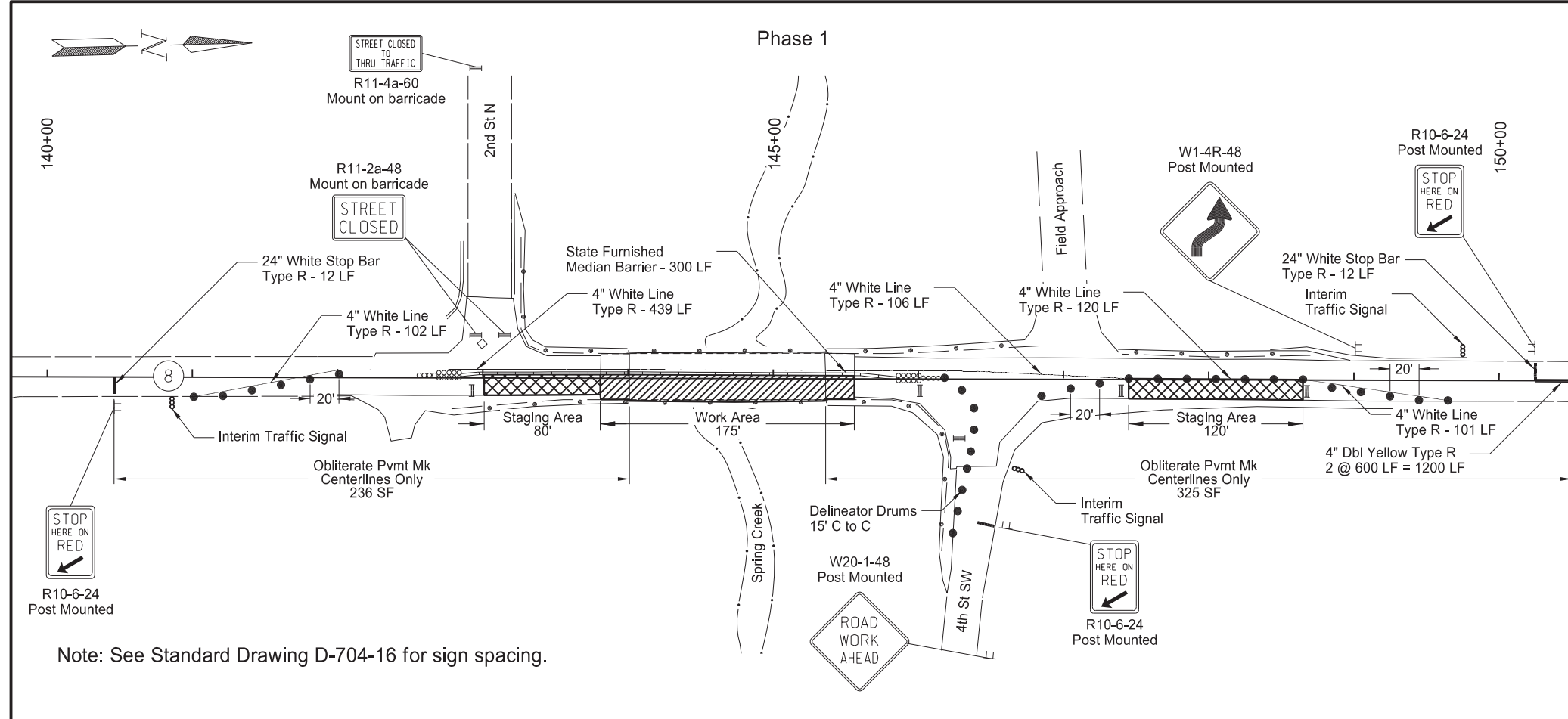
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|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 100 | 7 |



Note: See Standard Drawing D-704-16 for sign spacing.

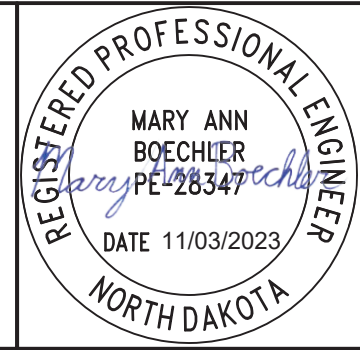
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| <p>Work Zone Traffic Control Sign Layout ND Hwy 8 Structure #8-114.980 - District 5 (Dickinson District)</p> | |
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|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 8 |

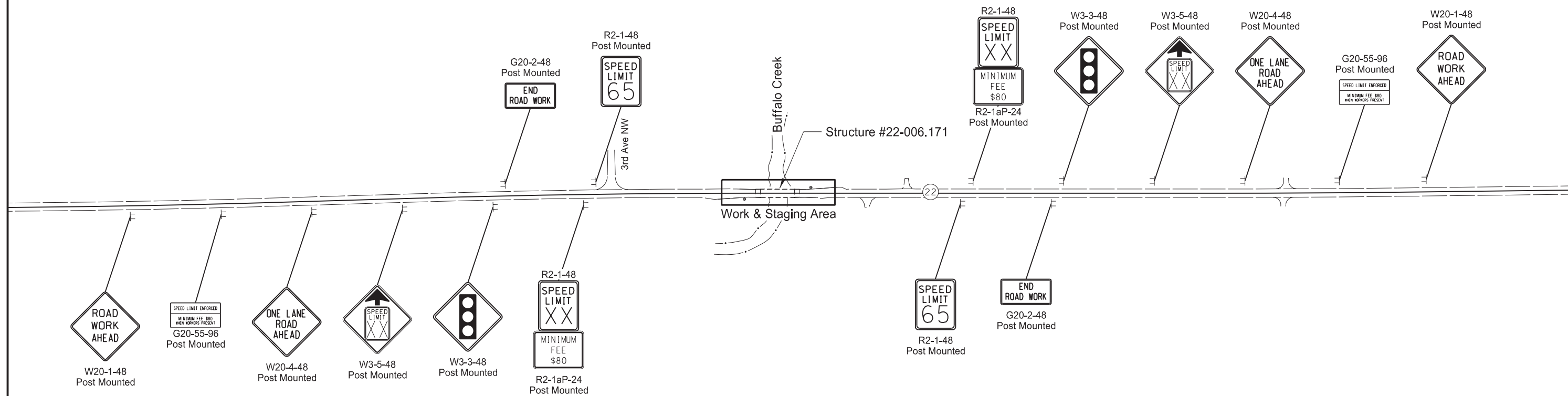
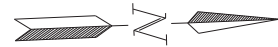


- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - State Furnished Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

Work Zone Traffic Control
Phase 1 & Phase 2
ND Hwy 8
Structure #8-114.980 - District 5
(Dickinson District)



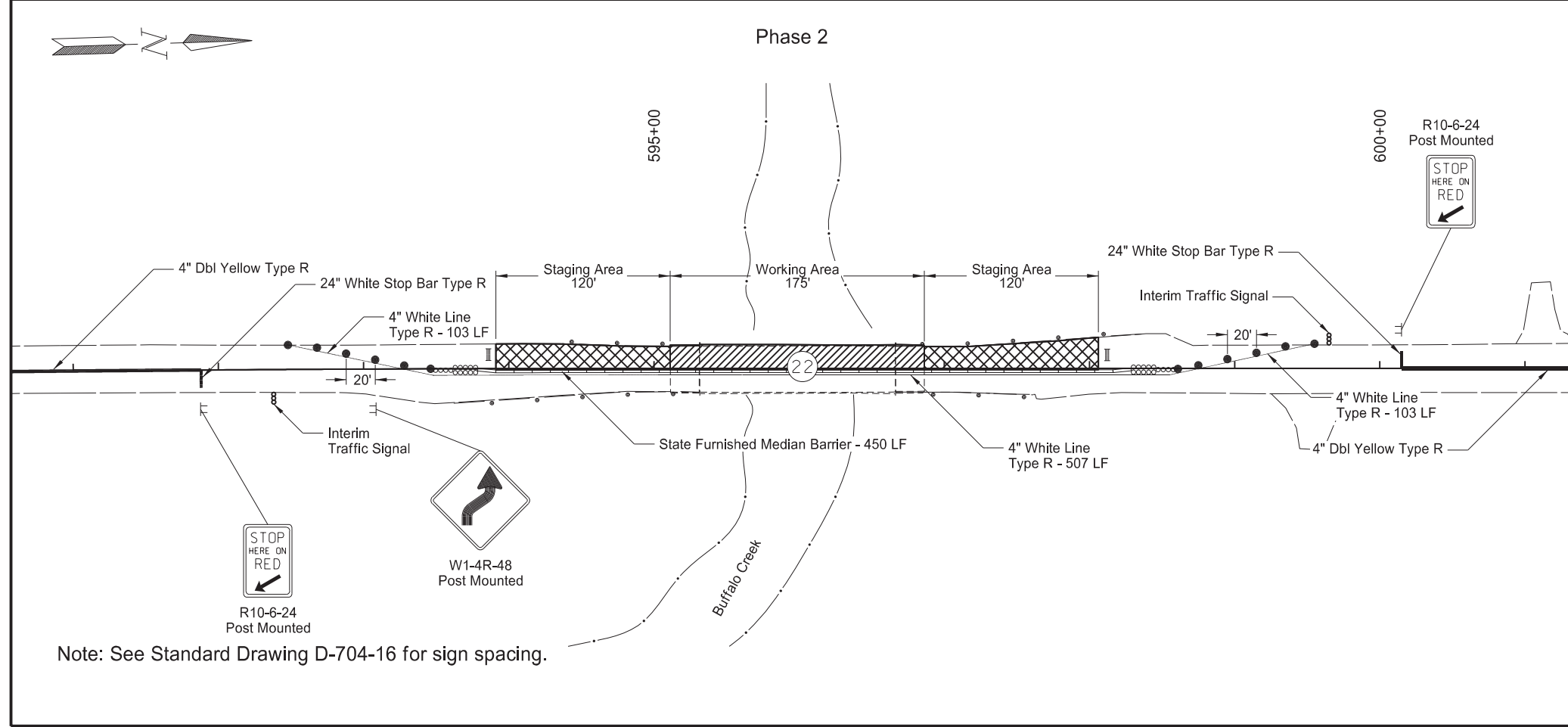
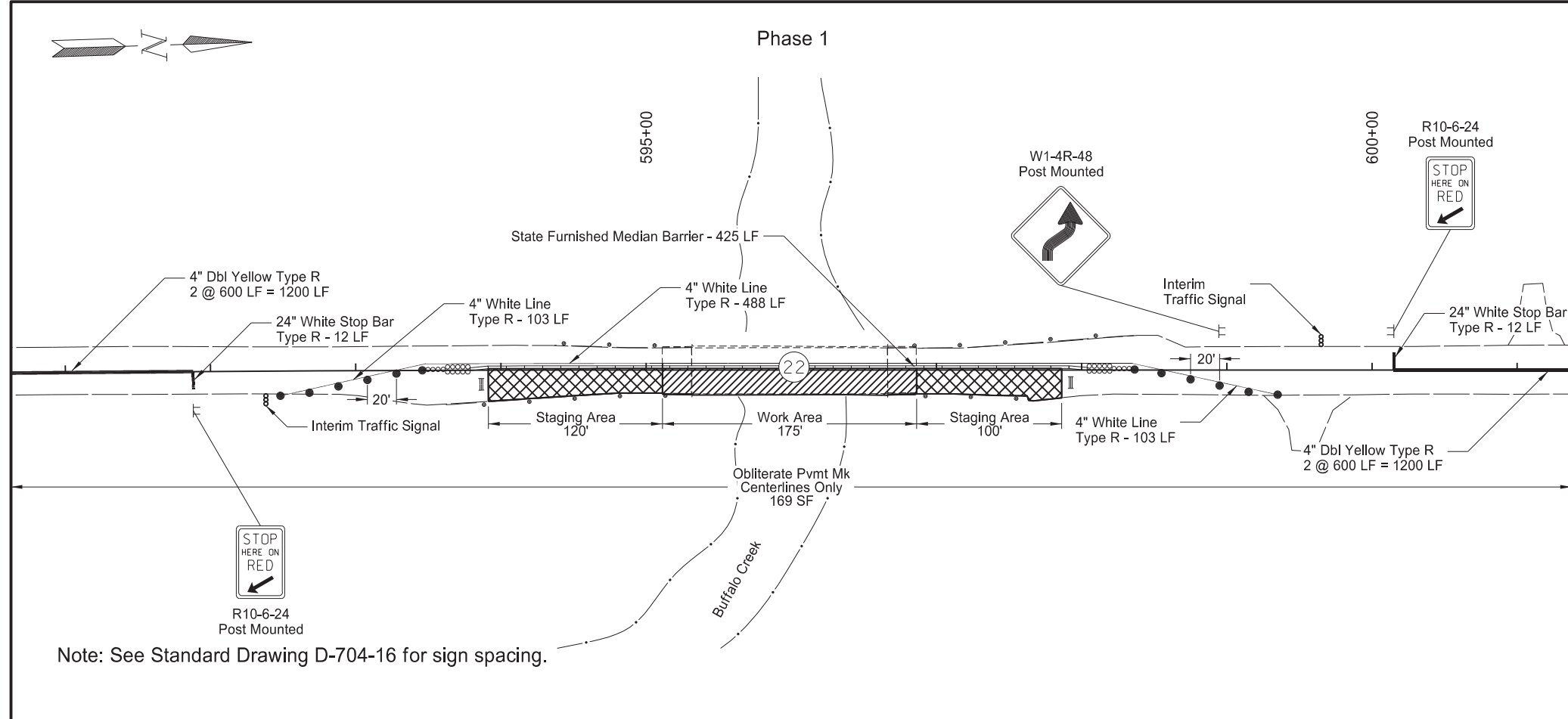
| | | | |
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 9 |



Note: See Standard Drawing D-704-16 for sign spacing.

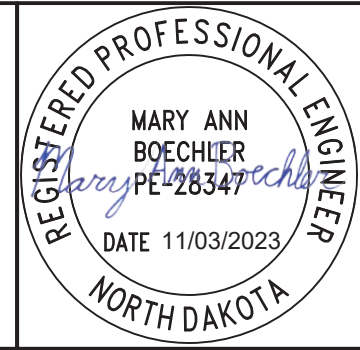
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| <p>Work Zone Traffic Control</p> <p>Sign Layout</p> <p>ND Hwy 22</p> <p>Structure #22-006.171 - District 5 (Dickinson District)</p> | |
|---|--|

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 10 |

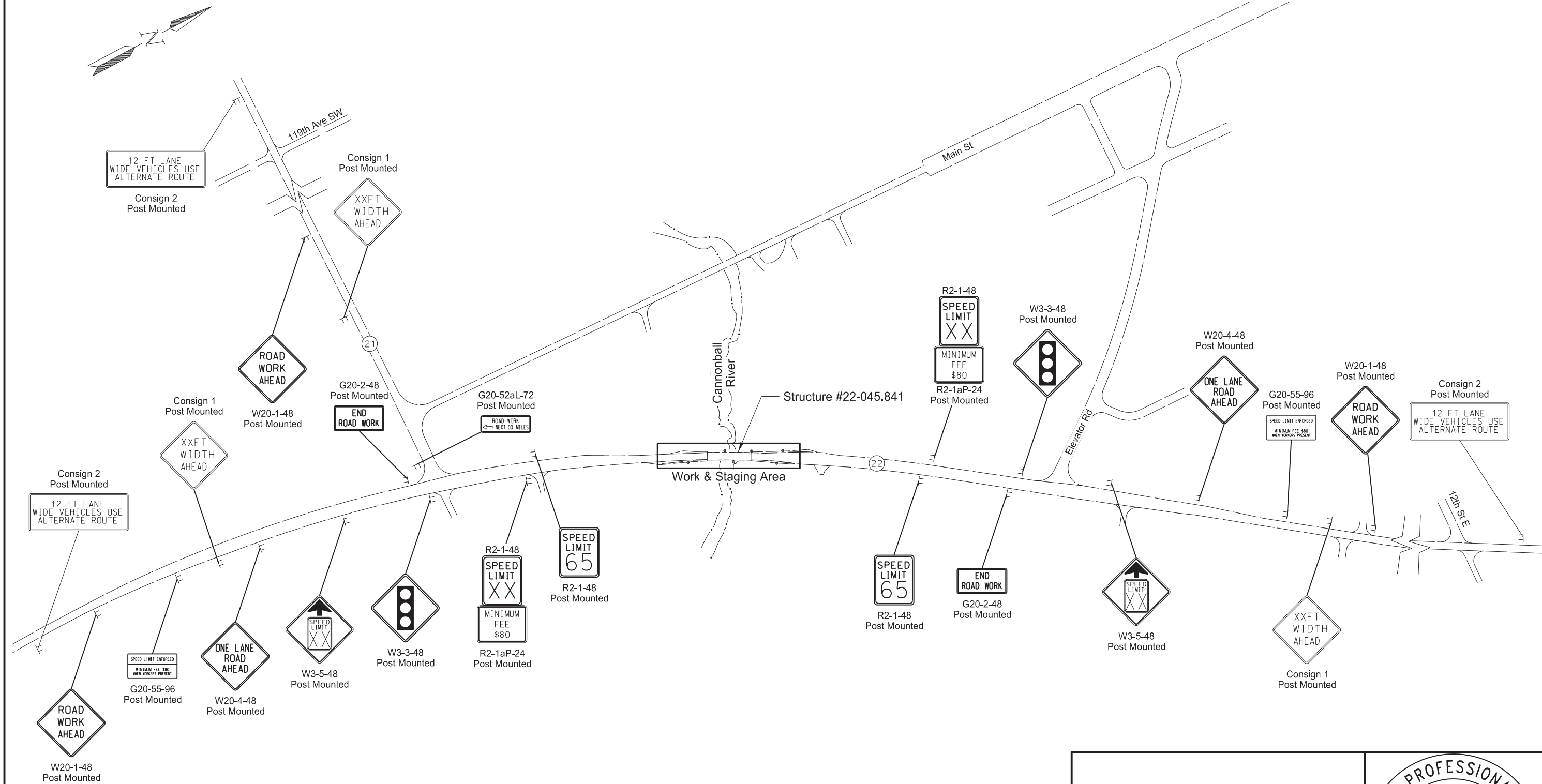


- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - State Furnished Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

Work Zone Traffic Control
Phase 1 & Phase 2
ND Hwy 22
Structure #22-006.171 - District 5
(Dickinson District)



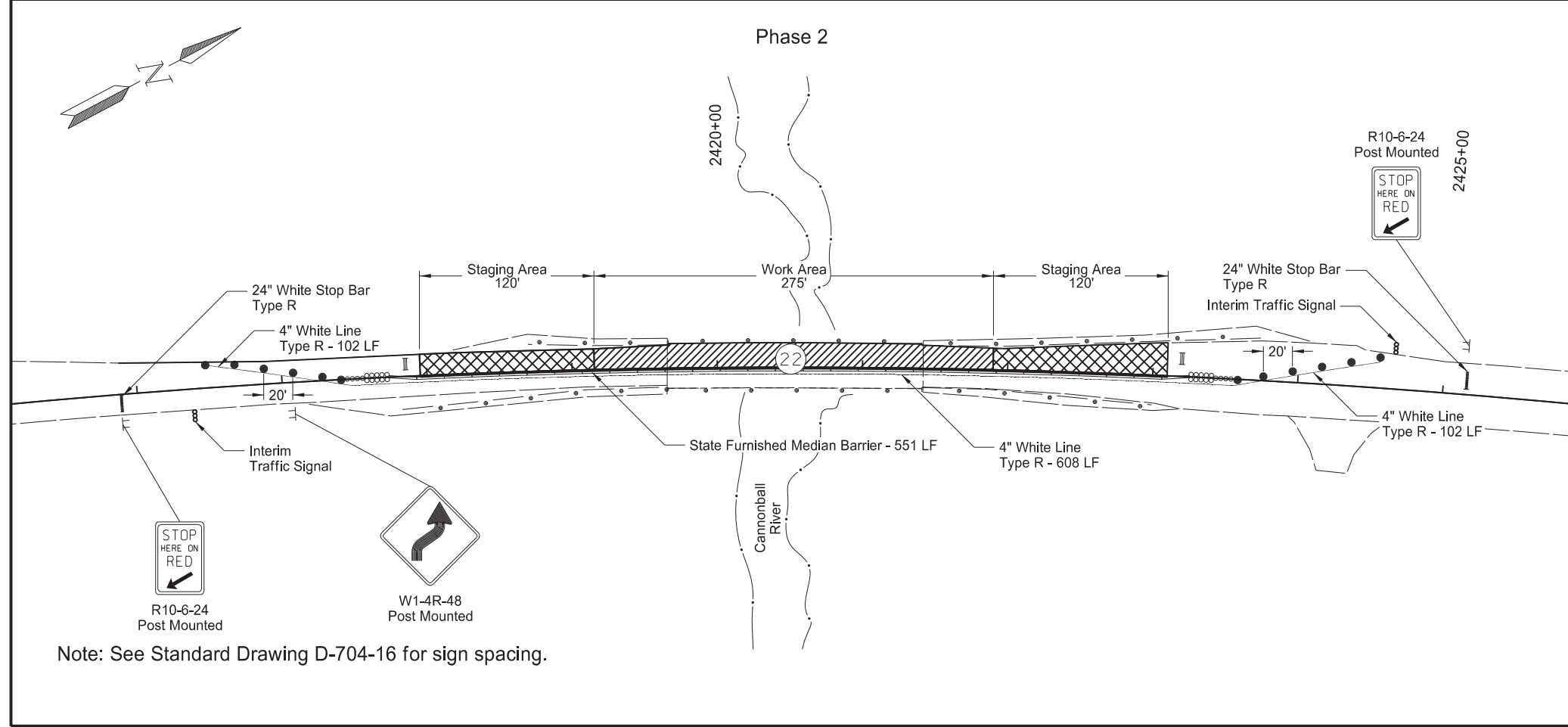
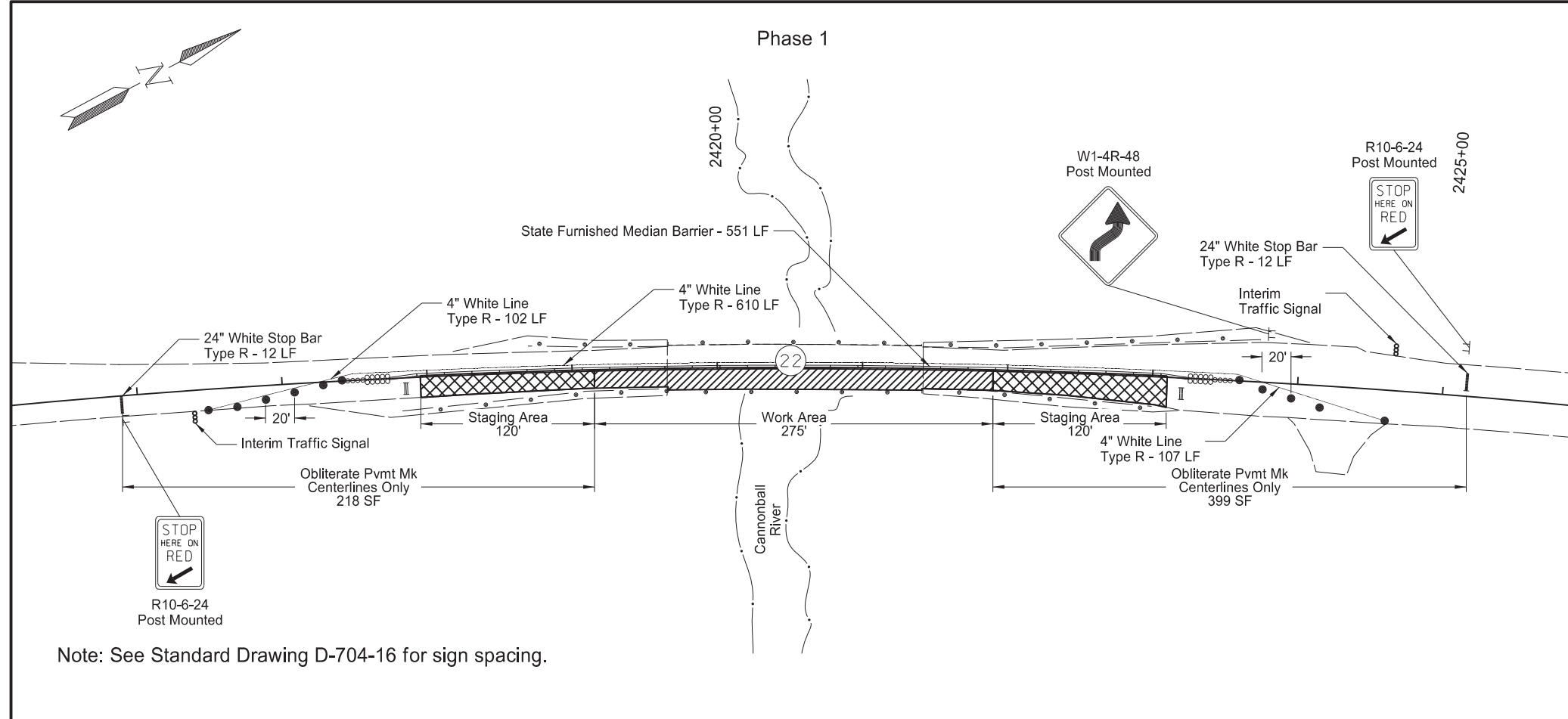
| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 11 |



Note: See Standard Drawing D-704-16 for sign spacing.

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| <p>Work Zone Traffic Control</p> <p>Sign Layout</p> <p>ND Hwy 22</p> <p>Structure #22-045.841 - District 5 (Dickinson District)</p> | |
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 12 |

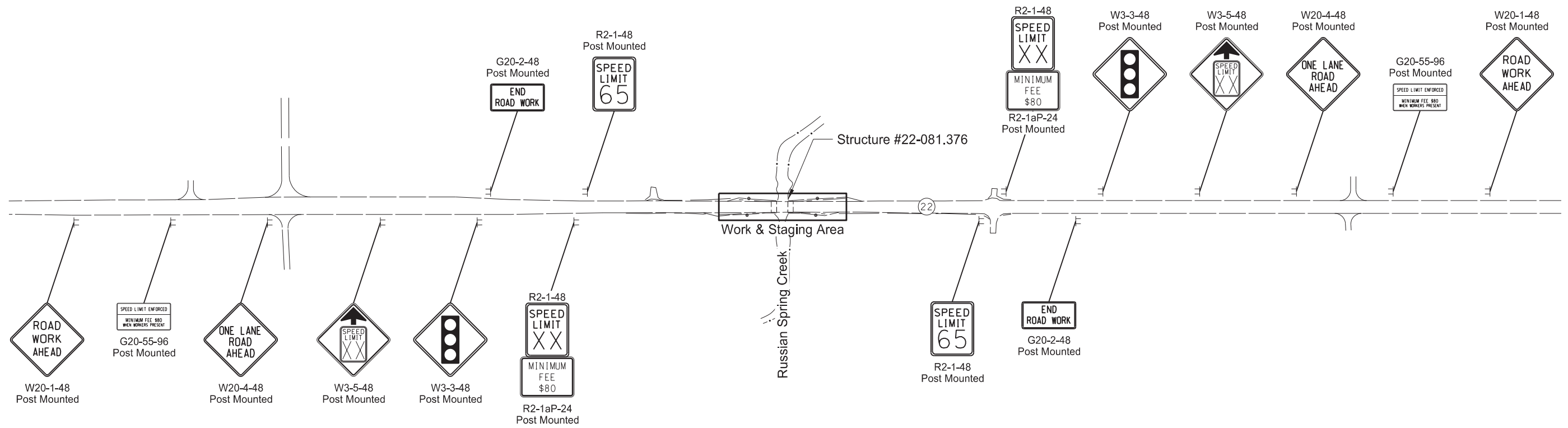
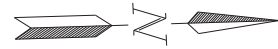


- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - State Furnished Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

Work Zone Traffic Control
Phase 1 & Phase 2
ND Hwy 22
Structure #22-045.841 - District 5
(Dickinson District)



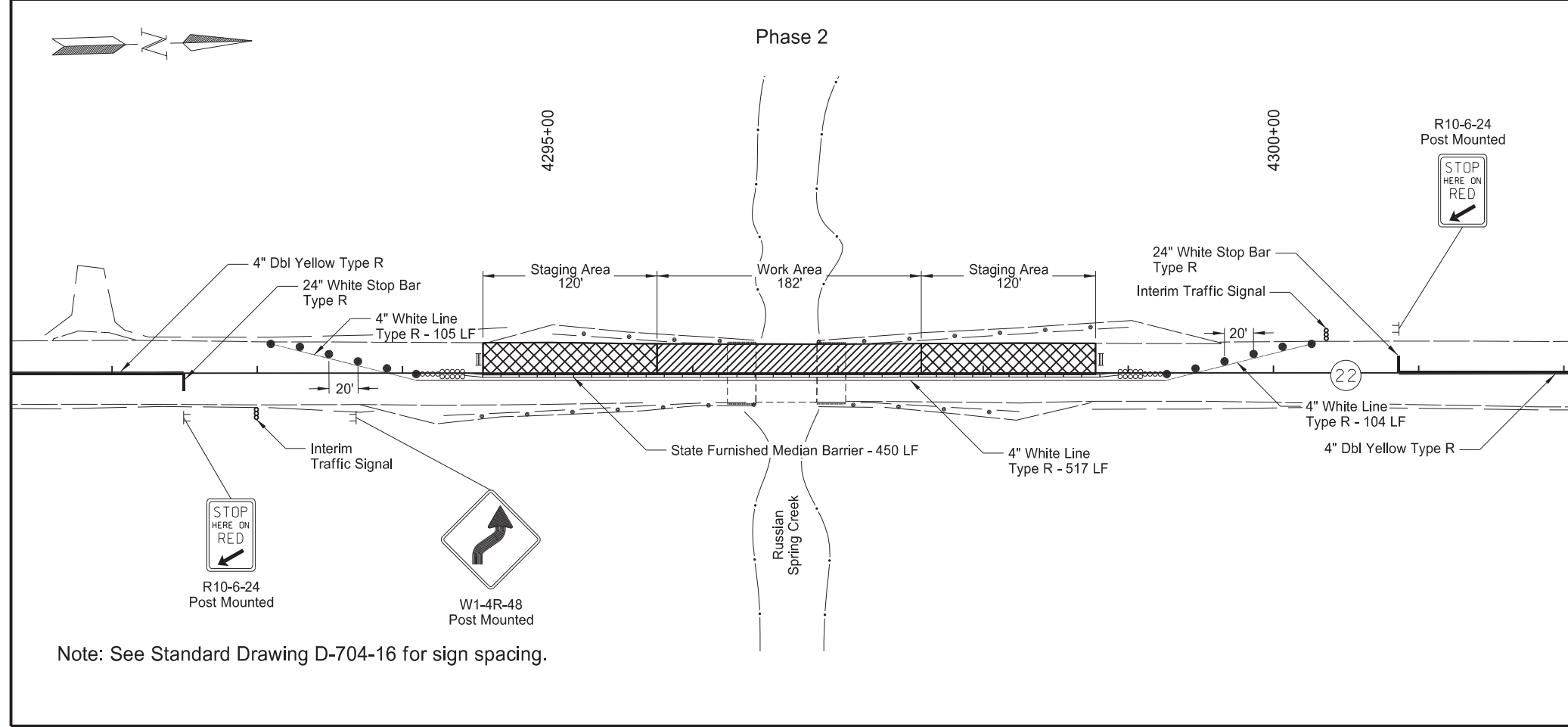
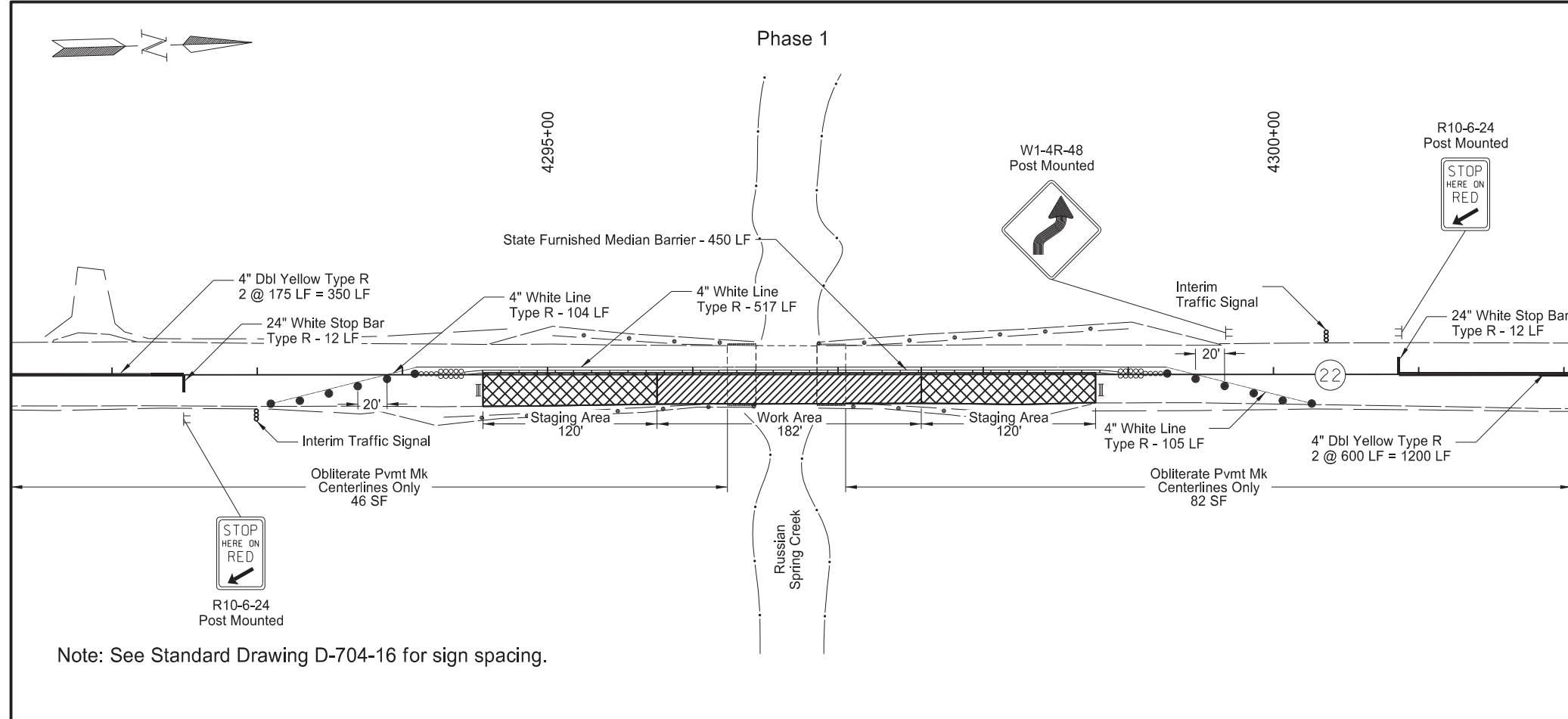
| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 13 |



Note: See Standard Drawing D-704-16 for sign spacing.

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| <p>Work Zone Traffic Control</p> <p>Sign Layout</p> <p>ND Hwy 22</p> <p>Structure #22-081.376 - District 5 (Dickinson District)</p> | |
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 14 |

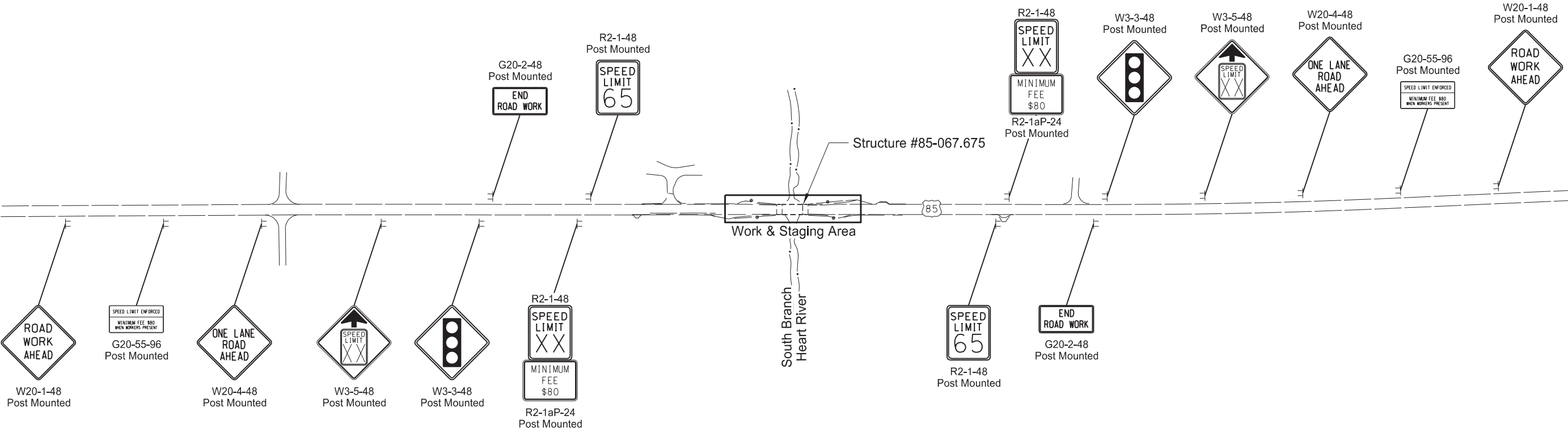
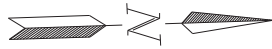


- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - State Furnished Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

Work Zone Traffic Control
Phase 1 & Phase 2
ND Hwy 22
Structure #22-081.376 - District 5
(Dickinson District)



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|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 100 | 15 |

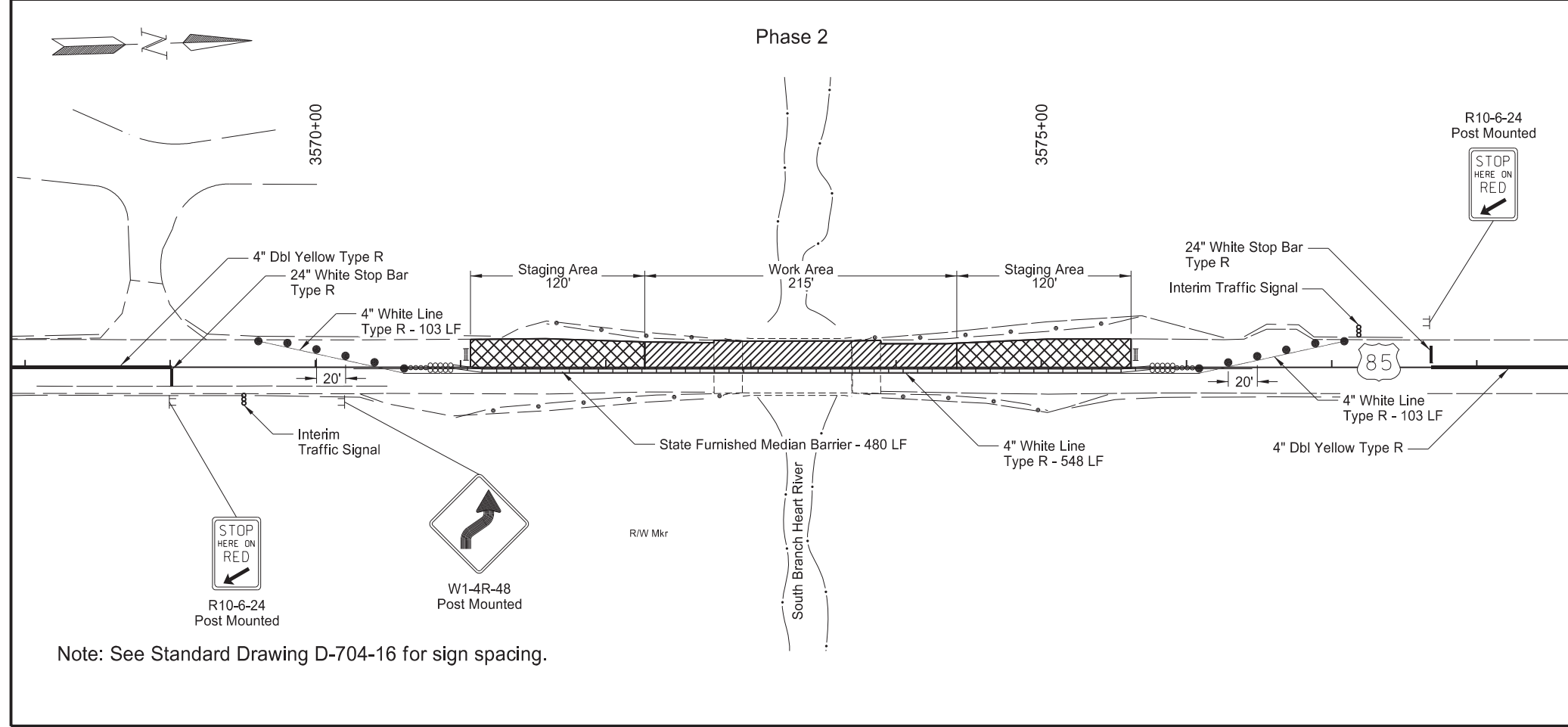
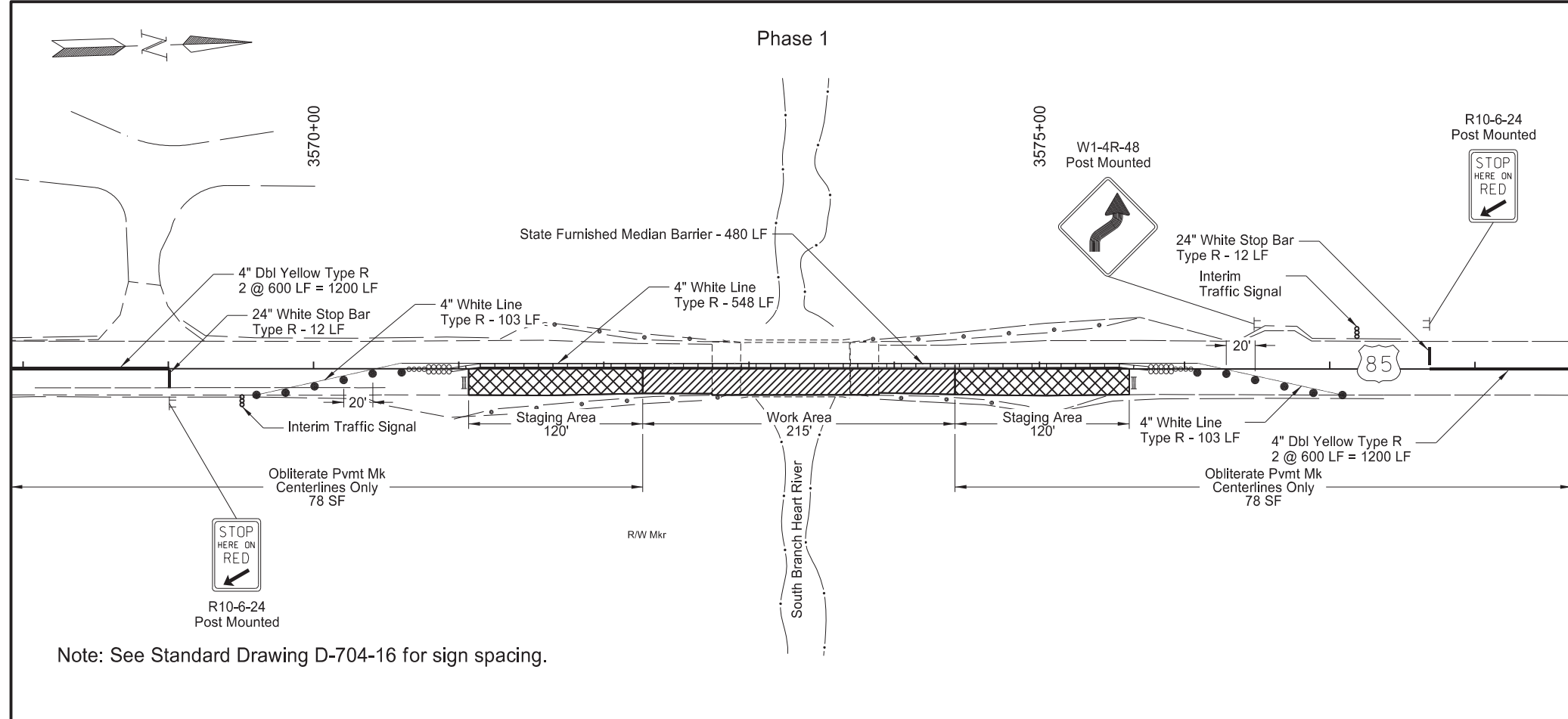


Note: See Standard Drawing D-704-16 for sign spacing.

Work Zone Traffic Control
 Sign Layout
 US Hwy 85
 Structure #85-067.675 - District 5
 (Dickinson District)



| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 100 | 16 |



- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - State Furnished Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

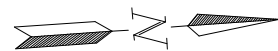
Work Zone Traffic Control
Phase 1 & Phase 2
US Hwy 85
Structure #85-067.675 - District 5
(Dickinson District)



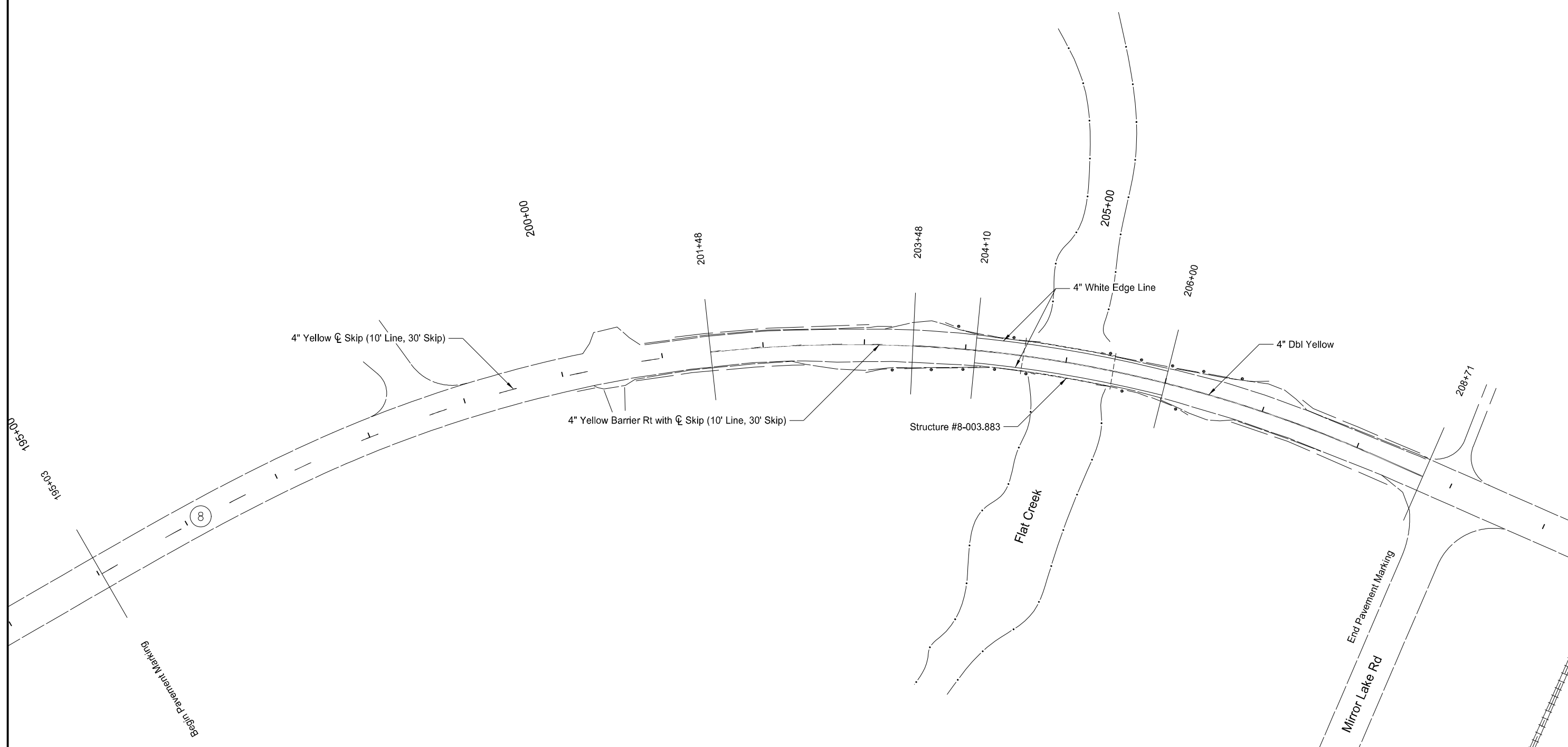
| SIGN NUMBER | Consign 1 | STATION(S): | N/A | AREA: 16.0 Sq.Ft. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| WIDTH X HEIGHT | 4'-0" x 4'-0" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BORDER WIDTH | 1.25" (inset 0.75") | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CORNER RADIUS | 3" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOUNTING | Ground | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BACKGROUND | TYPE: XI Reflective COLOR: Fluorescent Orange | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LEGEND/BORDER | TYPE: Non-reflective COLOR: Black | <small>Dimensions are in inches.tenths Letter locations are panel edge to lower left corner</small> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>SYMBOL</th> <th>X</th> <th>Y</th> <th>WID</th> <th>HT</th> <th>ANGLE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | | | | | SYMBOL | X | Y | WID | HT | ANGLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | X | Y | WID | HT | ANGLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <table border="1"> <thead> <tr> <th colspan="10">LETTER POSITION (X)</th> <th>LENGTH</th> <th>SIZE</th> <th>SERIES</th> </tr> </thead> <tbody> <tr> <td>X</td><td>X</td><td>F</td><td>T</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>25.7</td><td>10,7</td><td>D 2000</td> </tr> <tr> <td>19.5</td><td>27.3</td><td>36.1</td><td>40.9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>W</td><td>I</td><td>D</td><td>T</td><td>H</td><td></td><td></td><td></td><td></td><td></td><td></td><td>25.9</td><td>7</td><td>D 2000</td> </tr> <tr> <td>19.4</td><td>26.7</td><td>29.5</td><td>35.2</td><td>40.6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>A</td><td>H</td><td>E</td><td>A</td><td>D</td><td></td><td></td><td></td><td></td><td></td><td></td><td>30.1</td><td>7</td><td>D 2000</td> </tr> <tr> <td>17.3</td><td>24.3</td><td>30.8</td><td>35.7</td><td>42.7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | | | | | LETTER POSITION (X) | | | | | | | | | | LENGTH | SIZE | SERIES | X | X | F | T | | | | | | | | 25.7 | 10,7 | D 2000 | 19.5 | 27.3 | 36.1 | 40.9 | | | | | | | | | | | W | I | D | T | H | | | | | | | 25.9 | 7 | D 2000 | 19.4 | 26.7 | 29.5 | 35.2 | 40.6 | | | | | | | | | | A | H | E | A | D | | | | | | | 30.1 | 7 | D 2000 | 17.3 | 24.3 | 30.8 | 35.7 | 42.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LETTER POSITION (X) | | | | | | | | | | LENGTH | SIZE | SERIES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 17.3 | 24.3 | 30.8 | 35.7 | 42.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| SIGN NUMBER | Consign 2 | STATION(S): | | AREA: 38.0 Sq.Ft. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| BORDER WIDTH | 1.25" (inset 0.75") | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| MOUNTING | Ground | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BACKGROUND | TYPE: XI Relective COLOR: Fluorescent Orange | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LEGEND/BORDER | TYPE: Non-reflective COLOR: Black | <small>Dimensions are in inches.tenths Letter locations are panel edge to lower left corner</small> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>SYMBOL</th> <th>X</th> <th>Y</th> <th>WID</th> <th>HT</th> <th>ANGLE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | | | | | SYMBOL | X | Y | WID | HT | ANGLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | X | Y | WID | HT | ANGLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <table border="1"> <thead> <tr> <th colspan="14">LETTER POSITION (X)</th> <th>LENGTH</th> <th>SIZE</th> <th>SERIES</th> </tr> </thead> <tbody> <tr> <td>1</td><td>2</td><td></td><td>F</td><td>T</td><td></td><td>L</td><td>A</td><td>N</td><td>E</td><td></td><td></td><td></td><td></td><td></td><td>52.6</td><td>6</td><td>EM 2000</td> </tr> <tr> <td>30.7</td><td>34</td><td>38.9</td><td>44.9</td><td>50</td><td>54.4</td><td>60.4</td><td>65.2</td><td>72.3</td><td>78.9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>W</td><td>I</td><td>D</td><td>E</td><td></td><td>V</td><td>E</td><td>H</td><td>I</td><td>C</td><td>L</td><td>E</td><td>S</td><td></td><td>U</td><td>S</td><td>E</td><td></td> </tr> <tr> <td>10.2</td><td>17.6</td><td>20.5</td><td>26.8</td><td>31.2</td><td>37.2</td><td>43.8</td><td>49.5</td><td>56.1</td><td>58.7</td><td>64.9</td><td>70.3</td><td>75.8</td><td>80.7</td><td>86.7</td><td>93</td><td>99.4</td><td></td> </tr> <tr> <td>A</td><td>L</td><td>T</td><td>E</td><td></td><td>R</td><td>N</td><td>A</td><td>T</td><td>E</td><td></td><td></td><td></td><td></td><td>R</td><td>O</td><td>U</td><td>T</td><td>E</td> </tr> <tr> <td>14</td><td>21.2</td><td>26</td><td>31.5</td><td>37.2</td><td>43.3</td><td>49.2</td><td>55.8</td><td>61.3</td><td>65.7</td><td>71.7</td><td>77.6</td><td>84.1</td><td>90</td><td>95.6</td><td></td><td></td><td></td><td></td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | | | | | LETTER POSITION (X) | | | | | | | | | | | | | | LENGTH | SIZE | SERIES | 1 | 2 | | F | T | | L | A | N | E | | | | | | 52.6 | 6 | EM 2000 | 30.7 | 34 | 38.9 | 44.9 | 50 | 54.4 | 60.4 | 65.2 | 72.3 | 78.9 | | | | | | | | | W | I | D | E | | V | E | H | I | C | L | E | S | | U | S | E | | 10.2 | 17.6 | 20.5 | 26.8 | 31.2 | 37.2 | 43.8 | 49.5 | 56.1 | 58.7 | 64.9 | 70.3 | 75.8 | 80.7 | 86.7 | 93 | 99.4 | | A | L | T | E | | R | N | A | T | E | | | | | R | O | U | T | E | 14 | 21.2 | 26 | 31.5 | 37.2 | 43.3 | 49.2 | 55.8 | 61.3 | 65.7 | 71.7 | 77.6 | 84.1 | 90 | 95.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LETTER POSITION (X) | | | | | | | | | | | | | | LENGTH | SIZE | SERIES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | | F | T | | L | A | N | E | | | | | | 52.6 | 6 | EM 2000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30.7 | 34 | 38.9 | 44.9 | 50 | 54.4 | 60.4 | 65.2 | 72.3 | 78.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W | I | D | E | | V | E | H | I | C | L | E | S | | U | S | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.2 | 17.6 | 20.5 | 26.8 | 31.2 | 37.2 | 43.8 | 49.5 | 56.1 | 58.7 | 64.9 | 70.3 | 75.8 | 80.7 | 86.7 | 93 | 99.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | L | T | E | | R | N | A | T | E | | | | | R | O | U | T | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | 21.2 | 26 | 31.5 | 37.2 | 43.3 | 49.2 | 55.8 | 61.3 | 65.7 | 71.7 | 77.6 | 84.1 | 90 | 95.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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|--|--|
| <p>Work Zone Traffic Control Construction Sign Details</p> <p>Various Structures - District 5 (Dickinson District)</p> | |
|--|--|



| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 120 | 1 |

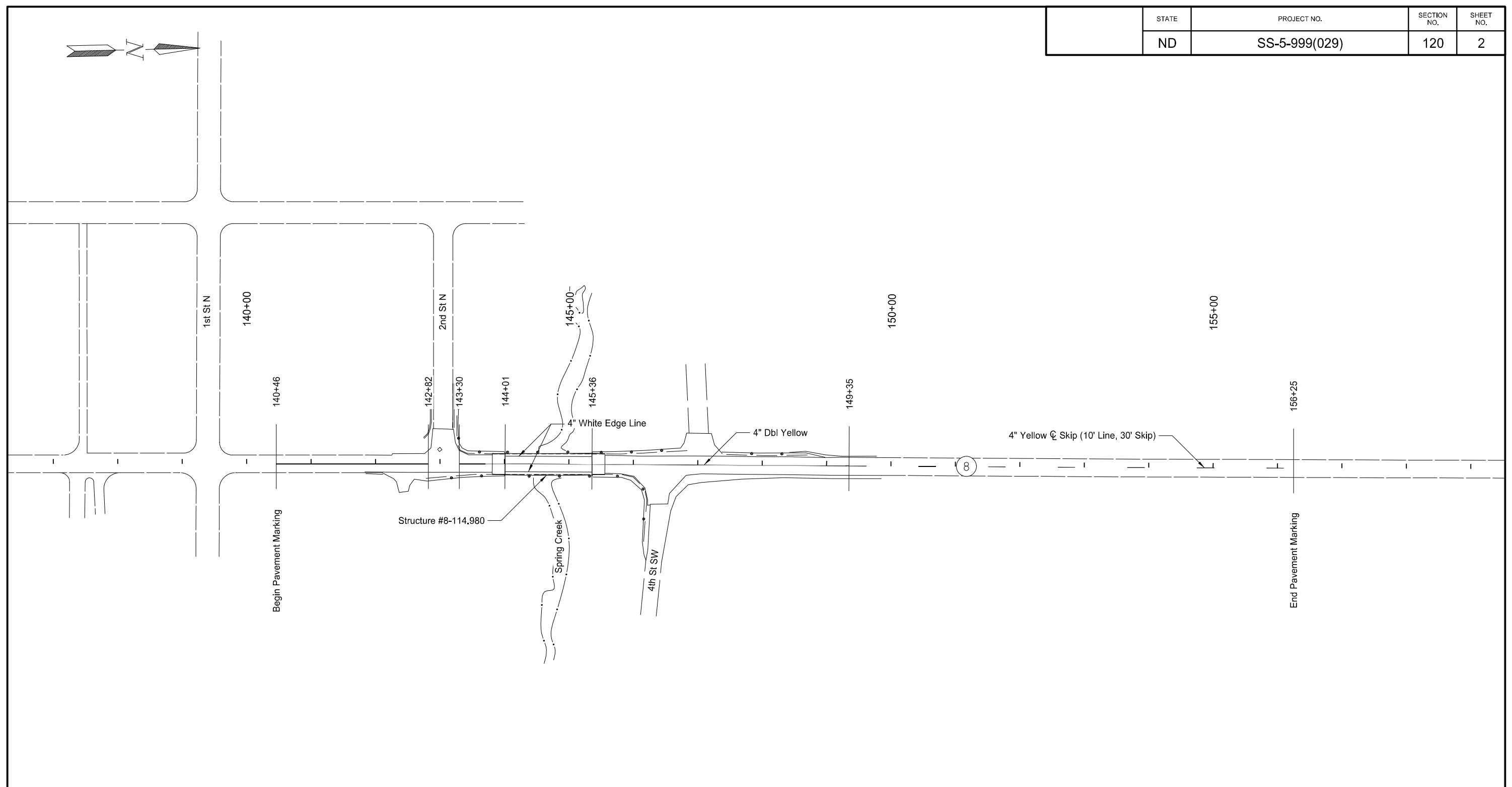
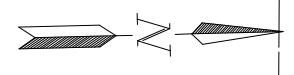


| SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|--|------|------|
| 762 1104 | PVMT MK PAINTED 4IN LINE | | |
| | Sta 195+03 to Sta 201+48 - Yellow \varnothing Skip | 161 | LF |
| | Sta 201+48 to Sta 203+48 - Yellow Barrier Rt with \varnothing Skip | 250 | LF |
| | Sta 203+48 to Sta 208+71 - Yellow \varnothing Dbl Barrier | 1046 | LF |
| | Sta 204+10 to Sta 206+00 - White Edge Line Lt | 190 | LF |
| | Sta 204+10 to Sta 206+00 - White Edge Line Rt | 190 | LF |

Pavement Marking Layout
 ND Hwy 8
 Structure #8-003.883 - District 5
 (Dickinson District)



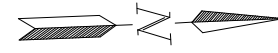
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 120 | 2 |



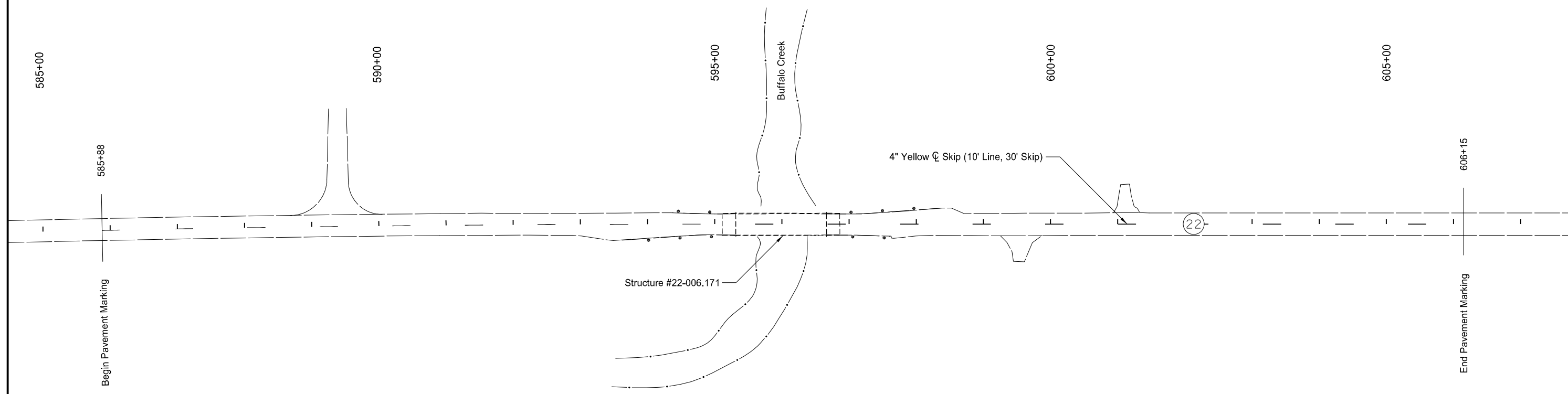
| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|--|------|------|
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | | |
| | | Sta 140+46 to Sta 142+82 - Yellow C̄ Dbl Barrier | 472 | LF |
| | | Sta 143+30 to Sta 149+35 - Yellow C̄ Dbl Barrier | 1210 | LF |
| | | Sta 144+01 to Sta 145+36 - White Edge Line Lt | 135 | LF |
| | | Sta 144+01 to Sta 145+36 - White Edge Line Rt | 135 | LF |
| | | Sta 149+35 to Sta 156+25 - Yellow C̄ Skip | 173 | LF |

Pavement Marking Layout
 ND Hwy 8
 Structure #8-114,980 - District 5
 (Dickinson District)





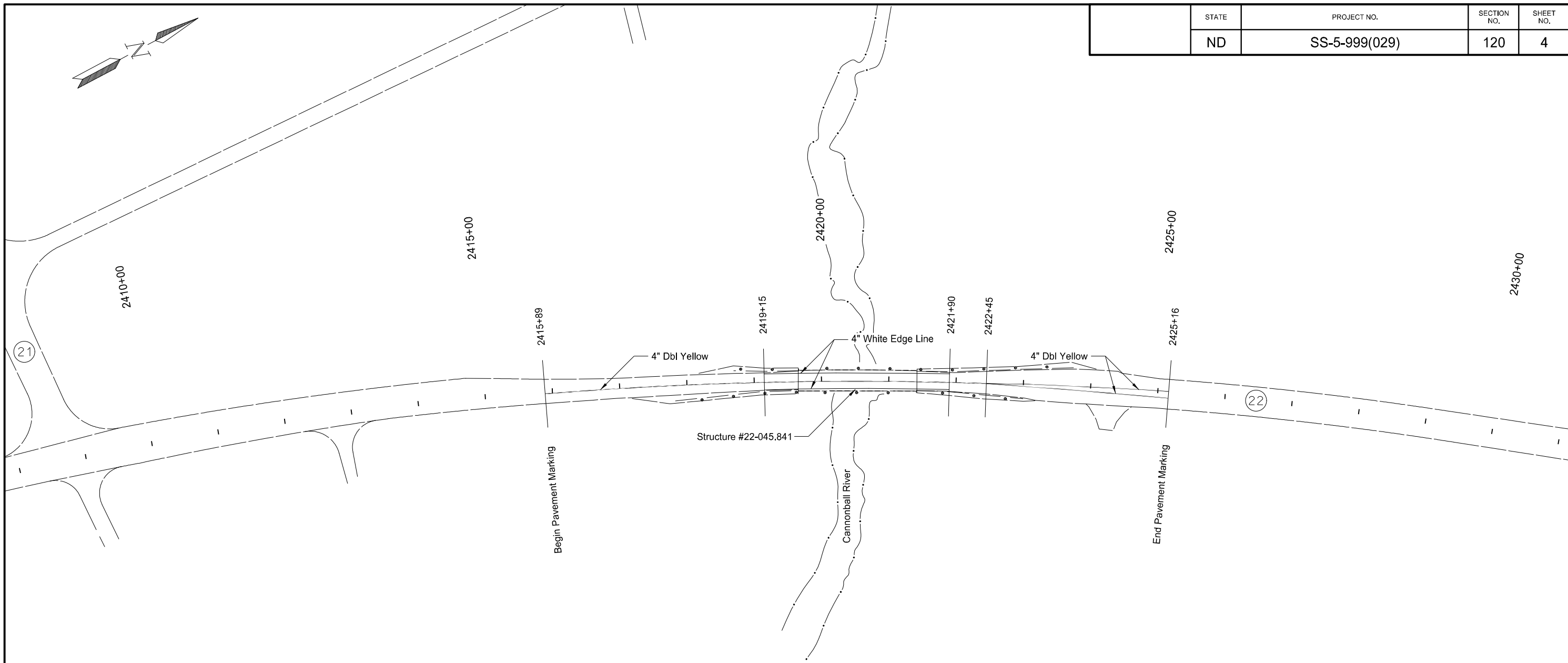
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| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 120 | 3 |



| SPEC | CODE | BID ITEM | QTY | UNIT |
|--|------|--------------------------|-----|------|
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | | |
| Sta 585+88 to Sta 606+15 - Yellow \oslash Skip | | | 507 | LF |

| | |
|--|--|
| Pavement Marking Layout ND Hwy 22 Structure #22-006.171 - District 5 (Dickinson District) | |
|--|--|

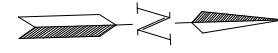
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 120 | 4 |



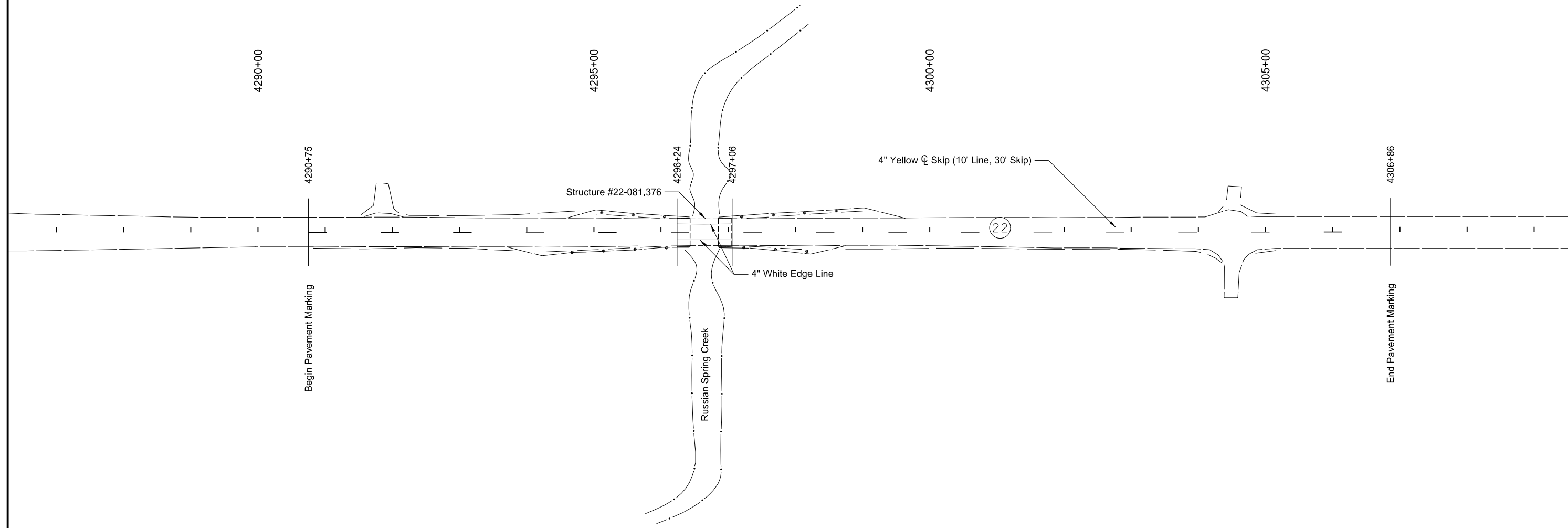
| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|--|------|------|
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | | |
| | | Sta 2415+89 to Sta 2422+45 - Yellow \oslash Dbl Barrier | 1312 | LF |
| | | Sta 2419+15 to Sta 2421+90 - White Edge Line Lt | 275 | LF |
| | | Sta 2419+15 to Sta 2421+90 - White Edge Line Rt | 275 | LF |
| | | Sta 2422+45 to Sta 2425+16 - Yellow \oslash Dbl Barrier (x2) | 1084 | LF |

Pavement Marking Layout
 ND Hwy 22
 Structure #22-045.841 - District 5
 (Dickinson District)



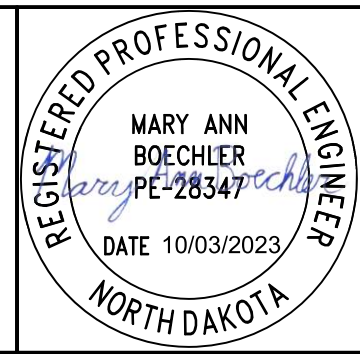


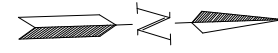
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| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 120 | 5 |



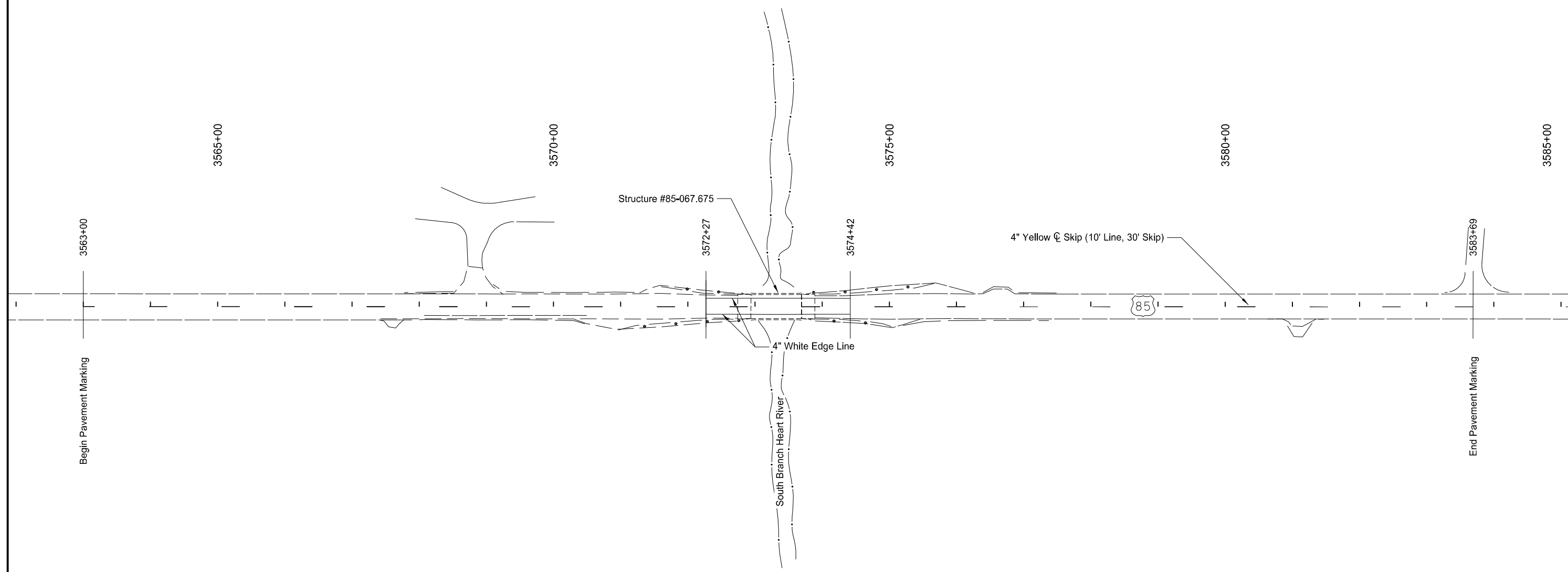
| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|---|-----|------|
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | | |
| | | Sta 4290+75 to Sta 4306+86 - Yellow C Skip | 403 | LF |
| | | Sta 4296+24 to Sta 4297+06 - White Edge Line Lt | 82 | LF |
| | | Sta 4296+24 to Sta 4297+06 - White Edge Line Rt | 82 | LF |

Pavement Marking Layout
 ND Hwy 22
 Structure #22-081.376 - District 5
 (Dickinson District)



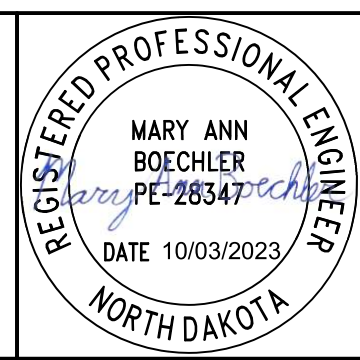


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| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 120 | 6 |



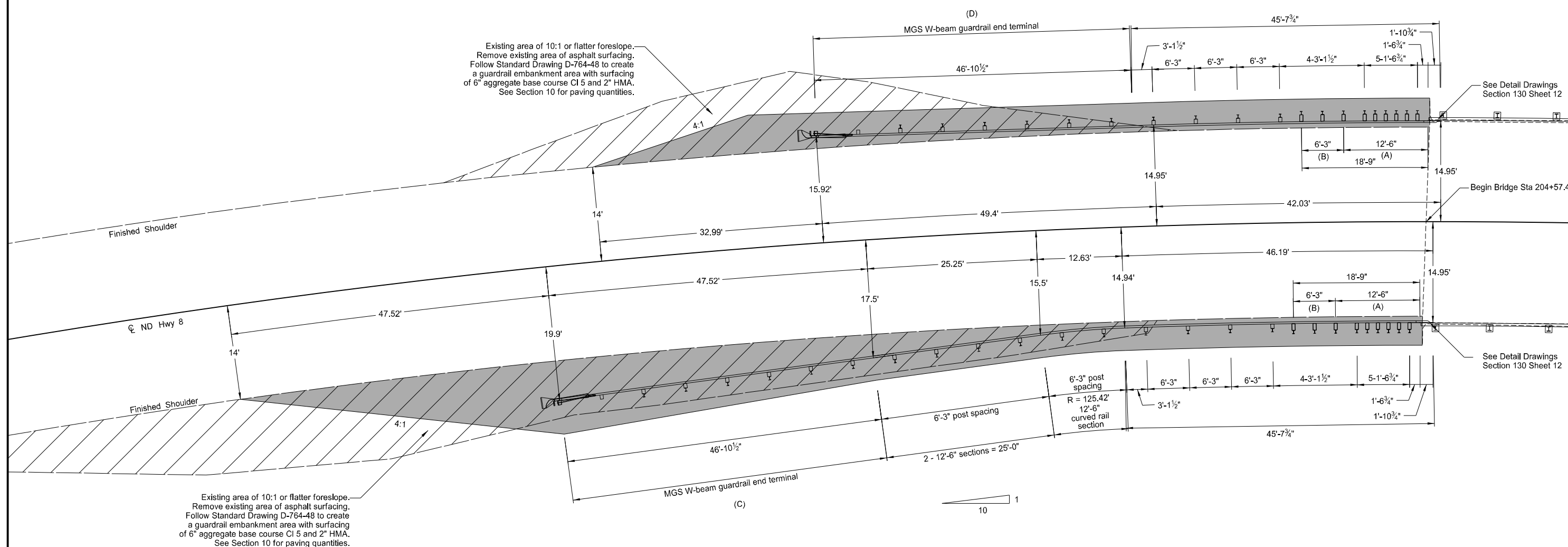
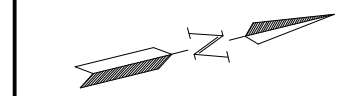
| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|--|-----|------|
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | | |
| | | Sta 3563+00 to Sta 3583+69 - Yellow \oslash Skip | 517 | LF |
| | | Sta 3572+27 to Sta 3574+42 - White Edge Line Lt | 215 | LF |
| | | Sta 3572+27 to Sta 3574+42 - White Edge Line Rt | 215 | LF |

Pavement Marking Layout
 US Hwy 85
 Structure #85-067.675 - District 5
 (Dickinson District)



23 USC § 407 Documents
 NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 1 |



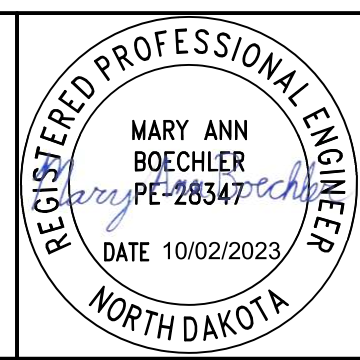
- New Guardrail Surfacing
- Removal of Bituminous Surfacing

- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install an MGS FLEAT end terminal at this location. See Standard D-764-38. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-38 install:
 Posts 3 through 6:
 Steel posts, per the manufacture's recommendation, with 8" routed timber blocks.
 Posts 7 and 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.
- (D) Install a MASH Sequential Kinking Terminal at this location. See Standard D-764-51. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-51 install:
 Posts 3 through 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.

Thrie/MGS W-Beam Guardrail Layout
 At Beginning of Bridge

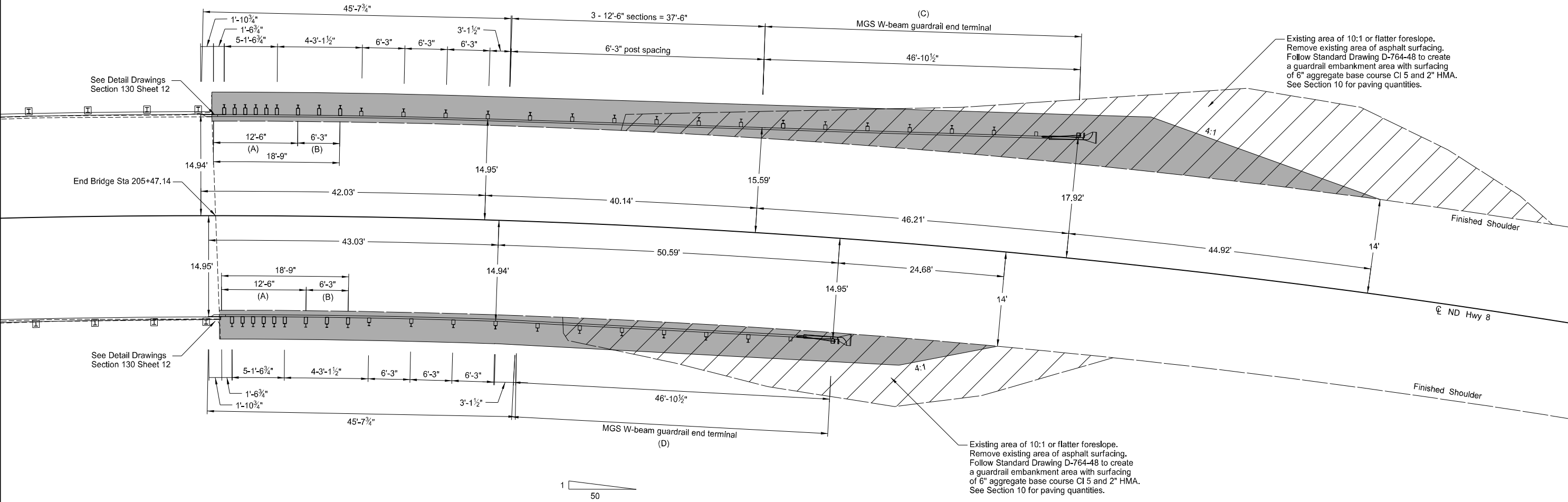
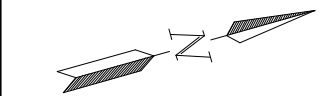
Flat Creek Bridge
 RP 3.883


ND Hwy 8




23 USC § 407 Documents
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 2 |



 New Guardrail Surfacing

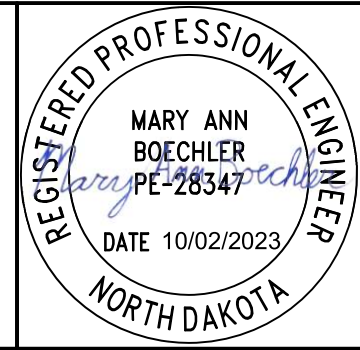
 Removal of Bituminous Surfacing

- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install an MGS FLEAT end terminal at this location. See Standard D-764-38. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-38 install:
 Posts 3 through 6:
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 Standard steel line posts with 8" routed wood blocks. See plan details.
- (D) Install a MASH Sequential Kinking Terminal at this location. See Standard D-764-51. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-51 install:
 Posts 3 through 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.

Thrie/MGS W-Beam Guardrail Layout
At End of Bridge

Flat Creek Bridge
RP 3.883

ND Hwy 8



| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 3 |

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS

| LOCATION | (A) 5/8" Ø x 10" LONG GUARD- RAIL BOLT | (A) W6 x 9 x 6'-0" POST | (A) 6" x 8" x 14" ROUTED TIMBER BLOCK | (A) 5/8" Ø x 1 1/4" LONG GUARD- RAIL BOLT | (A) 12'-6" STRAIGHT W-BEAM RAIL SECTION | (A) 12'-6" CURVED W-BEAM RAIL SECTION | (A) REFL- ECTOR- IZED PLATES | (A) W6 x 9 x 6'-6" POST | (A) HSS12 x 6 x 1/4 x 1'-9 1/8" STEEL BLOCK | (A) HSS12 x 6 x 1/4 x 1'-2" STEEL BLOCK | (A) 5/8" Ø x 14" LONG GUARD- RAIL BOLT | (A) 6'-3" W-THRIE BEAM TRANS- ITION SECTION | (A) 12'-6" DOUBLE THRIE BEAM SECTION | (A) 2'-6" THRIE BEAM TERM- INAL CON- NECTOR | (A) 7/8" Ø x 3/4" LONG BOLT | (A) 5/8" Ø x 2" LONG POST BOLT |
|-------------------------------|--|----------------------------------|--|---|--|--|--|----------------------------------|---|---|--|---|---|--|---|--|
| | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH |
| Sta 203+74.44 to 204+58.51 Rt | 10 | 12 | 10 | 72 | 4 | 1 | 6 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| Sta 204+14.53 to 204+59.64 Lt | 4 | 6 | 4 | 48 | 2 | | 4 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| Sta 205+46.10 to 205+92.28 Rt | 4 | 6 | 4 | 48 | 2 | | 4 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| Sta 205+44.97 to 206+27.14 Lt | 10 | 12 | 10 | 72 | 5 | | 6 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| TOTAL | 28 | 36 | 28 | 240 | 13 | 1 | 20 | 28 | 28 | 8 | 64 | 4 | 4 | 4 | 20 | 8 |

| SPEC CODE | BID ITEM | QTY | UNIT | SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|-------------------------------|--------------|-----------|-----------|-----------------------------------|--------------|-----------|
| 764 0131 | W-BEAM GUARDRAIL | | | 764 2080 | REMOVE BOX BEAM GUARDRAIL | | |
| | Sta 203+74.44 to 204+58.51 Rt | 83.2 | LF | | Sta 203+43.01 to 204+71.45 Rt | 127.4 | LF |
| | Sta 204+14.53 to 204+59.64 Lt | 45.7 | LF | | Sta 204+16.65 to 204+72.13 Lt | 56.3 | LF |
| | Sta 205+46.10 to 205+92.28 Rt | 45.7 | LF | | Sta 205+33.38 to 205+90.42 Rt | 56.3 | LF |
| | Sta 205+44.97 to 206+27.14 Lt | 83.2 | LF | | Sta 205+32.49 to 206+58.89 Lt | 127.4 | LF |
| | Total | 257.8 | LF | | Total | 367.4 | LF |
| 764 0145 | W-BEAM GUARDRAIL END TERMINAL | | | 764 2081 | REMOVE END TREATMENT & TRANSITION | | |
| | Sta 203+26.93 to 203+74.44 Rt | 1 | Ea | | Sta 203+01.54 to 203+43.01 Rt | 1 | Ea |
| | Sta 203+68.22 to 204+14.53 Lt | 1 | Ea | | Sta 203+78.35 to 204+16.65 Lt | 1 | Ea |
| | Sta 205+92.28 to 206+39.72 Rt | 1 | Ea | | Sta 205+90.42 to 206+30.13 Rt | 1 | Ea |
| | Sta 206+27.14 to 206+73.36 Lt | 1 | Ea | | Sta 206+58.89 to 206+96.73 Lt | 1 | Ea |
| | Total | 4 | Ea | | Total | 4 | Ea |

(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

Thrie/MGS W-Beam Guardrail Quantities
At Both Ends of Bridge

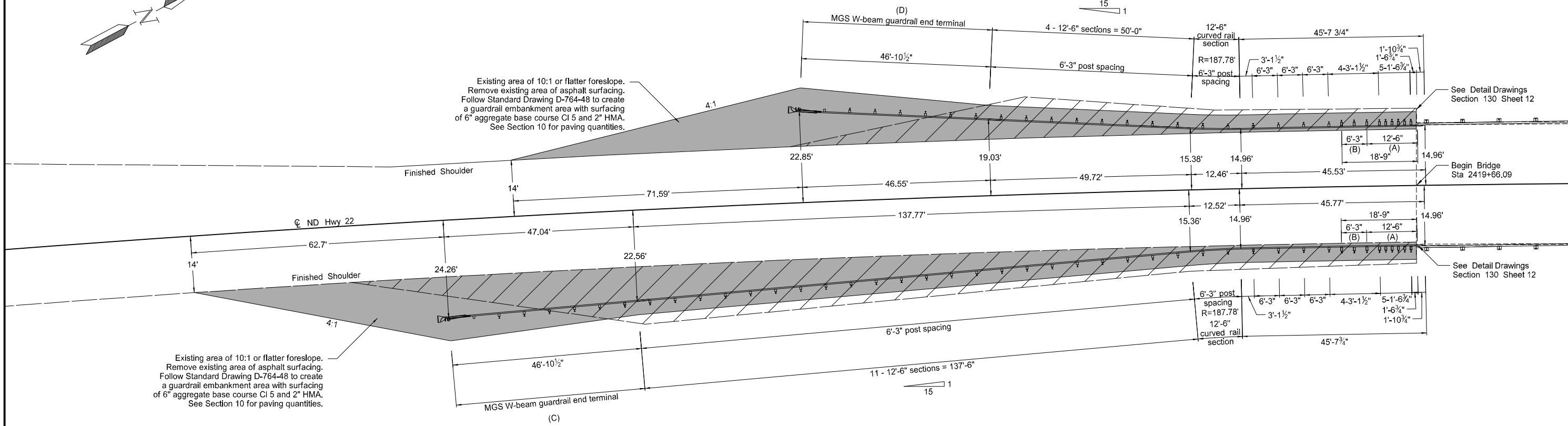
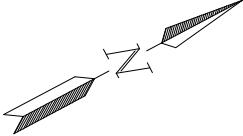
Flat Creek Bridge
RP 3.883

ND Hwy 8





23 USC § 407 Documents
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 4 |



Existing area of 10:1 or flatter foreslope. Remove existing area of asphalt surfacing. Follow Standard Drawing D-764-48 to create a guardrail embankment area with surfacing of 6" aggregate base course CI 5 and 2" HMA. See Section 10 for paving quantities.

Existing area of 10:1 or flatter foreslope. Remove existing area of asphalt surfacing. Follow Standard Drawing D-764-48 to create a guardrail embankment area with surfacing of 6" aggregate base course CI 5 and 2" HMA. See Section 10 for paving quantities.

 New Guardrail Surfacing
 Removal of Bituminous Surfacing

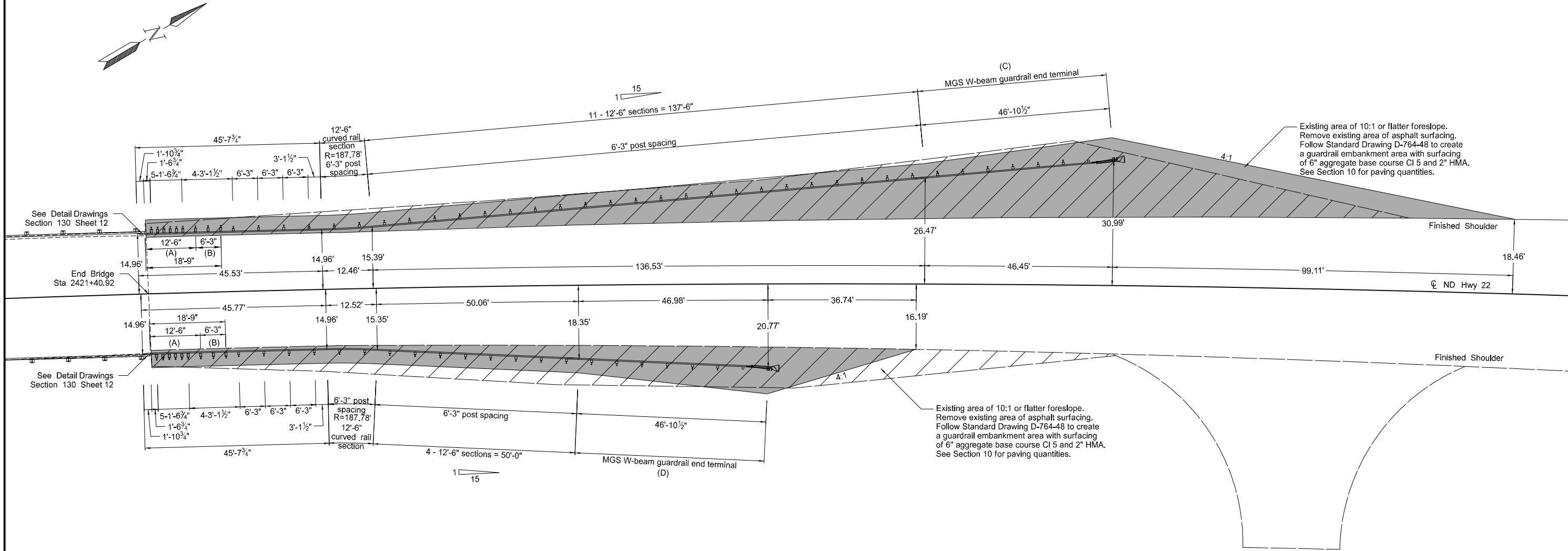
- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install an MGS FLEAT end terminal at this location. See Standard D-764-38. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-38 install:
 Posts 3 through 6:
 Steel posts, per the manufacturer's recommendation, with 8" routed timber blocks.
 Posts 7 and 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.
- (D) Install a MASH Sequential Kinking Terminal at this location. See Standard D-764-51. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-51 install:
 Posts 3 through 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.

Thrie/MGS W-Beam Guardrail Layout
At Beginning of Bridge
Cannonball River Bridge
RP 45.841
ND Hwy 22



23 USC § 407 Documents
 NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 5 |



New Guardrail Surfacing
 Removal of Bituminous Surfacing

- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install an MGS FLEAT end terminal at this location. See Standard D-764-38. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-38 install:
 Posts 3 through 6:
 Steel posts, per the manufacture's recommendation, with 8" routed timber blocks.
 Posts 7 and 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.
- (D) Install a MASH Sequential Kinking Terminal at this location. See Standard D-764-51. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-51 install:
 Posts 3 through 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.

Thrie/MGS W-Beam Guardrail Layout
 At End of Bridge
 Cannonball River Bridge
 RP 45.841
 ND Hwy 22



MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS

| LOCATION | (A) 5/8" Ø x 10" LONG GUARD- RAIL BOLT | (A) W6 x 9 x 6'-0" POST | (A) 6" x 8" x 14" ROUTED TIMBER BLOCK | (A) 5/8" Ø x 1 1/4" LONG GUARD- RAIL BOLT | (A) 12'- 6" STRAIGHT W-BEAM RAIL SECTION | (A) 12'- 6" CURVED W-BEAM RAIL SECTION | (A) REFL- ECTOR- IZED PLATES | (A) W6 x 9 x 6'-6" POST | (A) HSS12 x 6 x 1/4 x 1'-9 1/8" STEEL BLOCK | (A) HSS12 x 6 x 1/4 x 1'-2" STEEL BLOCK | (A) 5/8" Ø x 14" LONG GUARD- RAIL BOLT | (A) 6'-3" W-THRIE BEAM TRANS- ITION SECTION | (A) 12'-6" DOUBLE THRIE BEAM SECTION | (A) 2'-6" THRIE BEAM TERM- INAL CON- NECTOR | (A) 7/8" Ø x 3/4" LONG BOLT | (A) 5/8" Ø x 2" LONG POST BOLT |
|---------------------------------|--|----------------------------------|--|---|---|---|--|----------------------------------|---|---|--|---|---|--|---|--|
| | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH |
| Sta 2417+71.94 to 2419+68.00 Rt | 28 | 30 | 28 | 144 | 13 | 1 | 10 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| Sta 2418+60.71 to 2419+68.41 Lt | 14 | 16 | 14 | 88 | 6 | 1 | 7 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| Sta 2421+39.00 to 2422+47.35 Rt | 14 | 16 | 14 | 88 | 6 | 1 | 7 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| Sta 2421+38.60 to 2423+33.14 Lt | 28 | 30 | 28 | 144 | 13 | 1 | 10 | 7 | 7 | 2 | 16 | 1 | 1 | 1 | 5 | 2 |
| TOTAL | 84 | 92 | 84 | 464 | 38 | 4 | 34 | 28 | 28 | 8 | 64 | 4 | 4 | 4 | 20 | 8 |

| SPEC CODE | BID ITEM | QTY | UNIT | SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|------------------------------------|--------------|-----------|-----------|--|--------------|-----------|
| 764 | 0131 W-BEAM GUARDRAIL | | | 764 | 0151 REMOVE W-BEAM GUARDRAIL & POSTS | | |
| | Sta 2417+71.94 to 2419+68.00 Rt | 195.7 | LF | | Sta 2418+34.32 to 2419+65.10 Rt | 133.2 | LF |
| | Sta 2418+60.71 to 2419+68.41 Lt | 108.2 | LF | | Sta 2419+18.60 to 2419+66.48 Lt | 45.7 | LF |
| | Sta 2421+39.00 to 2422+47.35 Rt | 108.2 | LF | | Sta 2421+40.68 to 2422+45.86 Rt | 108.2 | LF |
| | Sta 2421+38.60 to 2423+33.14 Lt | 195.7 | LF | | Sta 2421+41.48 to 2423+28.82 Lt | 183.2 | LF |
| | Total | 607.8 | LF | | Total | 470.3 | LF |
| 764 | 0145 W-BEAM GUARDRAIL END TERMINAL | | | 764 | 2081 REMOVE END TREATMENT & TRANSITION | | |
| | Sta 2417+24.90 to 2417+71.94 Rt | 1 | Ea | | Sta 2417+82.03 to 2418+34.32 Rt | 1 | Ea |
| | Sta 2418+14.16 to 2418+60.71 Lt | 1 | Ea | | Sta 2418+79.11 to 2419+18.60 Lt | 1 | Ea |
| | Sta 2422+47.35 to 2422+94.32 Rt | 1 | Ea | | Sta 2422+45.86 to 2423+00.08 Rt | 1 | Ea |
| | Sta 2423+33.14 to 2423+79.57 Lt | 1 | Ea | | Sta 2423+28.82 to 2423+73.04 Lt | 1 | Ea |
| | Total | 4 | Ea | | Total | 4 | Ea |

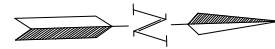
(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

Thrie/MGS W-Beam Guardrail Quantities
At Both Ends of Bridge

Cannonball River Bridge
RP 45.841

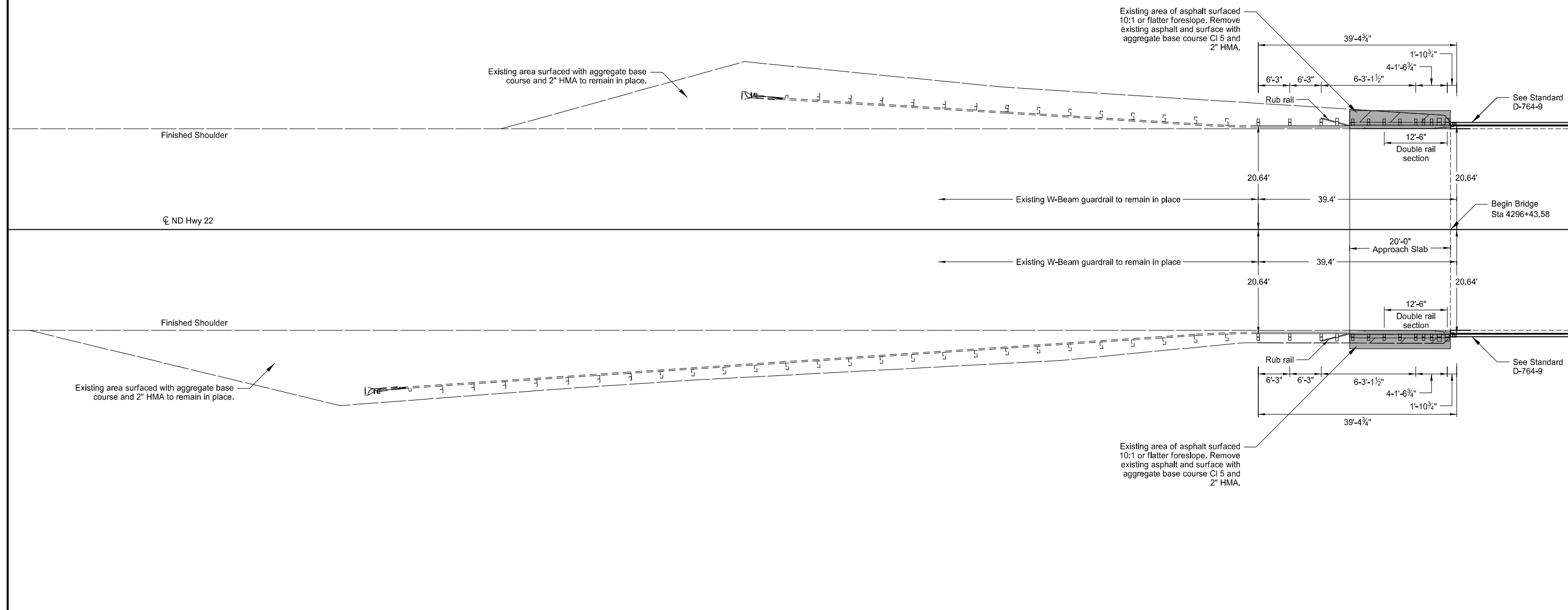
ND Hwy 22





23 USC § 407 Documents
NDDOT Reserves All Objections

| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 130 | 7 |



New Guardrail Surfacing
 Removal of Bituminous Surfacing

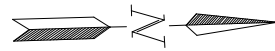
| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|---------------------------------|------|------|
| 764 | 0150 | REMOVE & RESET W-BEAM GUARDRAIL | | |
| | | Sta 4296+05.44 to 4296+44.83 Rt | 39.4 | LF |
| | | Sta 4296+05.44 to 4296+44.83 Lt | 39.4 | LF |
| | | Total | 78.8 | LF |

W-Beam Guardrail Layout
 At Beginning of Bridge

 Russian Spring Creek Bridge
 RP 81.376

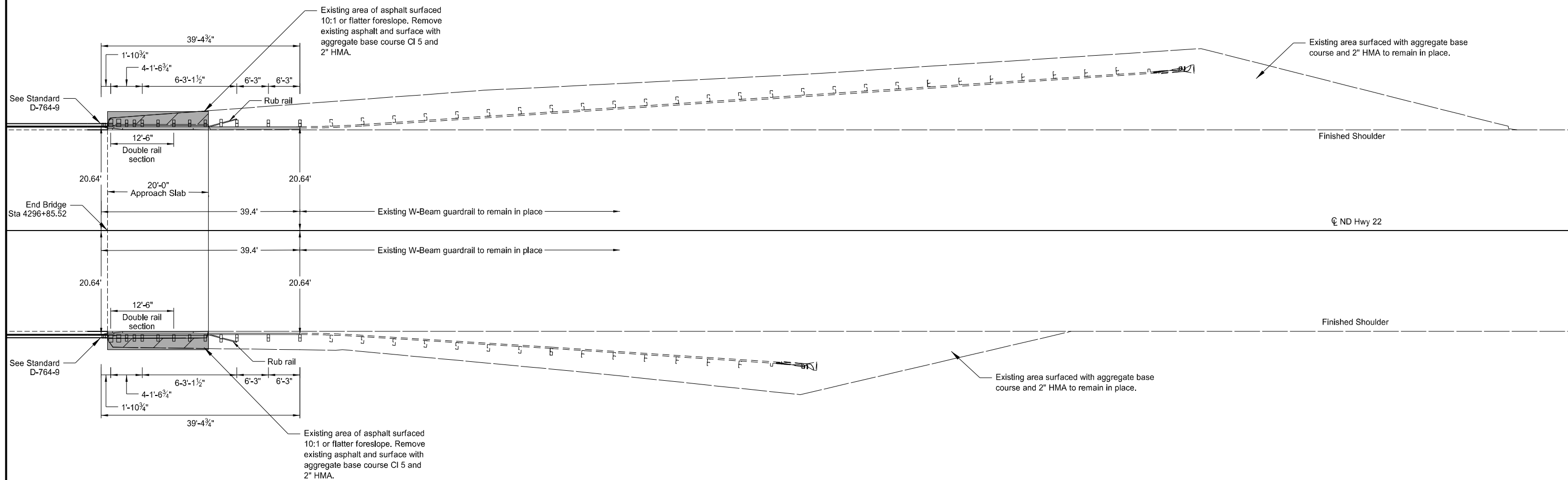
 ND Hwy 22

REGISTERED PROFESSIONAL ENGINEER
 MARY ANN BOECHLER
 PE-28347
 DATE 10/02/2023
 NORTH DAKOTA



23 USC § 407 Documents
NDDOT Reserves All Objections

| | | | | |
|--|-------|---------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | SS-5-999(029) | 130 | 8 |



- New Guardrail Surfacing
- Removal of Bituminous Surfacing

| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|---------------------------------|------|------|
| 764 | 0150 | REMOVE & RESET W-BEAM GUARDRAIL | | |
| | | Sta 4296+84.27 to 4297+23.66 Rt | 39.4 | LF |
| | | Sta 4296+84.27 to 4297+23.66 Lt | 39.4 | LF |
| | | Total | 78.8 | LF |

W-Beam Guardrail Layout
At End of Bridge

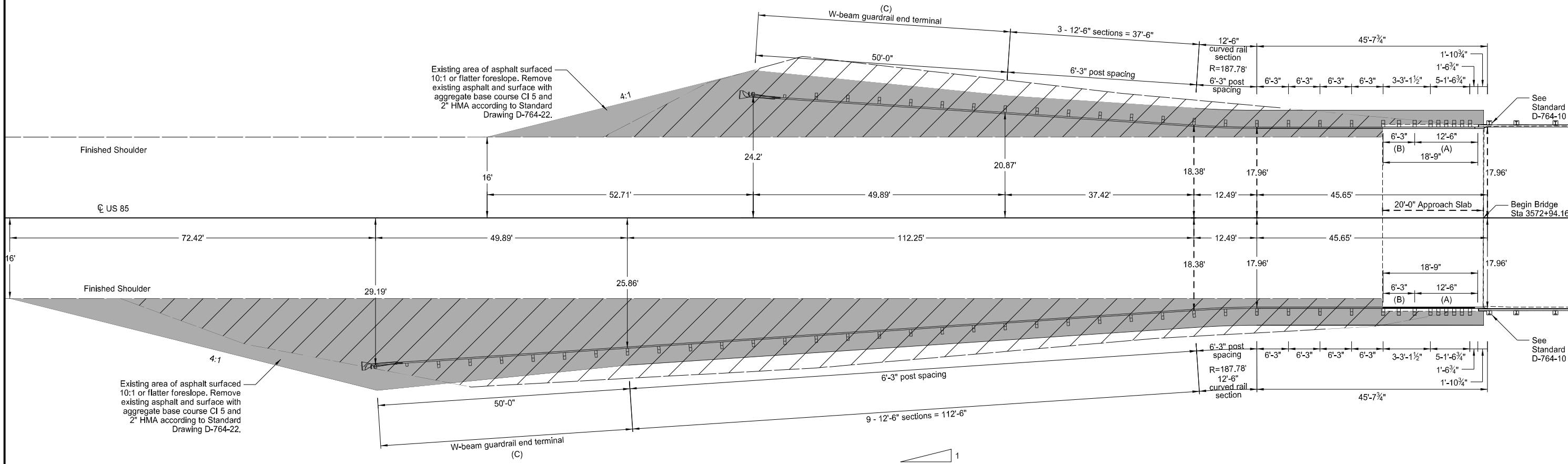
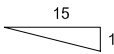
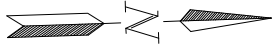
Russian Spring Creek Bridge
RP 81.376



ND Hwy 22



23 USC § 407 Documents
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 9 |



 New Guardrail Surfacing
 Removal of Bituminous Surfacing

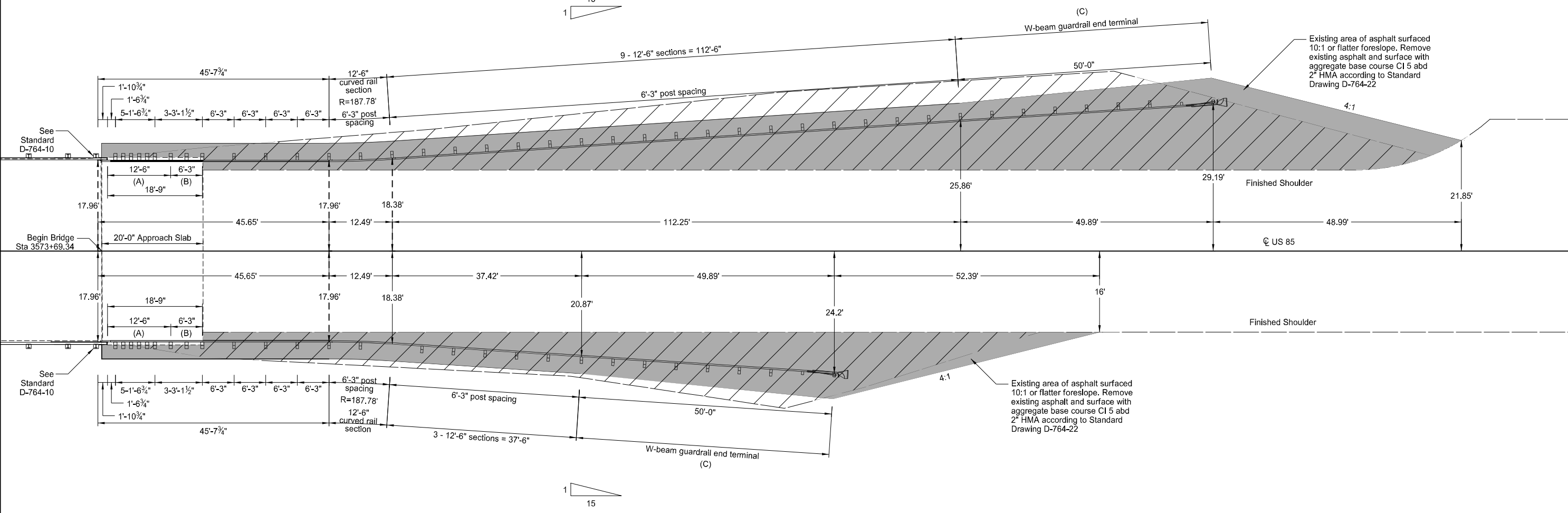
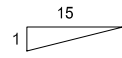
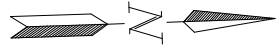
- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install a FLEAT end terminal at this location. See Standard Drawing D-764-6.

Thrie/W-Beam Guardrail Layout
At Beginning of Bridge
South Branch Heart River Bridge
RP 67.675
US Hwy 85



23 USC § 407 Documents
 NDDOT Reserves All Objections

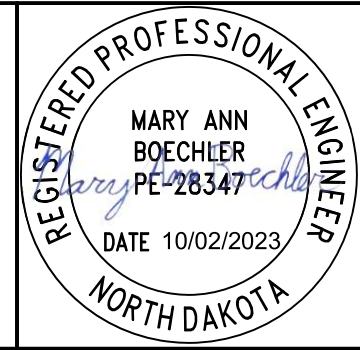
| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 10 |



New Guardrail Surfacing
 Removal of Bituminous Surfacing

- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install a FLEAT end terminal at this location. See Standard Drawing D-764-6.

Thrie W-Beam Guardrail Layout
 At End of Bridge
 South Branch Heart River Bridge
 RP 67.675
 US Hwy 85



| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 11 |

W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/ W-BEAM GUARDRAIL AT BRIDGE ENDS

| LOCATION | (A) 5/8" Ø X 18" LONG GUARD- RAIL BOLT | (A) 6" x 8" X 6'-0" TIMBER POST | (A) 6" x 8" X 14" WOOD OFF- SET BLOCK | (A) 5/8" Ø X 1 1/4" LONG GUARD- RAIL BOLT | (A) 12'- 6" STRAIGHT W-BEAM RAIL SECTION | (A) 12'- 6" CURVED W-BEAM RAIL SECTION | (A) REFL- ECTOR- IZED PLATES | (A) 8" X 8" X 6'-0" WOOD POST | (A) 8" x 8" X 22" WOOD OFF- SET BLOCK | (A) 8" x 8" X 18" WOOD OFF- SET BLOCK | (A) 8" x 8" X 14" WOOD OFF- SET BLOCK | (A) 6'-3" W-THRIE BEAM TRANS- ITION SECTION | (A) 12'-6" DOUBLE THRIE BEAM SECTION | (A) 2'-6" THRIE BEAM TERM- INAL CON- NECTOR | (A) 7/8" Ø x 3/4" LONG BOLT | (A) 5/8" Ø x 2" LONG POST BOLT |
|---------------------------------|--|---|---|---|---|---|--|---|---|---|---|---|---|--|---|--|
| | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH | EACH |
| Sta 3571+25.54 to 3572+94.93 Rt | 41 | 24 | 24 | 128 | 11 | 1 | 9 | 9 | 7 | 1 | 1 | 1 | 1 | 1 | 5 | 2 |
| Sta 3571+99.37 to 3572+94.93 Lt | 29 | 12 | 12 | 80 | 5 | 1 | 6 | 9 | 7 | 1 | 1 | 1 | 1 | 1 | 5 | 2 |
| Sta 3573+68.57 to 3574+64.11 Rt | 29 | 12 | 12 | 80 | 5 | 1 | 6 | 9 | 7 | 1 | 1 | 1 | 1 | 1 | 5 | 2 |
| Sta 3573+68.57 to 3575+38.97 Lt | 41 | 24 | 24 | 128 | 11 | 1 | 9 | 9 | 7 | 1 | 1 | 1 | 1 | 1 | 5 | 2 |
| TOTAL | 140 | 72 | 72 | 416 | 32 | 4 | 30 | 36 | 28 | 4 | 4 | 4 | 4 | 4 | 20 | 8 |

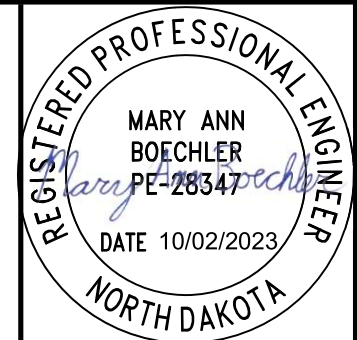
| SPEC CODE | BID ITEM | QTY | UNIT | SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|------------------------------------|--------------|-----------|-----------|--|--------------|-----------|
| 764 | 0131 W-BEAM GUARDRAIL | | | 764 | 0151 REMOVE W-BEAM GUARDRAIL & POSTS | | |
| | Sta 3571+25.54 to 3572+94.93 Rt | 170.7 | LF | | Sta 3571+23.04 to 3572+85.41 Rt | 162 | LF |
| | Sta 3571+99.37 to 3572+94.93 Lt | 95.7 | LF | | Sta 3572+22.53 to 3572+85.40 Lt | 62.9 | LF |
| | Sta 3573+68.57 to 3574+64.11 Rt | 95.7 | LF | | Sta 3573+78.57 to 3574+90.89 Rt | 112.3 | LF |
| | Sta 3573+68.57 to 3575+38.97 Lt | 170.7 | LF | | Sta 3573+78.43 to 3575+40.66 Lt | 162.2 | LF |
| | Total | 532.8 | LF | | Total | 499.4 | LF |
| 764 | 0145 W-BEAM GUARDRAIL END TERMINAL | | | 764 | 2081 REMOVE END TREATMENT & TRANSITION | | |
| | Sta 3570+74.65 to 3571+24.54 Rt | 1 | Ea | | Sta 3570+96.64 to 3571+23.04 Rt | 1 | Ea |
| | Sta 3571+49.48 to 3571+99.37 Lt | 1 | Ea | | Sta 3571+59.18 to 3572+22.53 Lt | 1 | Ea |
| | Sta 3574+64.11 to 3575+14.02 Rt | 1 | Ea | | Sta 3574+90.89 to 3575+04.58 Rt | 1 | Ea |
| | Sta 3575+38.97 to 3575+88.86 Lt | 1 | Ea | | Sta 3575+40.66 to 3575+67.10 Lt | 1 | Ea |
| | Total | 4 | Ea | | Total | 4 | Ea |

(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

Thrie/ W-Beam Guardrail Quantities
 At Both Ends of Bridge

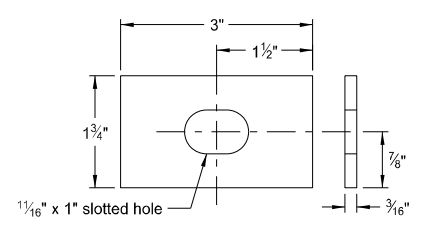
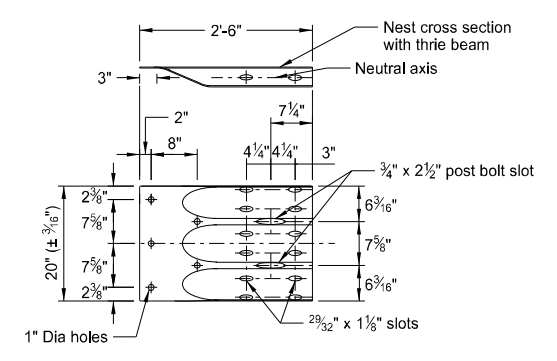
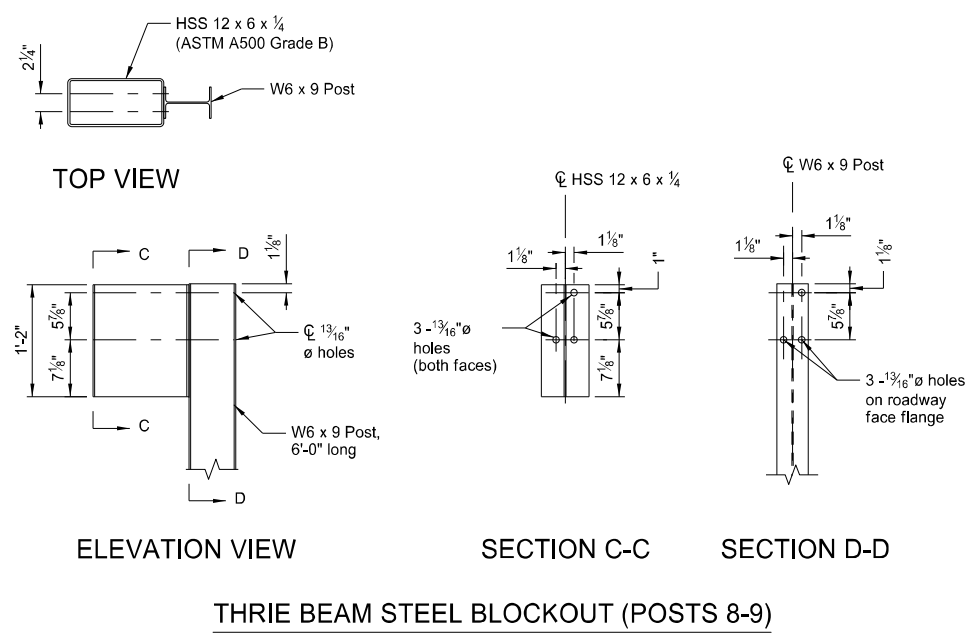
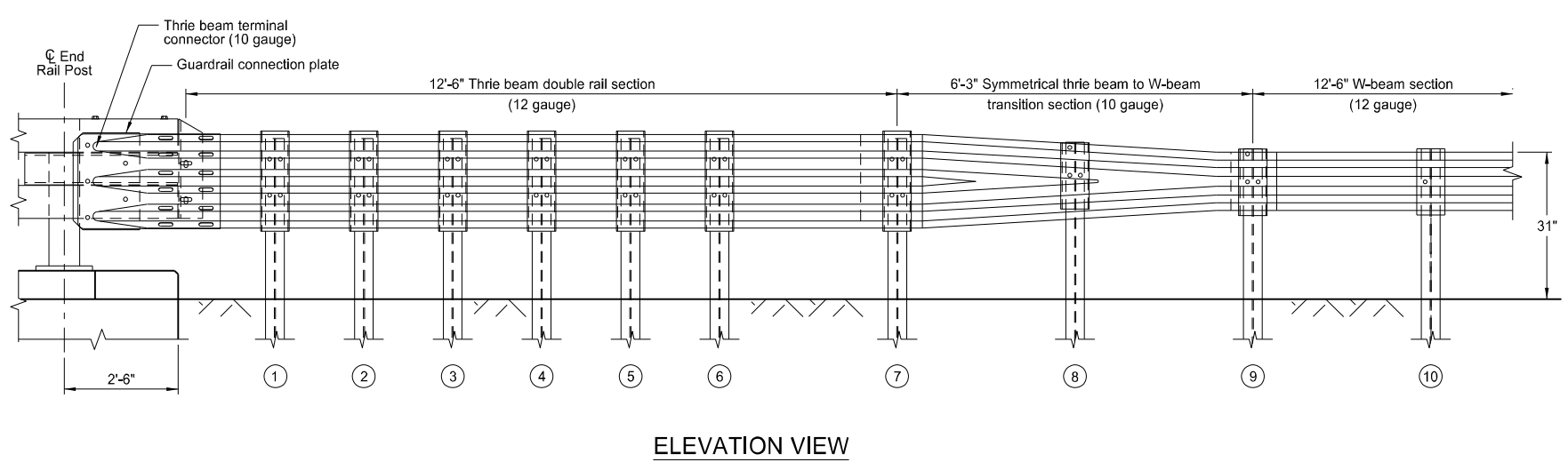
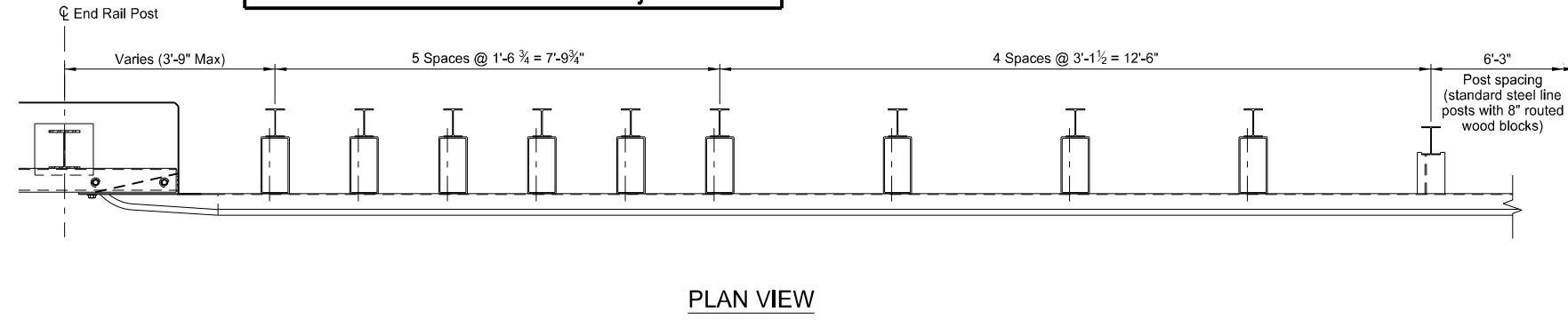
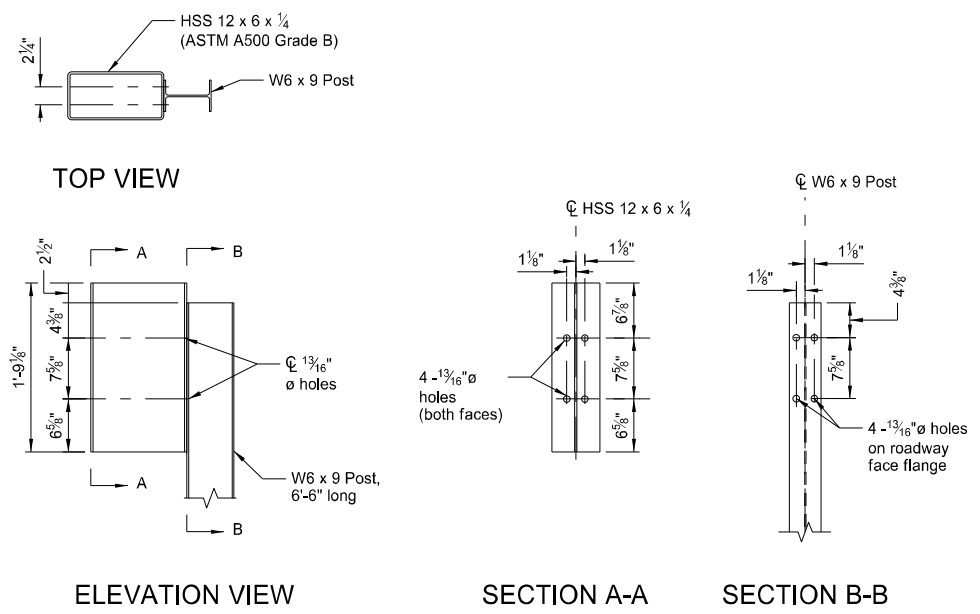
South Branch Heart River Bridge
 RP 67.675

US Hwy 85



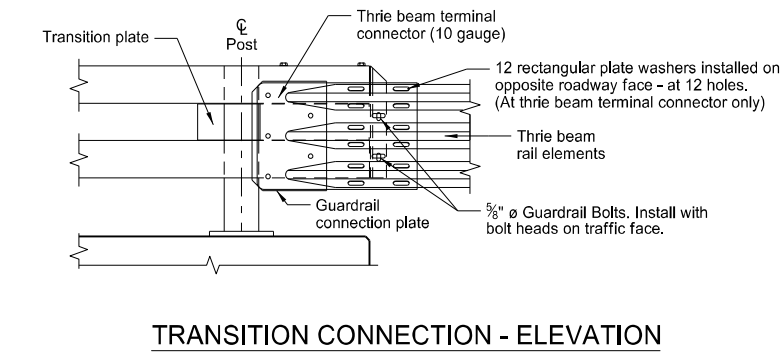
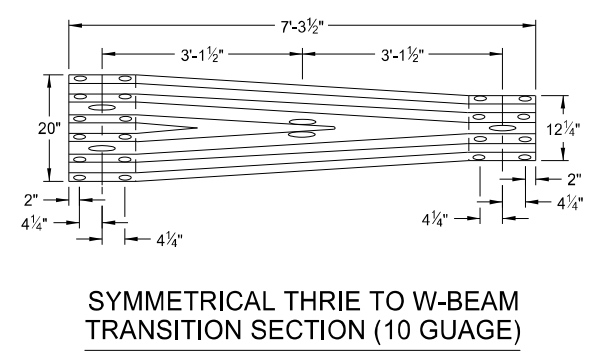
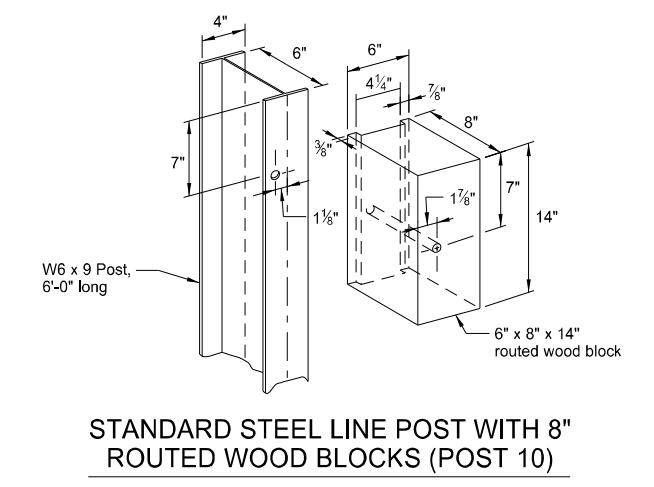
23 USC § 407 Documents
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 130 | 12 |



| POST NO. | POST SIZE | BLOCKOUT SIZE |
|----------|---------------------|-----------------------------------|
| 1-7 | W6 x 9 x 6'-6" long | HSS 12 x 6 x 1/4 x 1'-9 1/8" long |
| 8-9 | W6 x 9 x 6'-0" long | HSS 12 x 6 x 1/4 x 1'-2" long |
| 10 | W6 x 9 x 6'-0" long | 6" x 8" x 14" routed wood |

NOTES:
6"x8"x14" routed wood block can be substituted with composite blocks that have been MASH tested such as Mondo and King, or an approved equal.

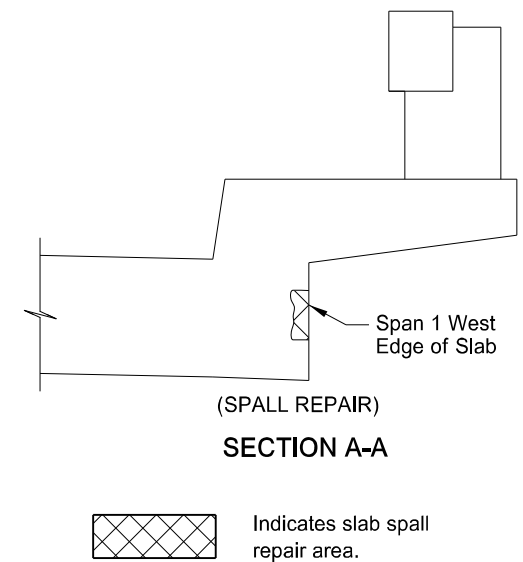
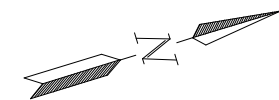
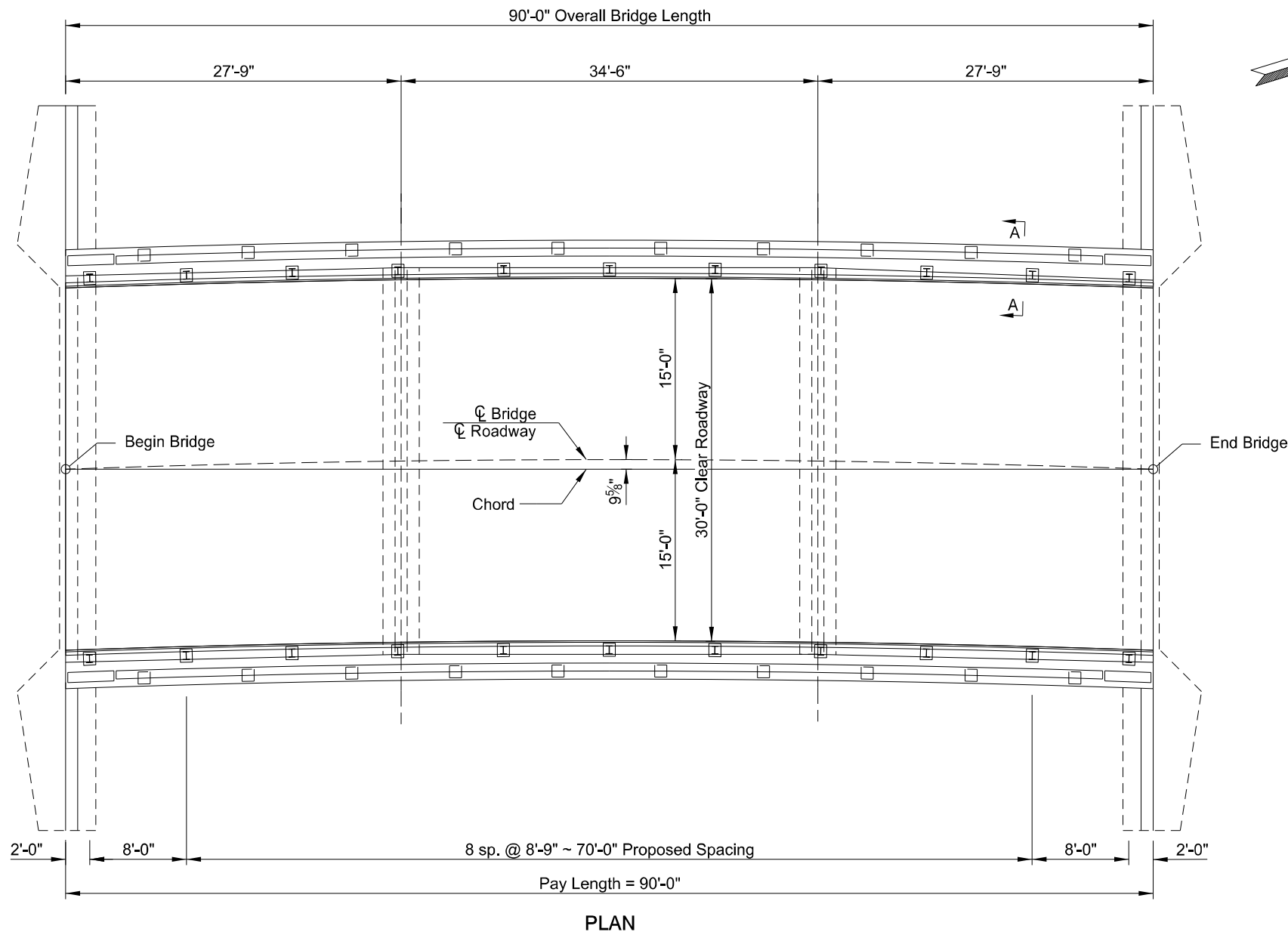


Thrie/MGS W-Beam Transition to Double Box Beam Rail Retrofit Detail
Flat Creek Bridge, RP 3.883, ND Hwy 8
Cannonball River Bridge, RP 45.841, ND Hwy 22



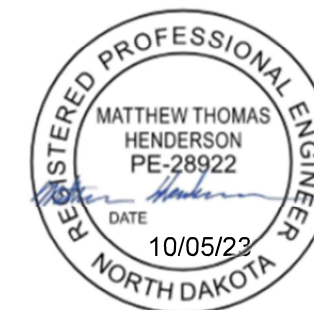
23 U.S.C. 407
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 1 |



BRIDGE BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|---|------|----------|
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 301 |
| 602 | 7000 | SPECIAL SURFACE FINISH | SF | 1309 |
| 624 | 3001 | DOUBLE BOX BEAM RAIL RETROFIT-FREE STANDING | LF | 180 |
| 650 | 0704 | OVERLAY CONCRETE | CY | 15.2 |
| 650 | 0707 | DECK CONCRETE | CY | 4.2 |
| 650 | 0710 | CLASS 1-H REMOVAL | SY | 300 |
| 650 | 0711 | CLASS 2-H REMOVAL | SY | 60 |
| 650 | 0712 | CLASS 3-H REMOVAL | SY | 15 |
| 930 | 9612 | SPALL REPAIR | SF | 1 |



FLAT CREEK

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Jason R. Thorenson Thorenson, Jason R.
10/05/23

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 2 |

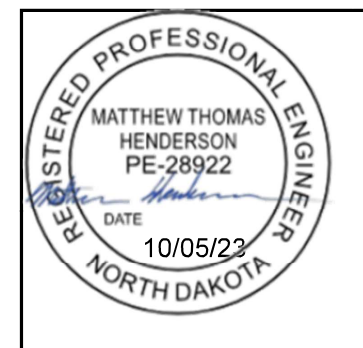
NOTES

- 100 SCOPE OF WORK: This project consists of placing a concrete deck overlay, slab spall repair, and a double box beam rail retrofit.
- 602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution to the top of deck. Apply penetrating water repellent solution prior to sealing any bridge deck overlay cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.
- After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.
- 602 SPECIAL SURFACE FINISH: Apply TexCote XL 70 BridgeCote with Silane to the end post surfaces, front face and top surfaces of existing curbs, and existing posts and railing surfaces. Use gray surface finish color number 36424 meeting Aerospace Material Specification (AMS) Standard 595. Apply surface finish prior to installation of rail retrofit.
- 650 OVERLAY CONCRETE: An additional 1/4" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.
- The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.
- The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, at the end of each day.
- 930 SPALL REPAIR: The edge of the slab has spalling as shown in the plans. Actual limits of repair should be determined by the Engineer in the field.
- Remove all unsound concrete and replace it with new concrete material. Use a 15-pound maximum size chipping hammer on any unsound concrete. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Remove enough concrete in the unsound areas to get behind periphery of outer reinforcement a minimum of 1".
- Sand blast clean the existing concrete and exposed reinforcing steel. Clean the existing concrete surface by high pressure water blasting. After the surface has dried and just before the patching material is placed, coat the surface with an epoxy bonding agent as recommended by the manufacturer.
- Use a two component, polymer-modified, cementitious repair mortar material that is specifically intended for patching concrete and contains a corrosion inhibitor. This patching material may be SikaTop 123 Plus (Sika Corporation), Duraltop Gel (Euclid Chemical Company), MasterEmaco N 400 (BASF Corporation), or an approved equal repair mortar. Cure the material as recommended by the manufacturer.

- 930 CRACK SEALING: After penetrating repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck overlay to determine the need for crack sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

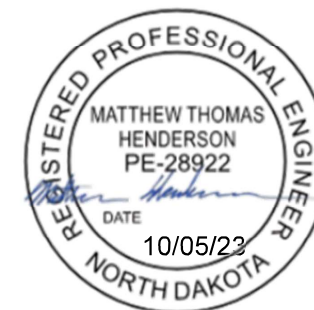
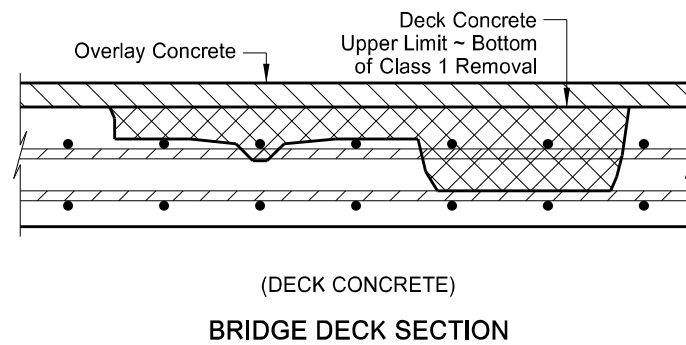
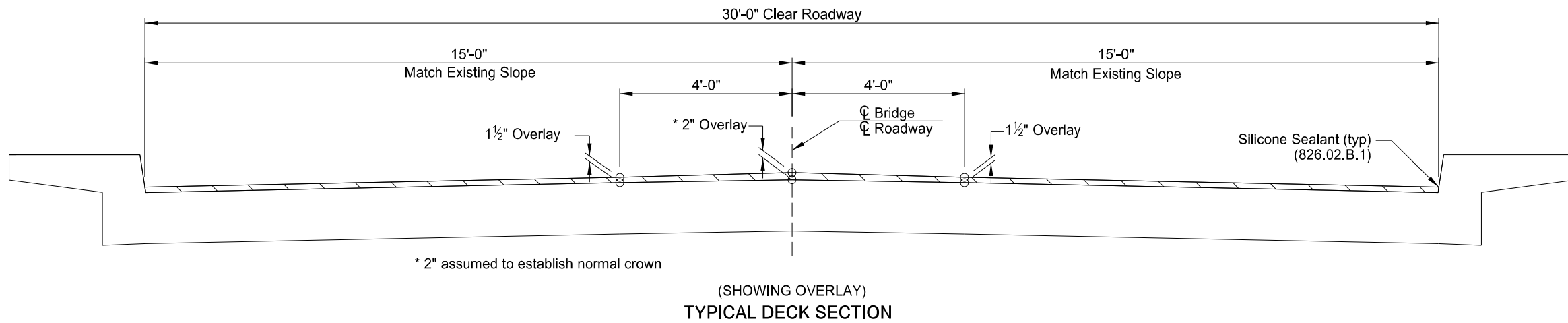
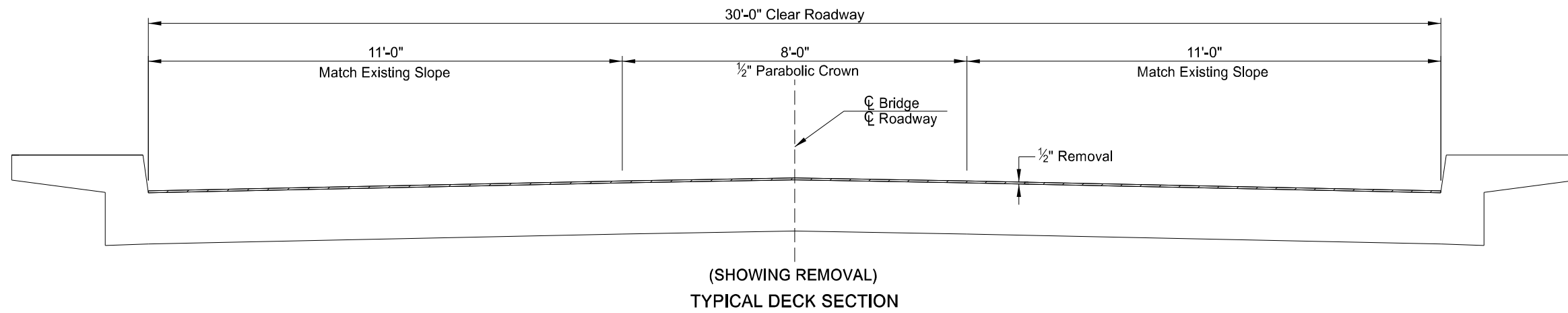
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase cracks with a sealant applicator to limits of crack, including those portions that are narrower than 0.007" wide. Use Paulco TE/2501 (Viking Paints, Inc), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.

Include the costs for crack sealing the deck overlay in the price bid for overlay concrete.



23 U.S.C. 407
NDDOT Reserves All Objections

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 3 |

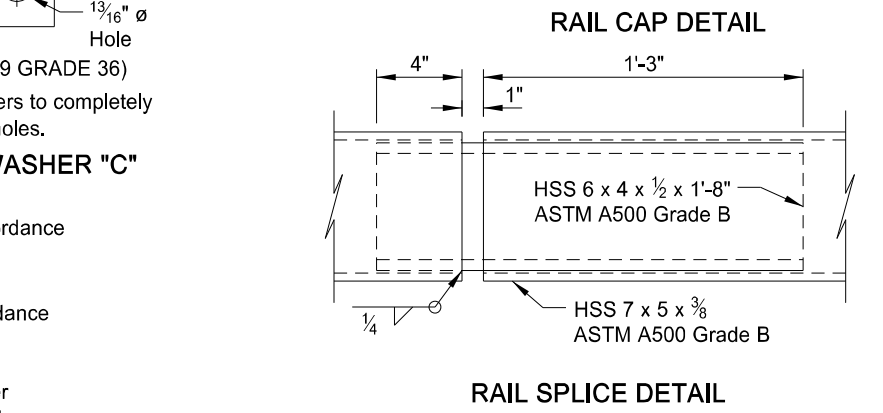
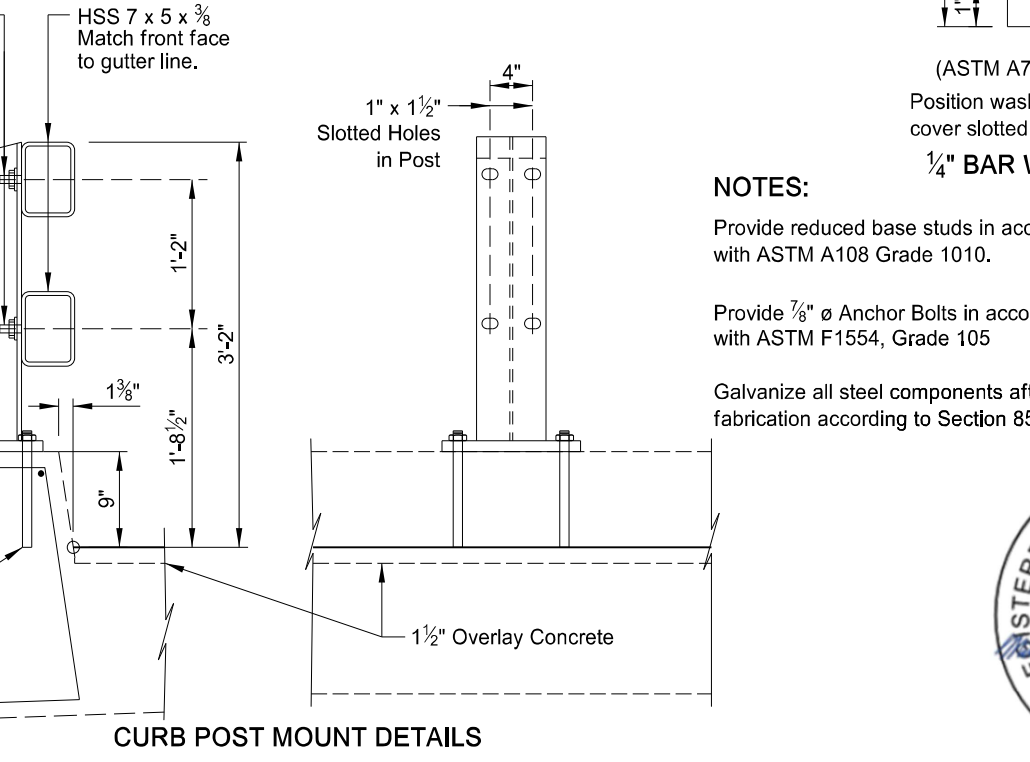
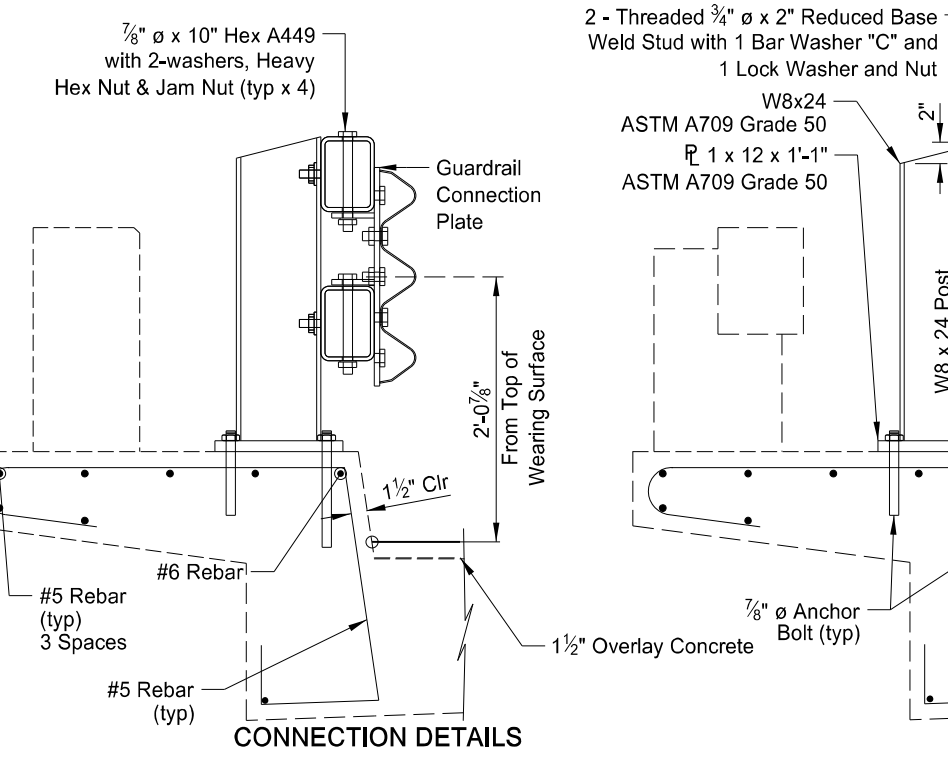
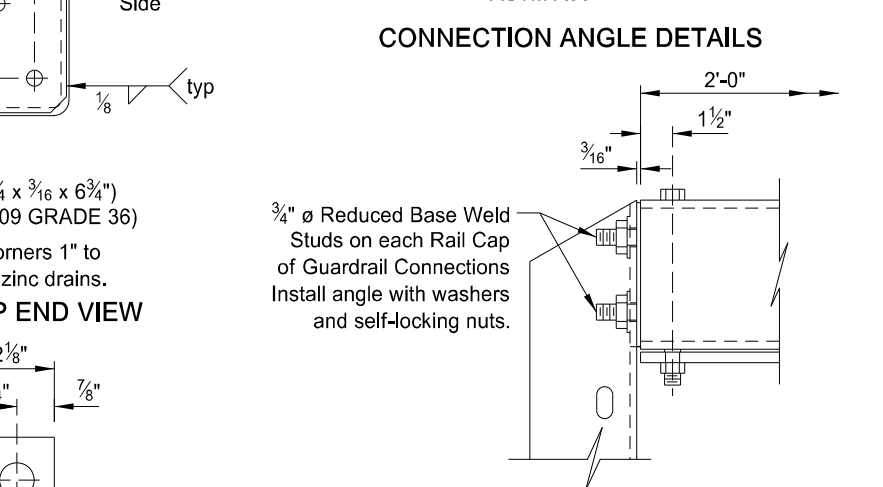
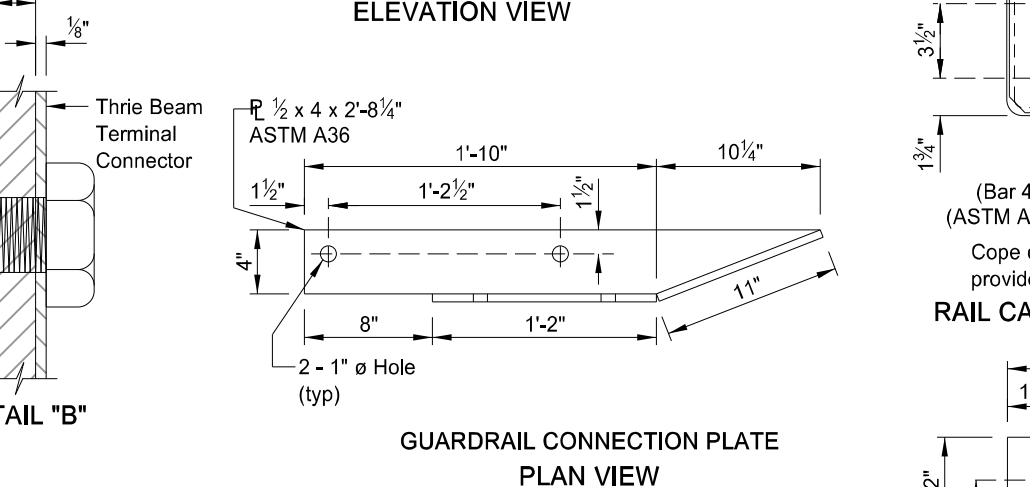
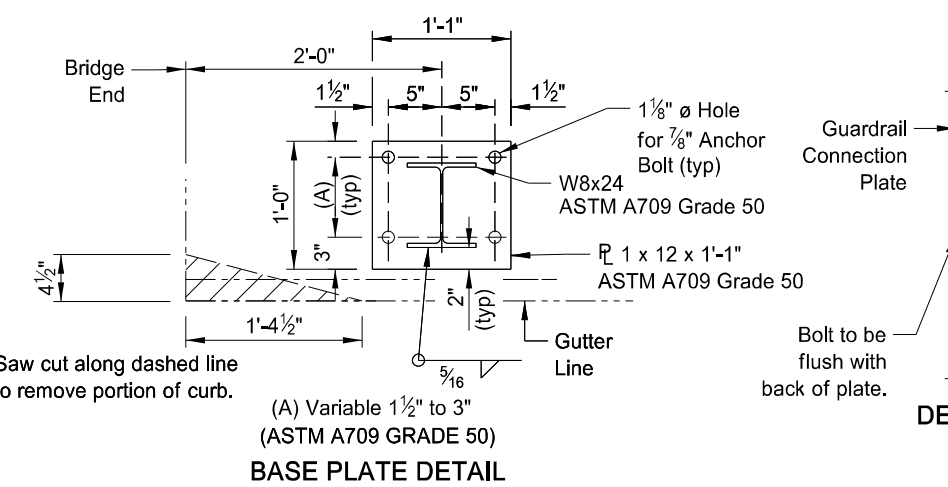
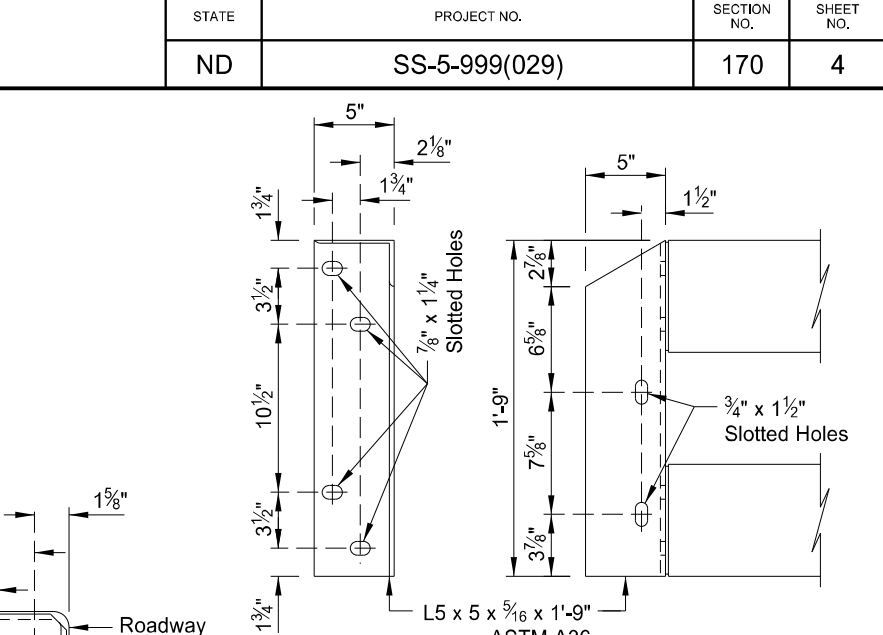
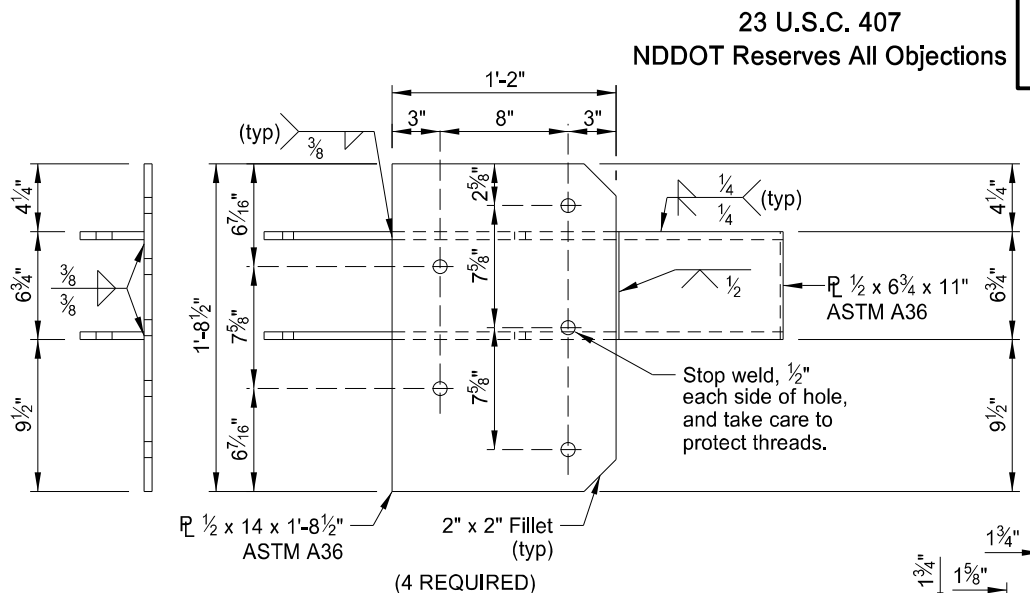
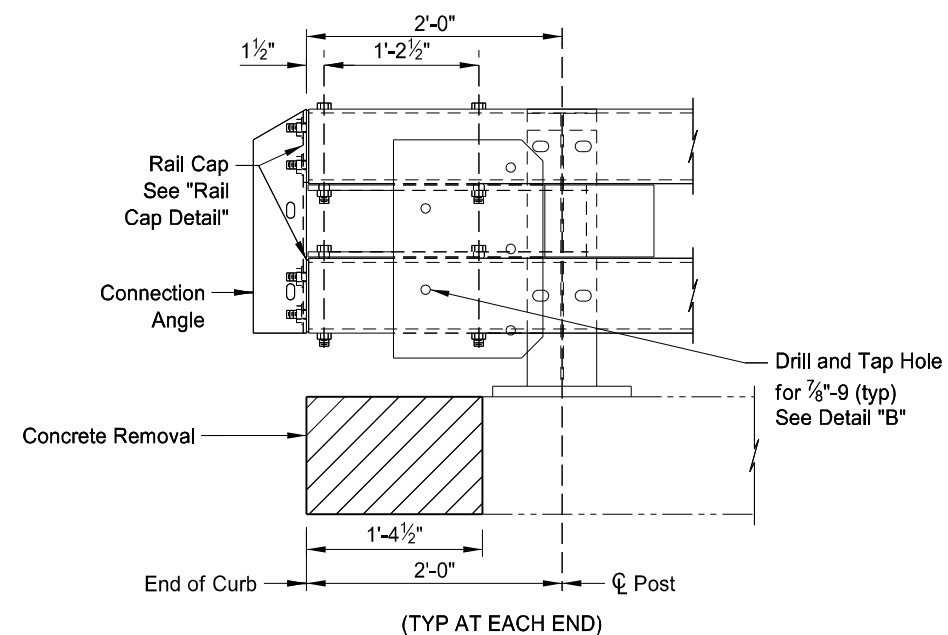


| QUANTITIES | |
|-------------------|---------|
| OVERLAY CONCRETE | 15.2 CY |
| DECK CONCRETE | 4.2 CY |
| CLASS 1-H REMOVAL | 300 SY |
| CLASS 2-H REMOVAL | 60 SY |
| CLASS 3-H REMOVAL | 15 SY |

| |
|----------------------|
| FLAT CREEK |
| DECK OVERLAY DETAILS |

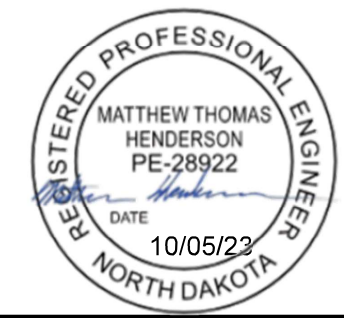
23 U.S.C. 407
NDDOT Reserves All Objections

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 4 |



NOTES:

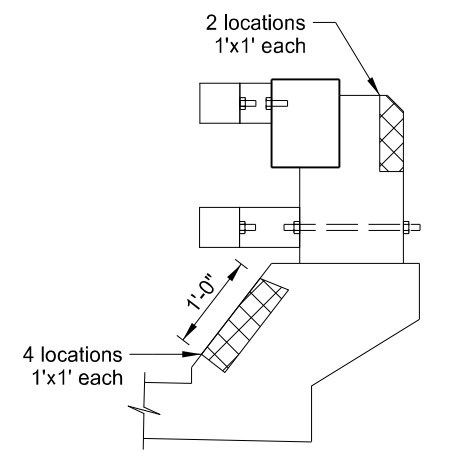
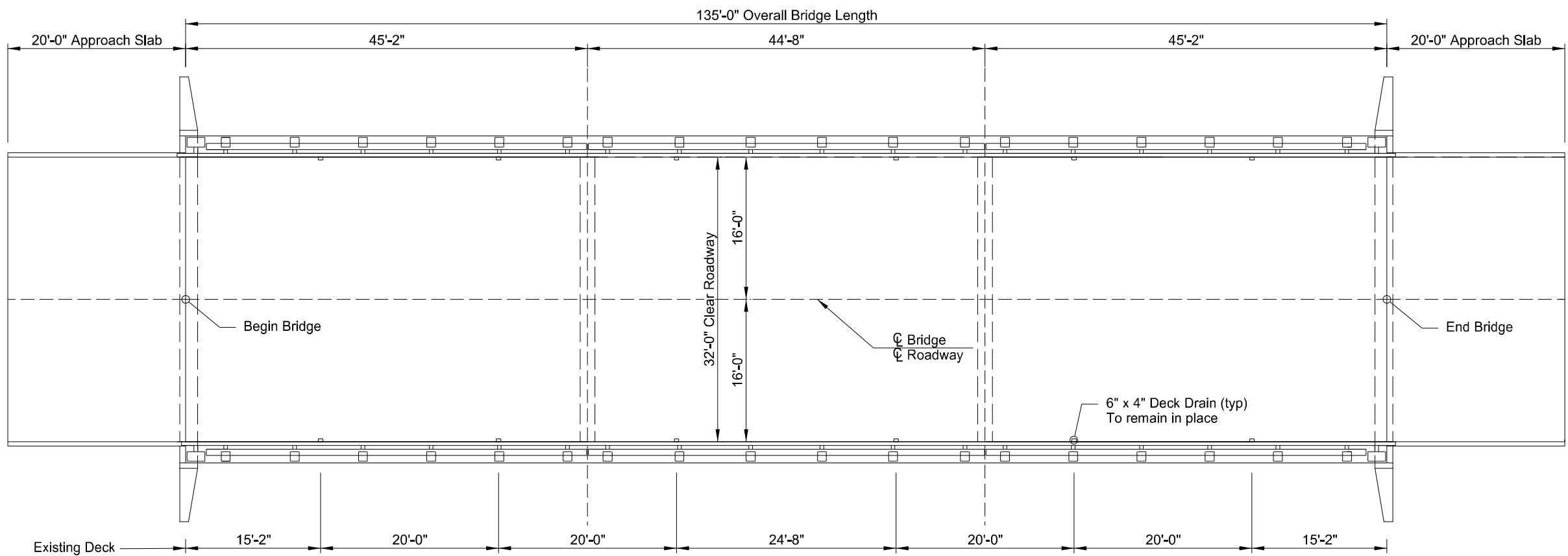
- Provide reduced base studs in accordance with ASTM A108 Grade 1010.
- Provide 7/8" ø Anchor Bolts in accordance with ASTM F1554, Grade 105
- Galvanize all steel components after fabrication according to Section 854.



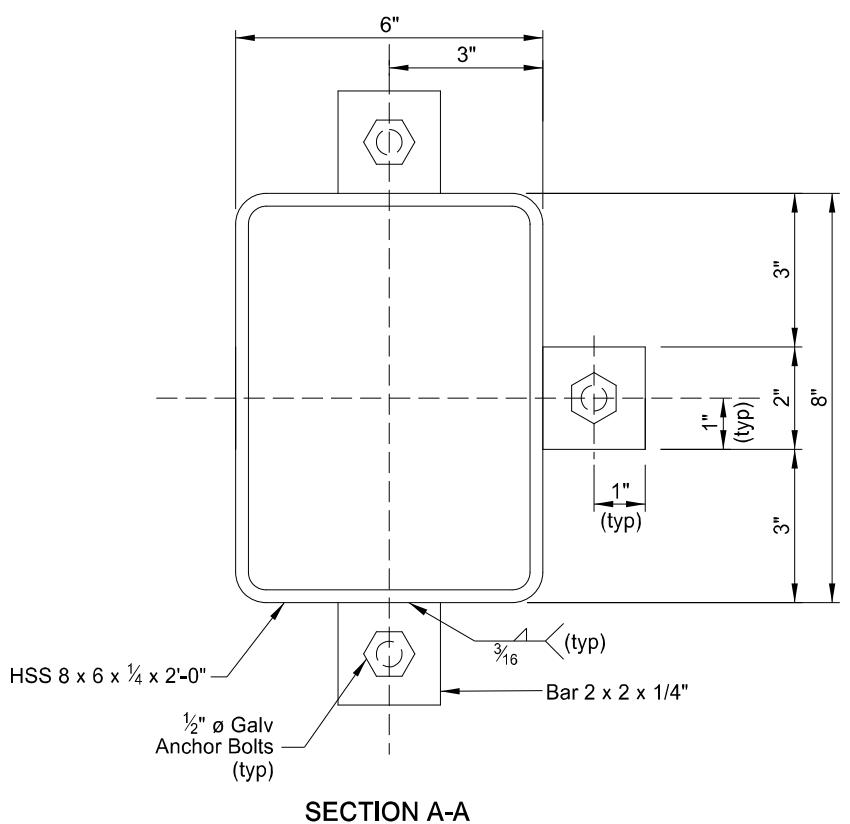
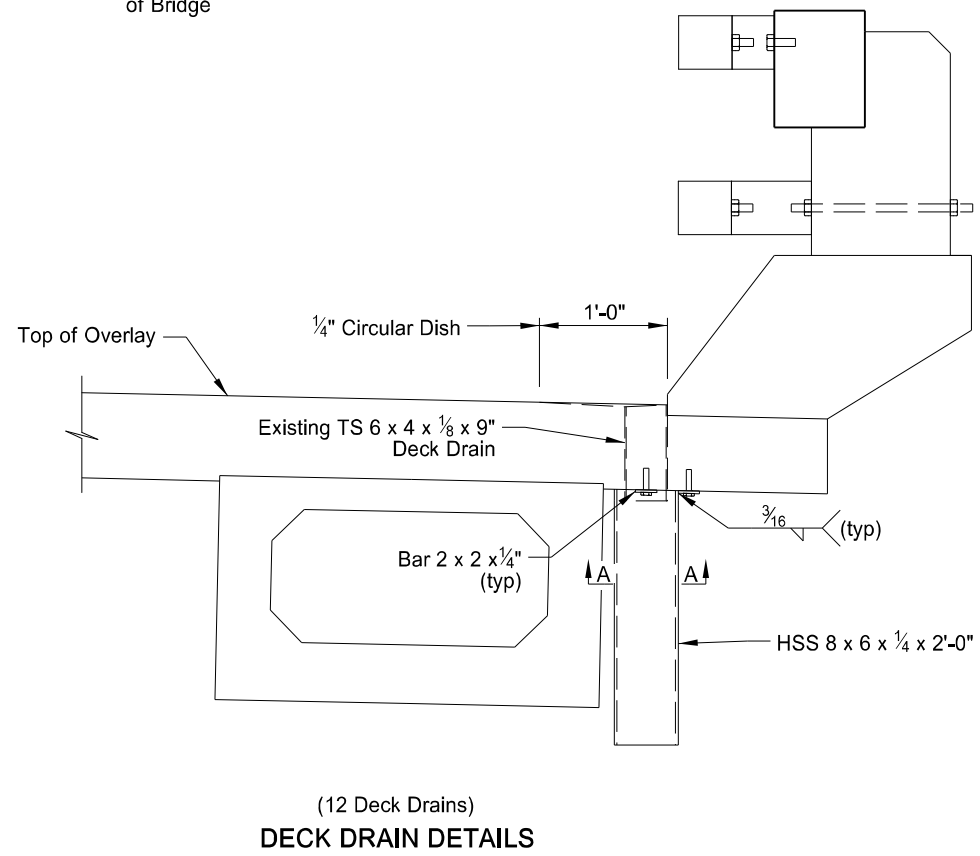
| QUANTITIES | |
|---|--------|
| RAIL RETROFIT - FREE STANDING | 180 LF |
| FLAT CREEK | |
| DOUBLE BOX BEAM RAIL RETROFIT DETAILS (FREE STANDING) | |

23 U.S.C. 407
NDDOT Reserves All Objections

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 5 |

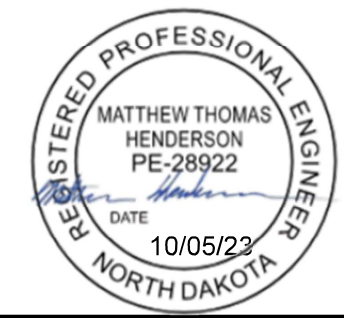


PLAN



BRIDGE BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|---------------------------------------|------|----------|
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 570 |
| 602 | 1260 | BRIDGE DECK CRACK SEALING | LF | 41 |
| 650 | 0704 | OVERLAY CONCRETE | CY | 27.5 |
| 650 | 0707 | DECK CONCRETE | CY | 10.5 |
| 650 | 0710 | CLASS 1-H REMOVAL | SY | 480 |
| 650 | 0711 | CLASS 2-H REMOVAL | SY | 151 |
| 650 | 0712 | CLASS 3-H REMOVAL | SY | 38 |
| 650 | 0720 | CLASS 1 REMOVAL | SY | 480 |
| 930 | 9534 | MODIFY DECK DRAIN | EA | 12 |
| 930 | 9612 | SPALL REPAIR | SF | 6 |



SPRING CREEK

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

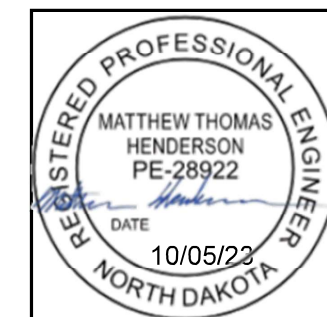
Thorenson, Jason R.
10/05/23

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 6 |

NOTES

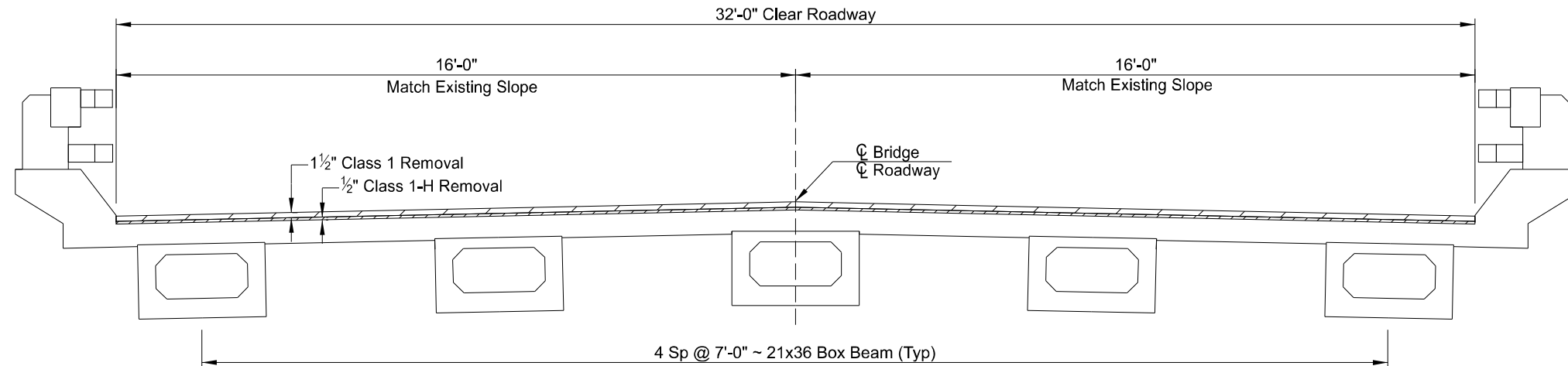
- 100 SCOPE OF WORK: This project consists of placing a concrete deck overlay, curb and post spall repair, and deck drain extensions.
- 602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution to the top of deck and to the front face and top of curbs. Apply penetrating water repellent solution prior to sealing any bridge deck overlay cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.
- After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.
- 650 OVERLAY CONCRETE: An additional ¼" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.
- The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.
- The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, at the end of each day.
- 930 SPALL REPAIR: The curb and rail post have spalling as shown in the plans in multiple locations. Actual limits of repair should be determined by the Engineer in the field.
- Remove all unsound concrete and replace it with new concrete material. Use a 15-pound maximum size chipping hammer on any unsound concrete. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Remove enough concrete in the unsound areas to get behind periphery of outer reinforcement, a minimum of 1".
- Sand blast clean the existing concrete and exposed reinforcing steel. Clean the existing concrete surface by high pressure water blasting. After the surface has dried and just before the patching material is placed, coat the surface with an epoxy bonding agent as recommended by the manufacturer.
- Use a two component, polymer-modified, cementitious repair mortar material that is specifically intended for patching concrete and contains corrosion inhibitor. This patching material may be SikaTop 123 Plus (Sika Corporation), Duraltop Gel (Euclid Chemical Company), MasterEmaco N 400 (BASF Corporation), or an approved equal repair mortar. Cure the material as recommended by the manufacturer.

- 930 MODIFIED DECK DRAINS: Provide structural bars for the deck drain extensions meeting Section 834.01 A, except the Charpy V-notch test is waived. The HSS deck drainpipe shall be ASTM A5000 Grade B. Galvanize all structural bars and tubes according to Section 854.
- Provide anchor bolts meeting ASTM A 307 Grade A, nuts meeting ASTM A563 and washers meeting ASTM F 436. Galvanize bolts, nuts, and washers according to Section 854.
- Install the anchor bolts according to the manufacturer's recommendations with an expansive anchor bolt system capable of developing and allowable tensile load of 3,020 lbs in 3000 psi concrete.
- Include all labor, equipment, and materials required to install the anchor bolts into the underside of the deck and extend the deck drains in the bid item "MODIFY DECK DRAIN".
- 930 CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck overlay and curb to determine the need for crack sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.
- Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase cracks with a sealant applicant to limits of crack, including those portions that are narrower than 0.007" wide. Use Paulco TE/2501 (Viking Paints, Inc), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.
- Include the costs for crack sealing the deck overlay in the price bid for overlay concrete. Only pay for the materials and work associated with crack sealing for the curbs with the bid item "Bridge Deck Crack Sealing."

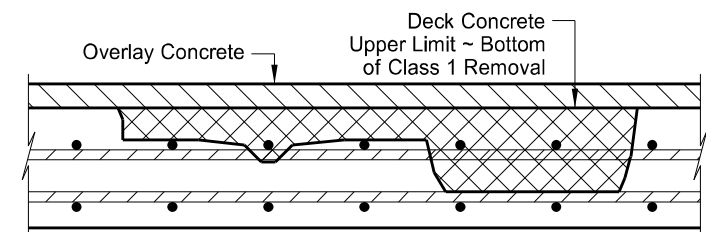


23 U.S.C. 407
NDDOT Reserves All Objections

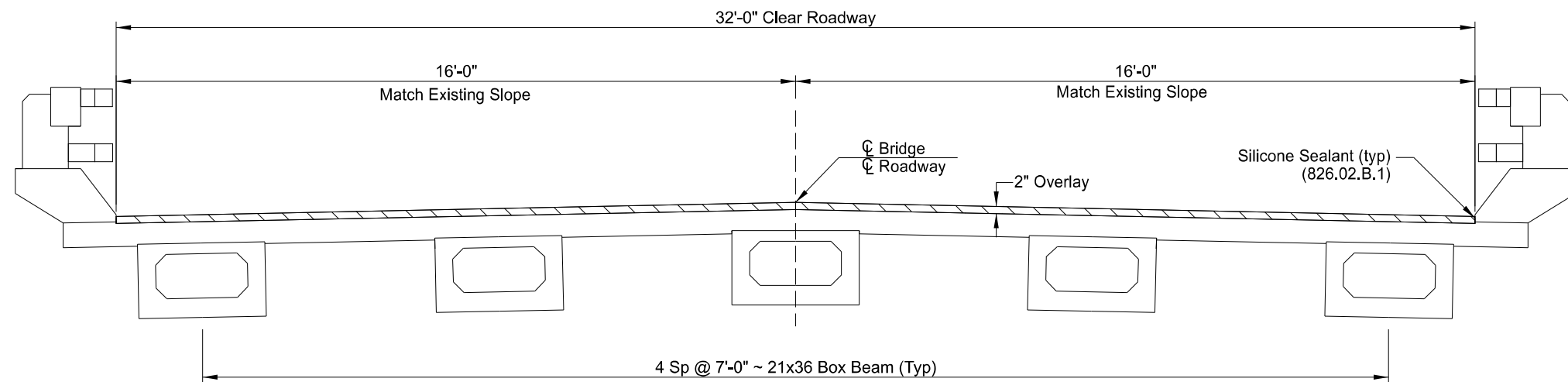
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 7 |



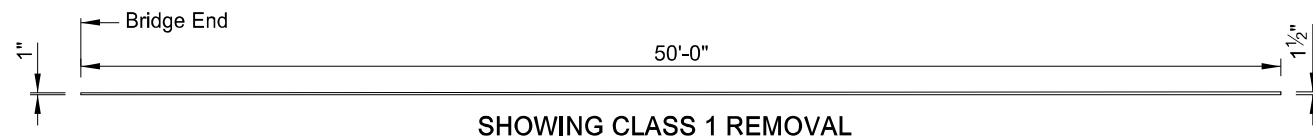
(SHOWING REMOVAL)
TYPICAL DECK SECTION



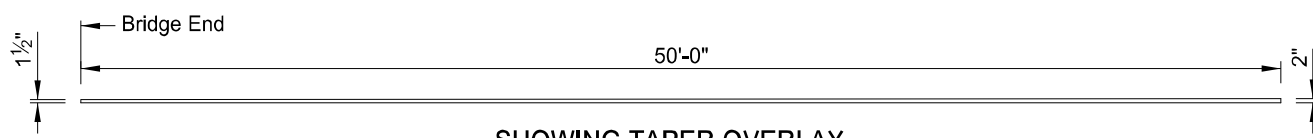
(DECK CONCRETE)
BRIDGE DECK SECTION



(SHOWING OVERLAY)
TYPICAL DECK SECTION

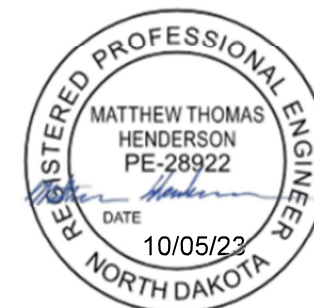


SHOWING CLASS 1 REMOVAL



SHOWING TAPER OVERLAY

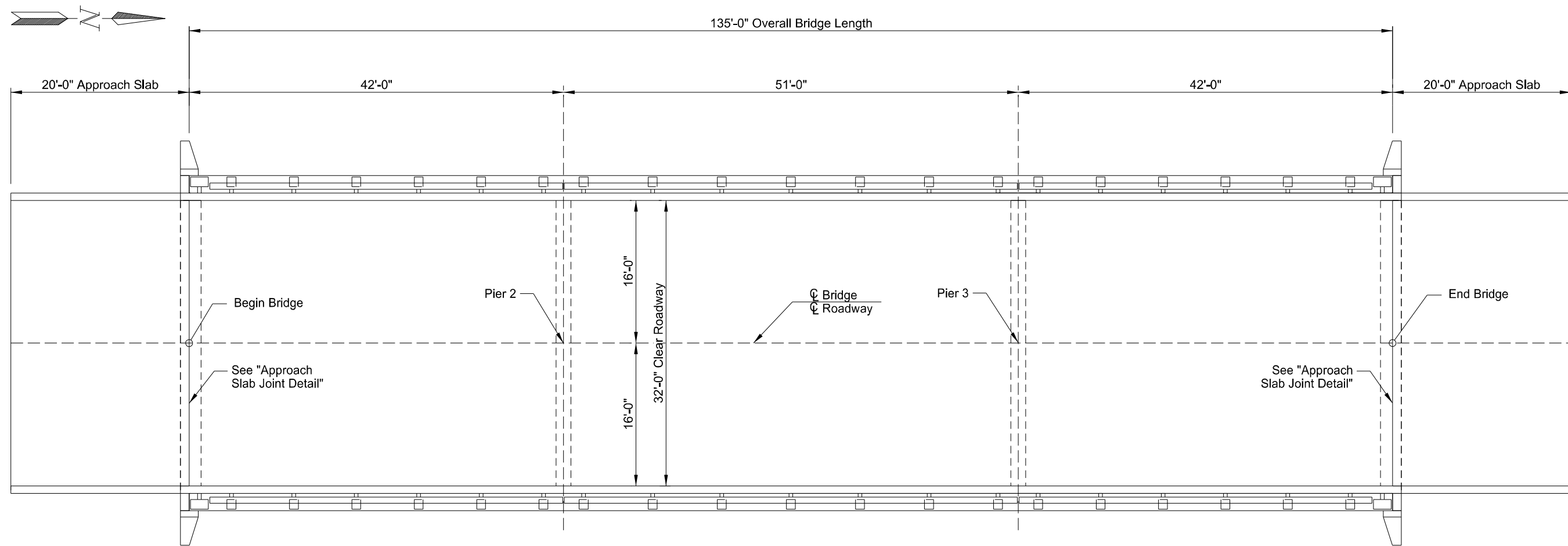
| QUANTITIES | |
|-------------------|---------|
| OVERLAY CONCRETE | 27.5 CY |
| DECK CONCRETE | 10.5 CY |
| CLASS 1-H REMOVAL | 480 SY |
| CLASS 2-H REMOVAL | 151 SY |
| CLASS 3-H REMOVAL | 38 SY |
| CLASS 1 REMOVAL | 480 SY |



| |
|---------------|
| SPRING CREEK |
| BRIDGE LAYOUT |

23 U.S.C. 407
NDDOT Reserves All Objections

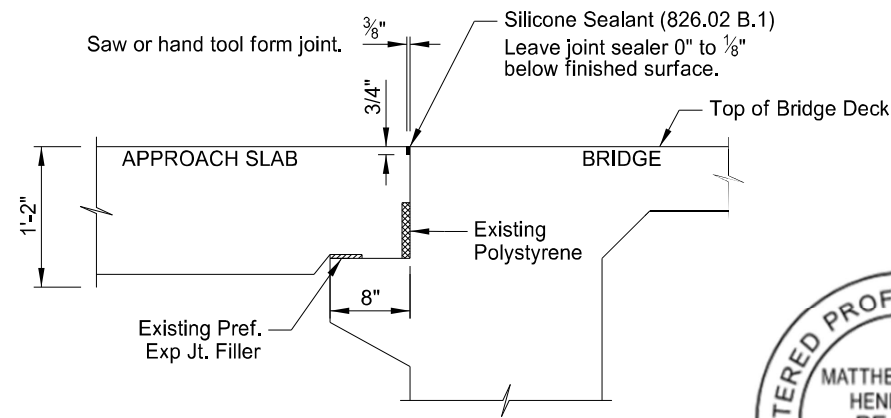
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 8 |



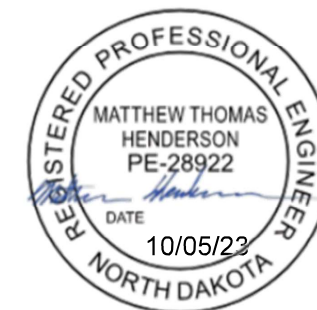
PLAN

BRIDGE BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|---------------------------------------|-------|----------|
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 573 |
| 930 | 8644 | SILICONE SEALANT | LF | 66 |
| 930 | 9612 | SPALL REPAIR | SF | 53 |
| 930 | 9630 | PIER REPAIR | L SUM | 1 |



APPROACH SLAB JOINT DETAIL



BUFFALO CREEK

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Jason R. Thorenson Thorenson, Jason R.
10/05/23

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 9 |

NOTES

100 SCOPE OF WORK: Work at this site consists of resealing the approach slab joint, applying a penetrating water repellent to the top deck and curbs, spall repairs on the concrete rails and curbs, crack repairs on north abutment wings, and repairing concrete spalls at Piers 2 and 3.

602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution to the top of the deck and to the front face and top of curbs. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.

930 SPALL REPAIR: The concrete rails and curbs have spalling and north abutment has cracking as shown in the elevation and section views. Actual repair limits are to be determined by the Engineer in the field.

Remove all unsound concrete and replace it with new concrete material. Use a 15-pound maximum size chipping hammer on any unsound concrete. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Remove enough concrete in unsound areas to get behind periphery of outer reinforcement a minimum of 1".

Sand blast clean the existing concrete and exposed reinforcing steel. Clean the existing concrete surface by high pressure water blasting. After the surface has dried and just before the patching material is placed, coat the surface with an epoxy bonding agent.

Use a two component, polymer-modified, cementitious repair mortar material that is specifically intended for patching concrete. This patching material may be SikaTop 123 Plus (Sika Corporation), Duraltop Gel (Euclid Chemical Company), MasterEmaco N 400 (BASF Corporation), or an approved equal repair mortar. Cure the material as recommended by the manufacturer.

930 PIER REPAIR: Pier 2 & Pier 3 have spalling and areas of abrasion with exposed aggregate as shown in the elevation and section views.

Remove all debris and marine growth from the piers. In areas of spalling, as identified by the Engineer, remove all unsound concrete. Should hydraulic or air pressurized equipment be used for removal use a maximum size 15-pound chipping hammer. Clean the exposed reinforcing steel utilizing a wire brush. In areas of abrasion, remove all loose, exposed aggregate from the face. Removals of unsound concrete should be limited to 1/2 inch in depth from the existing face in areas of abrasion.

Use materials that are specifically intended for underwater concrete repairs. Confinement for the repair material, concrete repair material, and associated equipment will be required. The method of confinement and installation will be SPiRe Panel (QuakeWrap, Inc.), or an approved equal watertight form. The grout material will be SikaGrout 328 (Sika Corporation), EUCO Tremie Grout (Euclid Chemical Company) or an approved equal. The non-shrink grout material must contain an anti-washout admixture and corrosion inhibitor, be pumpable, and have positive expansion. Install all materials as recommended by the manufacturer. Use welded wire fabric conforming to

ASTM A185 Grade 65. The Contractor may lap splice the welded wire fabric. Lap splices must be contact splices at least 12" in length and spaced no closer than 5 feet on center.

Prior to placing grout for the pier repair, the Contractor will perform a proof test of the grout placement method to be approved by the Engineer. Construct a temporary form with a 4 inch wide by 3 foot long by 2 foot high annular space with the 4x4 W4.0x4.0 welded wire fabric centralized in the space. Pump the annular space from the bottom up with the grout via tremie tube or other approved method. After the grout has cured, remove the forms, and inspect the cured grout for voids or other defects. The test will be accepted if the grout was placed in a continuous fashion and without voids or other unconsolidated areas in the cured product.

At Pier 2:

After the removal of unsound concrete, securely adhere the form panel directly to the pier over the spall(s). Inject the space full, from the bottom up, with non-shrink grout material. A pressure release hole at the top of the void should be provided to relieve excess water in the void.

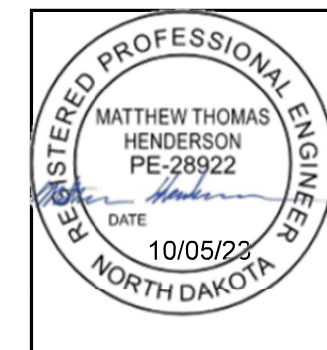
At Pier 3:

After the removal of unsound concrete and loose aggregate, install the 4B201 bars into the existing pier according to the manufacturer's recommendations with a high strength adhesive. The high strength adhesive will be specifically intended for concrete anchorage and underwater applications with a minimum ultimate pullout strength of 3k and must meet the requirements of Section 806.0. Secure the watertight formwork, welded wire fabric, and ice nose in place. Formwork shall penetrate a minimum of 6 inches into the channel bottom, but not past the bottom of the existing pier. Dewater the annular space between the formwork and existing pier. Pump the grout plug from the bottom up via tremie tube or other approved method. Allow the plug to cure for 24 hours to create bottom seal. Dewater the annular space between the formwork and existing pier. Proceed to pump the remainder of the annular space with grout from the bottom up via tremie tube or other approved method.

Prior to the completion of work, remove the watertight form. Repair any voids or other areas identified by the engineer.

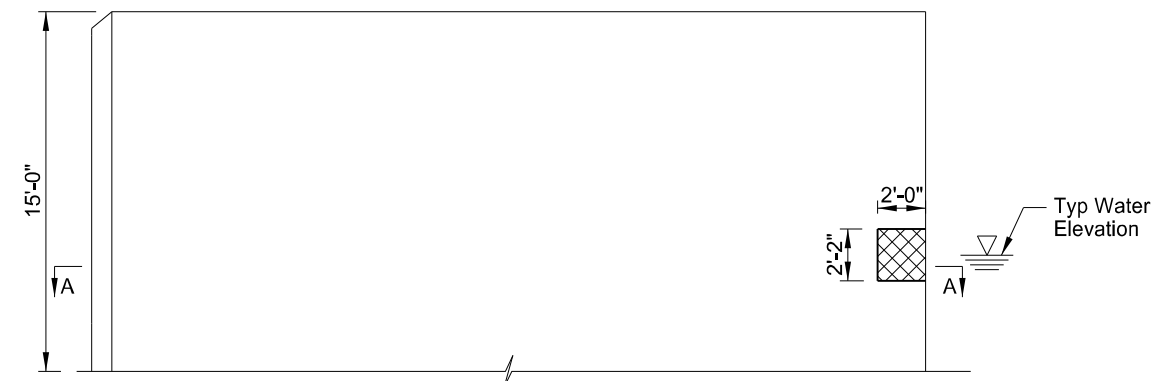
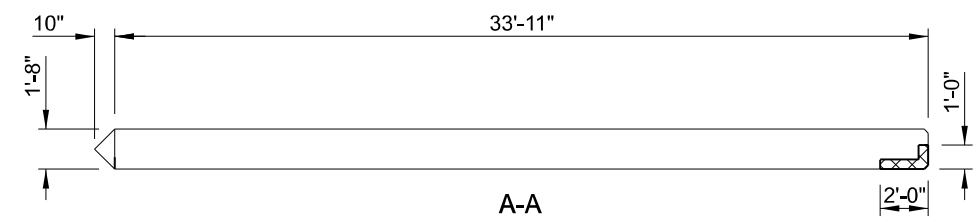
The pier repair areas are shown in the elevation and section views. The actual limits of repair area are to be determined by the Engineer in the field following the removal of unsound material. Include all the labor, equipment, and materials needed to repair the pier wall spall areas in the lump sum bid item "Pier Repair".

930 SILICONE SEALANT: Reseal the joints between approach slab and deck. Clean the joints of all foreign material before the silicone sealant is installed. Use a low modulus (Type 5) silicone sealant. Extend the silicone sealant 6" up the face of the curb. Apply silicone sealant only after the penetrating water repellent has been applied. Include all materials, labor and equipment required to place the silicone sealant in the bid item "Silicone Sealant".

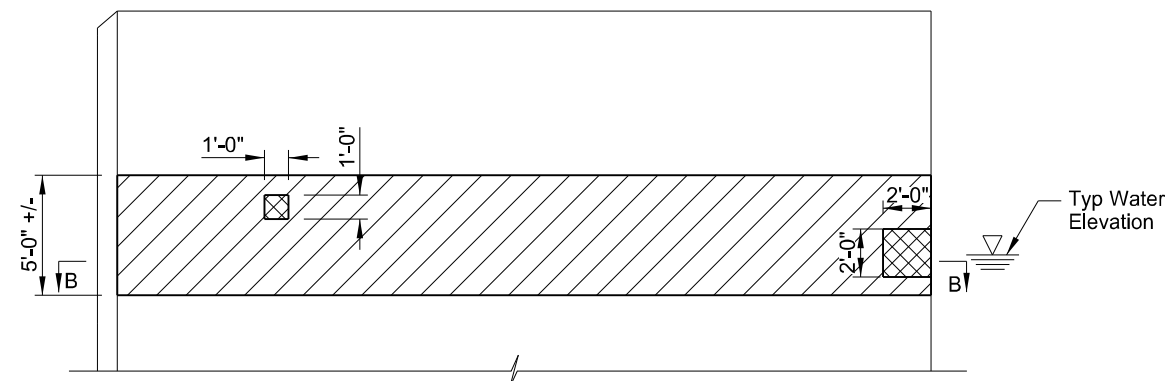
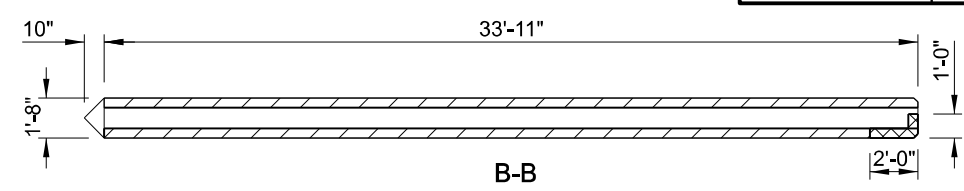


23 U.S.C. 407
NDDOT Reserves All Objections

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 10 |



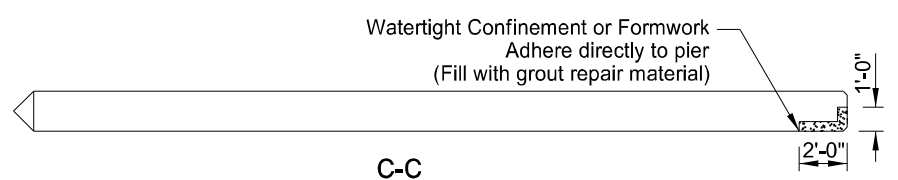
(EXISTING SPALL)
PIER 2 ELEVATION - FACING NORTH



(EXISTING SPALL)
PIER 3 ELEVATION - FACING NORTH

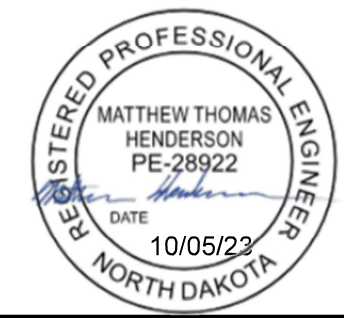
Refer to sheet 22-006.171-4 for Pier 3 Repair Layout.

- Indicates area of abrasion and exposed aggregate.
- Indicates area of spalling.
- Indicates grout repair material.



(REPAIR LAYOUT)
PIER 2 ELEVATION - FACING NORTH

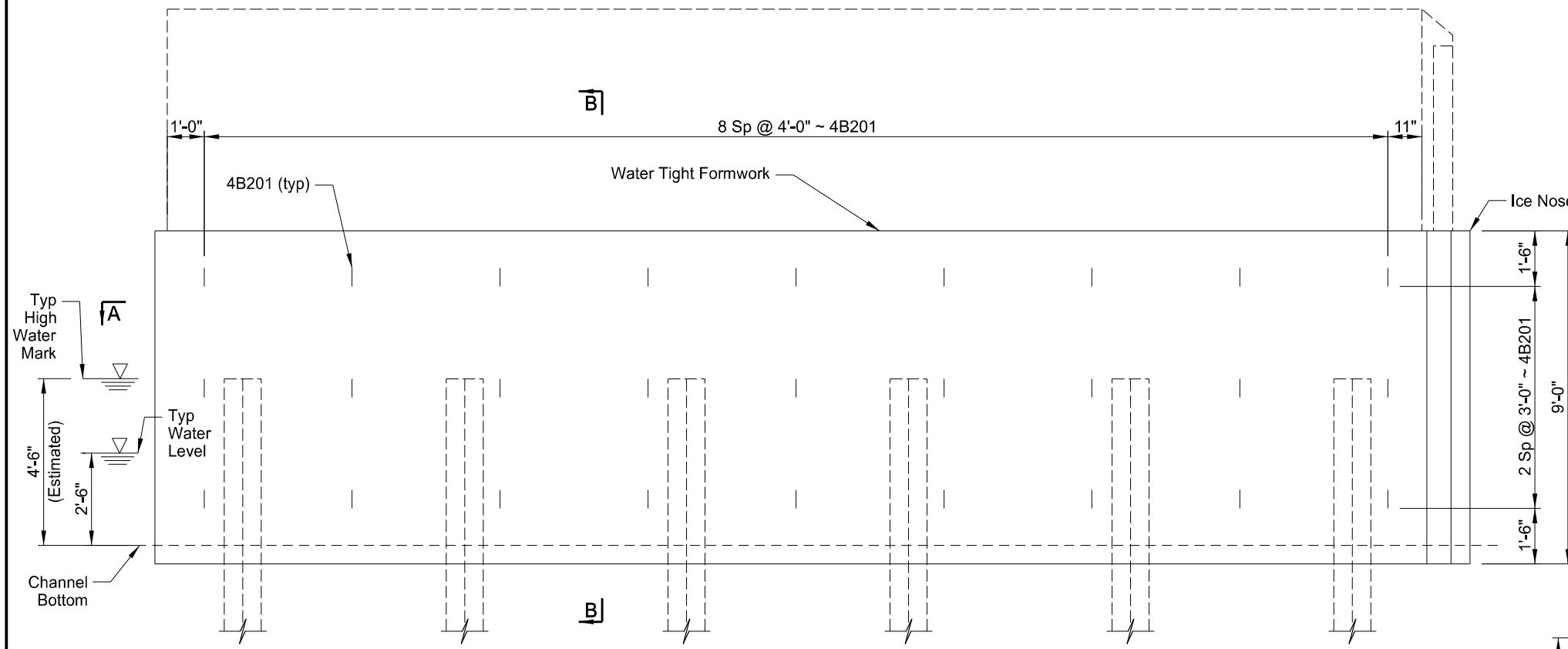
NOTES:
Waterline elevation is based on inspection photos from July 18, 2022 and is expected to fluctuate.



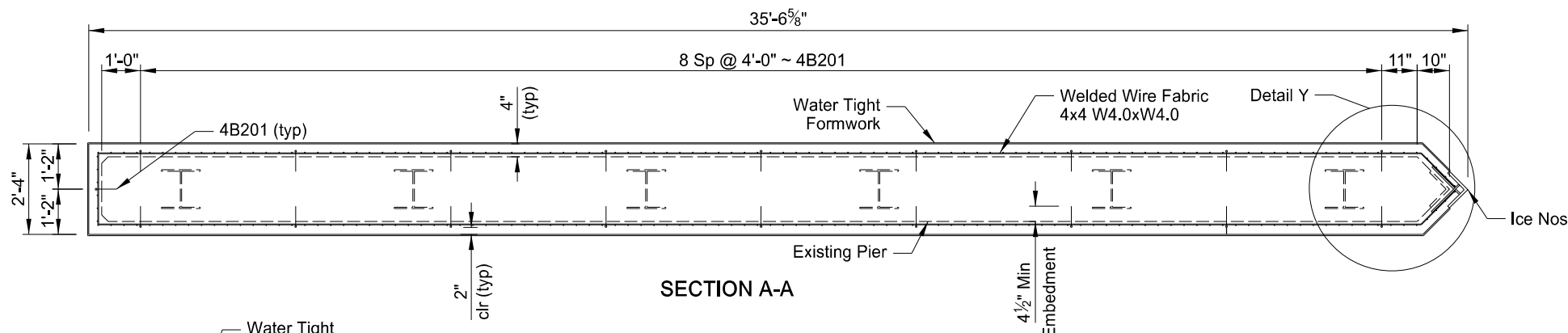
| QUANTITIES (BOTH PIERS) | |
|-------------------------|---------|
| PIER REPAIR | 1 L SUM |
| BUFFALO CREEK | |
| PIER REPAIRS 1 OF 2 | |

23 U.S.C. 407
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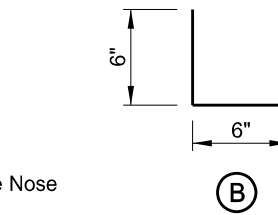
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 11 |



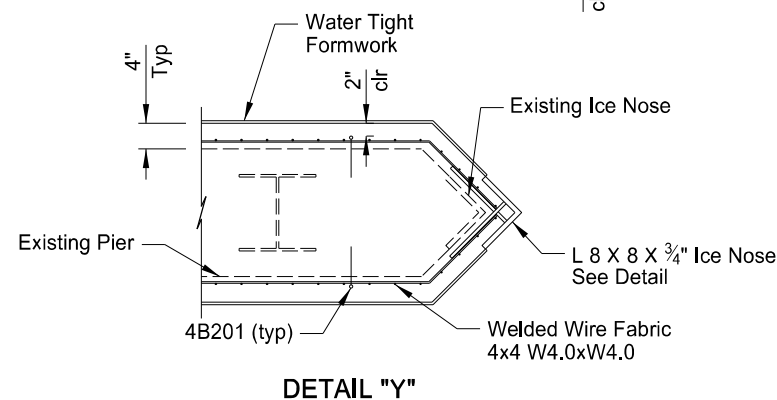
PIER 3 REPAIR LAYOUT - FACING SOUTH
(WELDED WIRE FABRIC NOT SHOWN)



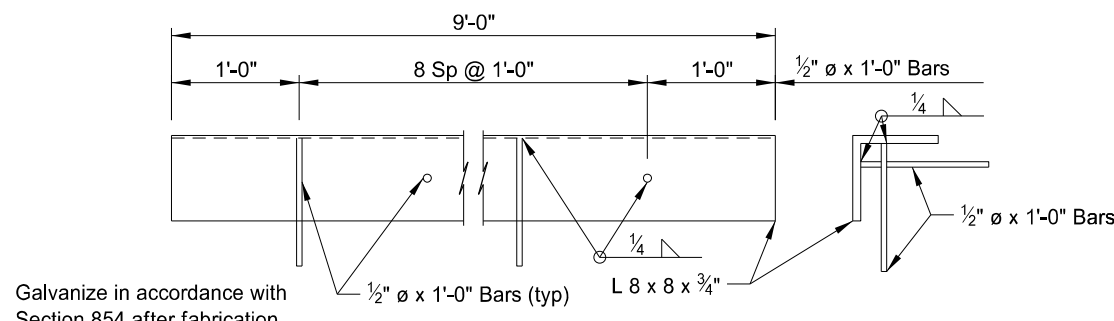
SECTION A-A



SECTION B-B



DETAIL 'Y'



ICE NOSE DETAIL

SKEW ANGLE = 0°

| BAR LIST - TWO SIDES | | | |
|----------------------|-----------------|-----|--------|
| SIZE | MARK | NO. | LENGTH |
| 4 | B201* | 57 | 1'-0" |
| - | 4x4 W4.0 x W4.0 | - | 650 SF |

| ESTIMATED MATERIAL QUANTITIES | |
|-------------------------------|------------|
| REINFORCING STEEL (LBS) | GROUT (CY) |
| 570 | 8.1 |

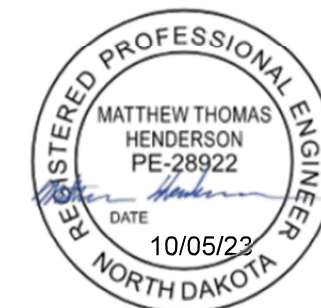
* Length may increase, depending on manufacturer's recommendations for anchorage. Provide a minimum length of 1'-0".

NOTES:

1. Install the 4B201 bars into the existing pier according to the manufacturer's recommendations with a high strength adhesive intended for concrete anchorage and underwater applications (3k min. ultimate pullout) and that meets the requirements of Section 806.02. The dimension of the 4B201 is based on the embedment shown. The actual bar dimension will be based on the embedment according to the chemical adhesive manufacturer's recommendation.
2. Verify the quantity, size, and shape of the bar reinforcement against the structure drawings and immediately notify the Engineer of any discrepancies. Discrepancies in the bar list will not be cause for adjustment of the contract unit price.
3. All dimensions are out to out of bars.
4. Nominal length of each bent bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.
5. Provide reinforcing steel that meets the requirements of Section 612.
6. The estimated material quantities shown are for information purposes only.

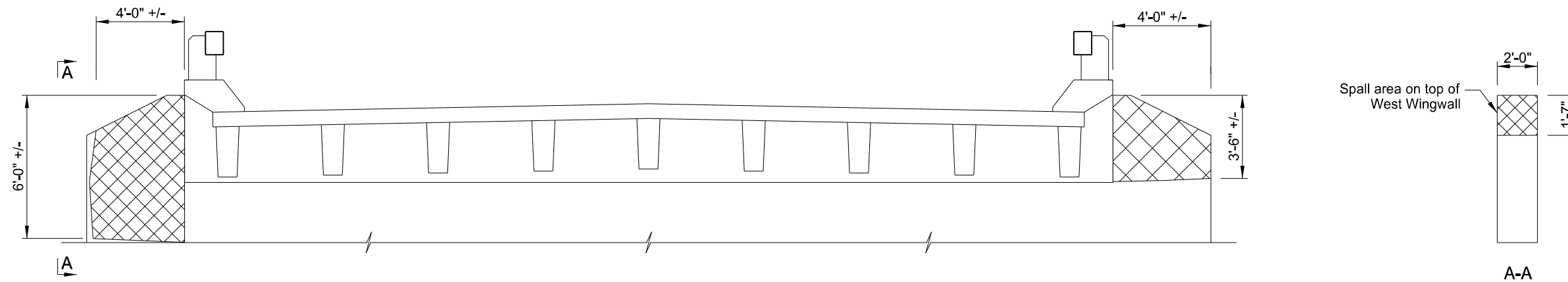
| QUANTITIES | (BOTH PIERS) |
|-------------|--------------|
| PIER REPAIR | 1 L SUM |

| |
|------------------------|
| BUFFALO CREEK |
| PIER REPAIRS 2 OF 2 |



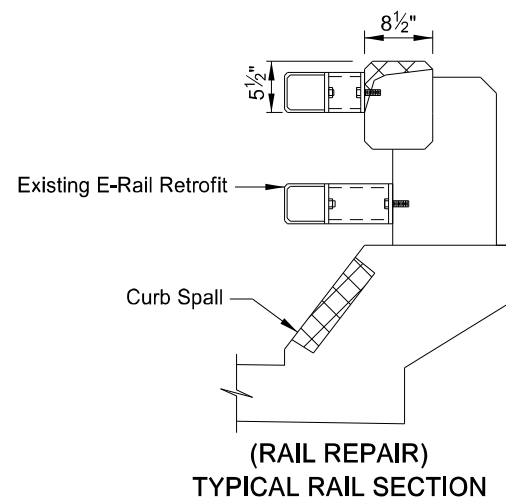
23 U.S.C. 407
NDDOT Reserves All Objections

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|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 12 |



NORTH ABUTMENT ELEVATION - FACING NORTH

 Indicates spall repair area.



| RAIL SPALL REPAIR | | | |
|-------------------|------|------|----|
| LOCATION | SPAN | POST | SF |
| West Rail | 2 | 3 | 2 |
| West Rail | 2 | 4 | 4 |
| East Curb | 2 | 2 | 7 |
| East Curb | 1 | 3 | 3 |

NOTES:

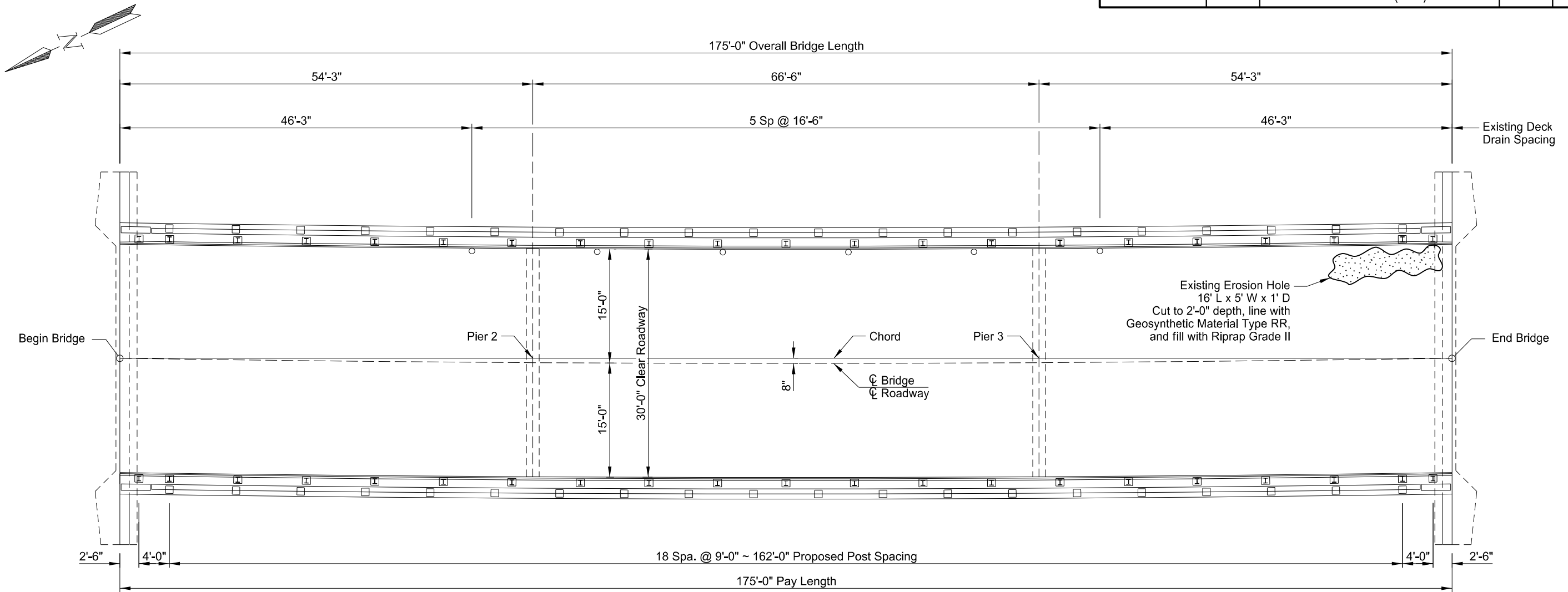
Some spall repair locations on the rail may require the removal and reset of rail retrofit attached to the concrete rail. If the existing anchors are no longer secure in the concrete as determined by the Engineer in the field, after performing the spall repair, install new embedded 3/4" diameter anchor bolts using a chemical adhesive system that can develop a tensile strength of at least 17,500 lbs. Include all work, materials, and equipment of the cost of installing new anchors in the bid item "Spall Repair".



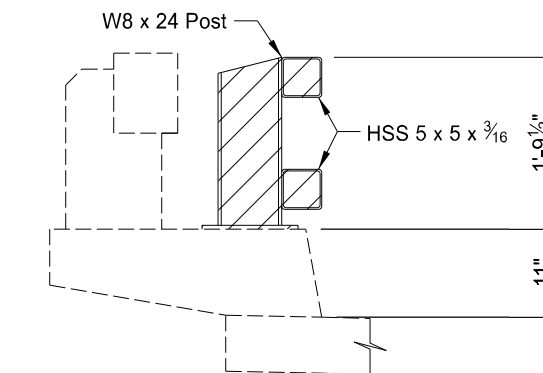
| QUANTITIES | |
|---------------|-------|
| SPALL REPAIR | 53 SF |
| | |
| | |
| BUFFALO CREEK | |
| | |
| SPALL REPAIRS | |

23 U.S.C. 407
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 13 |



PLAN



RAIL REMOVAL DETAIL



Hatched area indicated existing double box beam steel rail retrofit to be removed. Include the removal of the existing rail retrofit in the contract unit price for "Double Box Beam Rail Retrofit - Free Standing."

BRIDGE BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|---|------|----------|
| 256 | 0200 | RIPRAP GRADE II | CY | 6.0 |
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 585 |
| 602 | 7000 | SPECIAL SURFACE FINISH | SF | 2531 |
| 624 | 3001 | DOUBLE BOX BEAM RAIL RETROFIT - FREE STANDING | LF | 350 |
| 650 | 0704 | OVERLAY CONCRETE | CY | 28.4 |
| 650 | 0707 | DECK CONCRETE | CY | 8.1 |
| 650 | 0710 | CLASS 1-H REMOVAL | SY | 584 |
| 650 | 0711 | CLASS 2-H REMOVAL | SY | 117 |
| 650 | 0712 | CLASS 3-H REMOVAL | SY | 30 |
| 930 | 8230 | SHORING | EA | 1 |
| 930 | 9534 | MODIFY DECK DRAIN | EA | 6 |
| 930 | 9612 | SPALL REPAIR | SF | 27 |



CANNONBALL RIVER BRIDGE

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Jason Thorenson Thorenson, Jason R.
10/05/23

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 14 |

NOTES

- 100 SCOPE OF WORK: This project consists of removing and replacing a concrete deck overlay, remove an existing rail retrofit, deck drain extensions, repairing concrete spall areas on the abutment, curb, pier, and deck soffit, and double box beam rail retrofit.
- 256 RIPRAP GRADE II: Cut existing scour hole to 2'-0" depth. Line with Geosynthetic Material Type RR and fill scour hole with Riprap Grade II. 16 SY of Geosynthetic Material Type RR should be installed in compliance with Section 700.
- Include Geosynthetic Material Type RR and all other materials, labor, and equipment required for this work in the price bid for "Riprap Grade II". Riprap will not be measured on the project and will be paid as plan quantity. Excavation is incidental to this bid item and will be included in the cost of the "Riprap Grade II".
- 602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution to the top of deck. Apply penetrating water repellent solution prior to sealing any bridge deck overlay cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.
- After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.
- 602 SPECIAL SURFACE FINISH: Apply TexCote XL 70 BridgeCote with Silane to the new end post surfaces, front face and top surfaces of existing curbs, and existing posts and railing surfaces. Use gray surface finish color number 36424 meeting Aerospace Material Specification (AMS) Standard 595. Apply surface finish prior to installation of rail retrofit.
- 650 OVERLAY CONCRETE: An additional 1/4" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.
- The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.
- The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, at the end of each day.
- 930 SHORING: Design and provide the shoring required to support the east girder at the north abutment for the duration of the adjacent abutment concrete repairs. Provide shoring and jacking plan design sealed by a registered Engineer licensed in the State of North Dakota for approval two weeks prior to the start of construction. Include all costs for shoring, include all labor, equipment, and materials in the price bid for "Shoring".
- 930 SPALL REPAIR: The deck, curb, abutments, and piers have spalling as shown in the elevation and section views.

Remove all unsound concrete and replace it with new concrete material. Use a 15-pound maximum size chipping hammer on any unsound concrete. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Remove enough concrete in unsound areas to get behind periphery of outer reinforcing a minimum of 1".

Sand blast clean the existing concrete and exposed reinforcing steel. Clean the existing concrete surface by high pressure water blasting. After the surface has dried and just before the patching material is placed, coat the surface with an epoxy bonding agent.

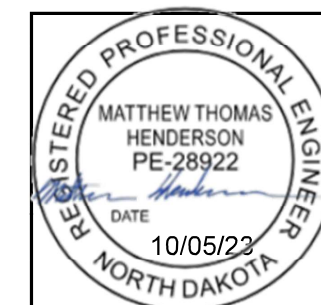
Use a two component, polymer-modified, cementitious repair mortar material that is specifically intended for patching concrete. This patching material may be SikaTop 123 Plus (Sika Corporation), Duraltop Gel (Euclid Chemical Company), MasterEmaco N 400 (BASF Corporation), or an approved equal repair mortar. Cure the material as recommended by the manufacturer.

- 930 MODIFY DECK DRAINS: Provide structural bars for the deck drain extensions meeting Section 834.01A, except the Charpy V-notch test is waived. The HSS deck drainpipe shall be ASTM A500 Grade B. Galvanize all structural bars and tubes according to Section 854.

Provide anchor bolts meeting ASTM A 307 Grade A, nuts meeting ASTM A563, and washers meeting ASTM F 436. Galvanize bolts, nuts, and washers according to Section 854.

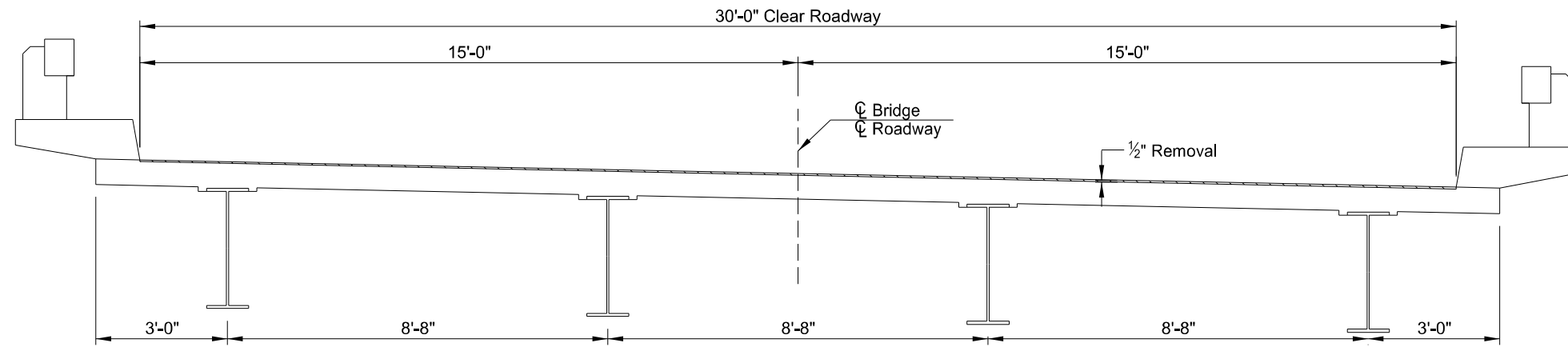
Install the anchor bolts according to the manufacturer's recommendations with an expansive anchor bolt system capable of developing an allowable tensile load of 3,020 lb in 3,000 psi concrete.

Include all labor, equipment, and materials required to install the anchor bolts into the underside of the deck and extend the deck drains in the bid item "MODIFY DECK DRAINS."

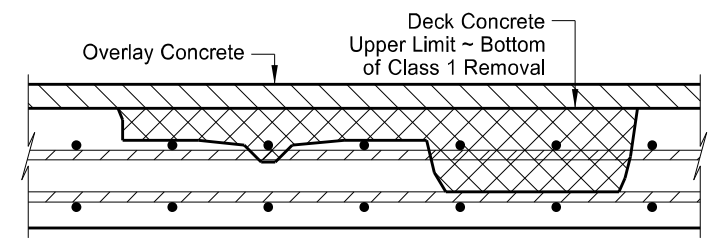


23 U.S.C. 407
 NDDOT Reserves All Objections

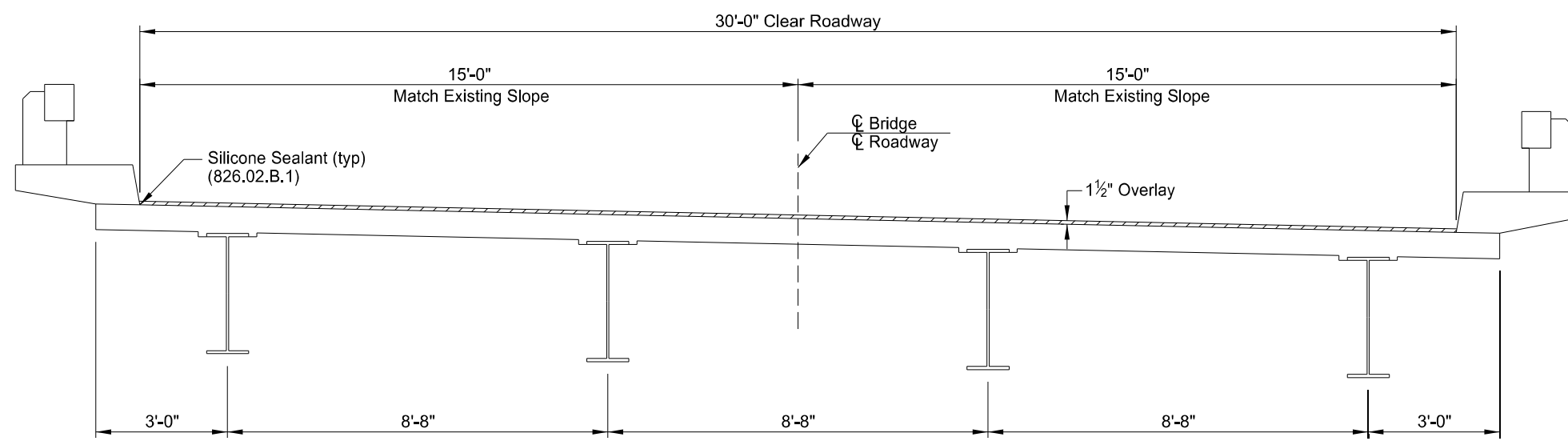
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 15 |



(SHOWING REMOVAL)
 TYPICAL SECTION

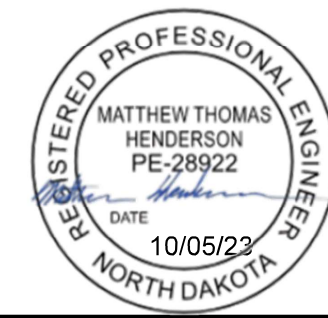


(DECK CONCRETE)
 BRIDGE DECK SECTION



(SHOWING OVERLAY)
 TYPICAL SECTION

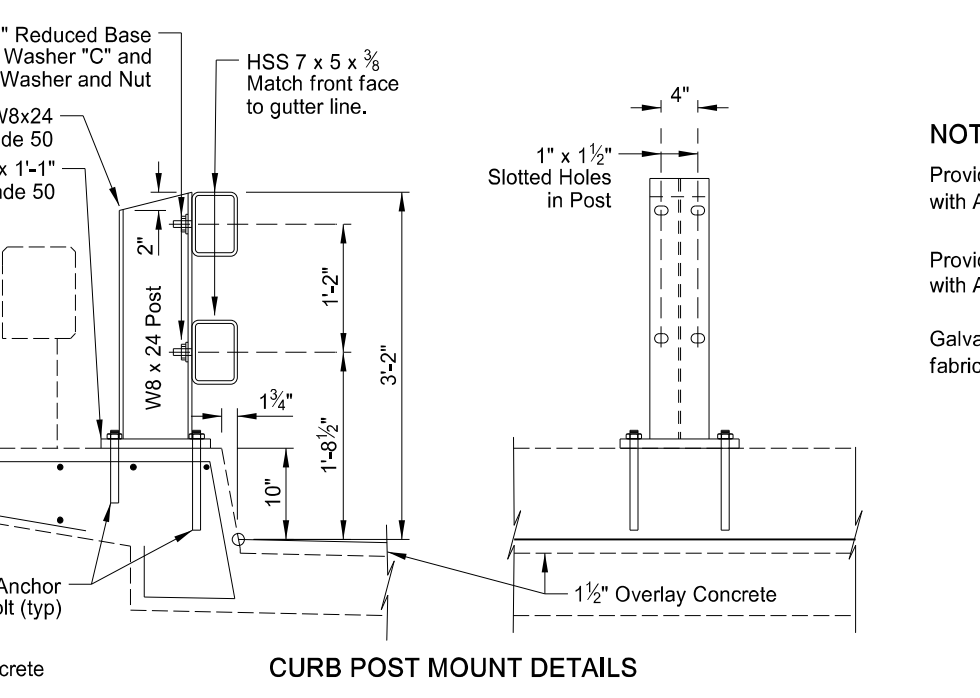
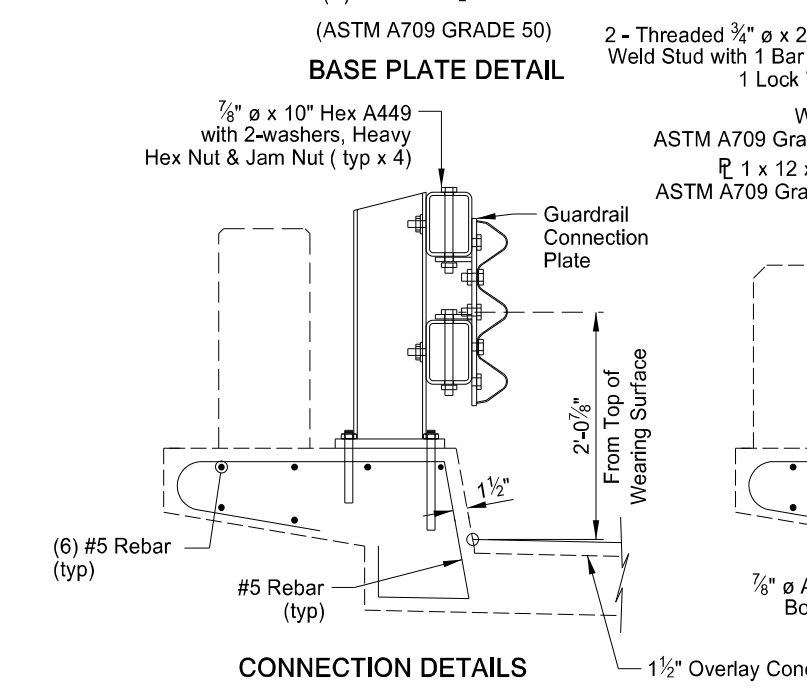
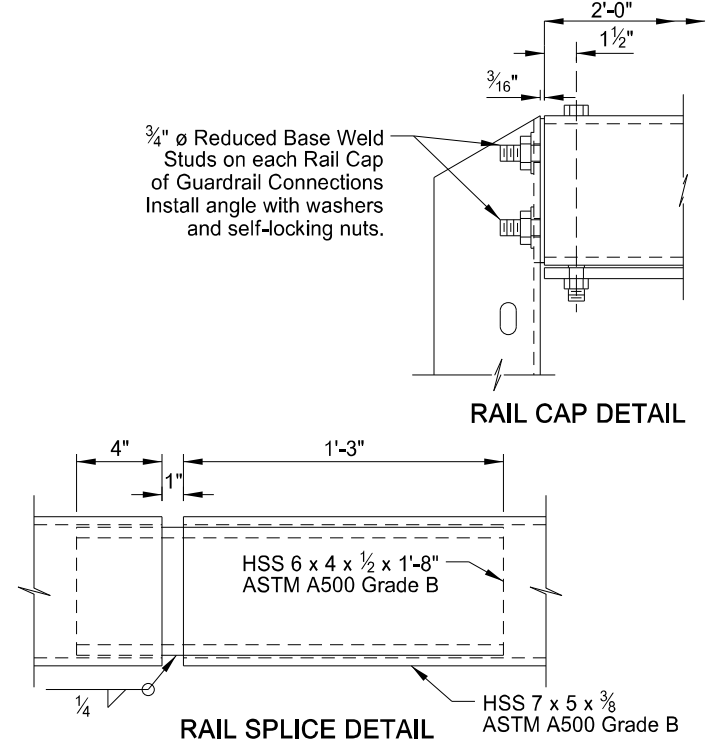
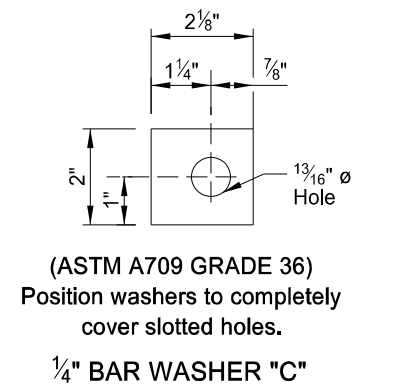
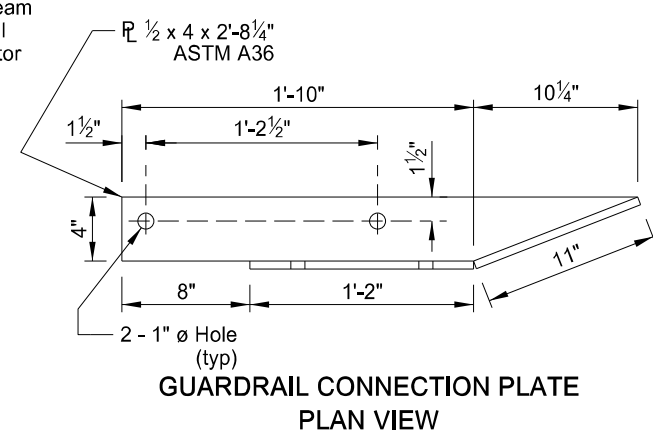
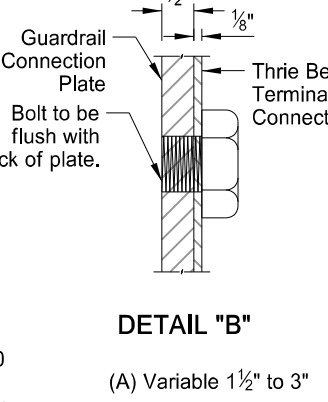
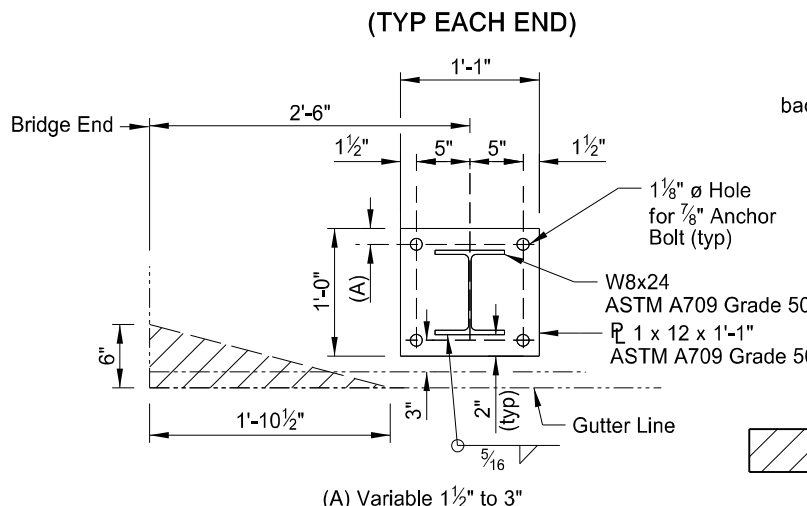
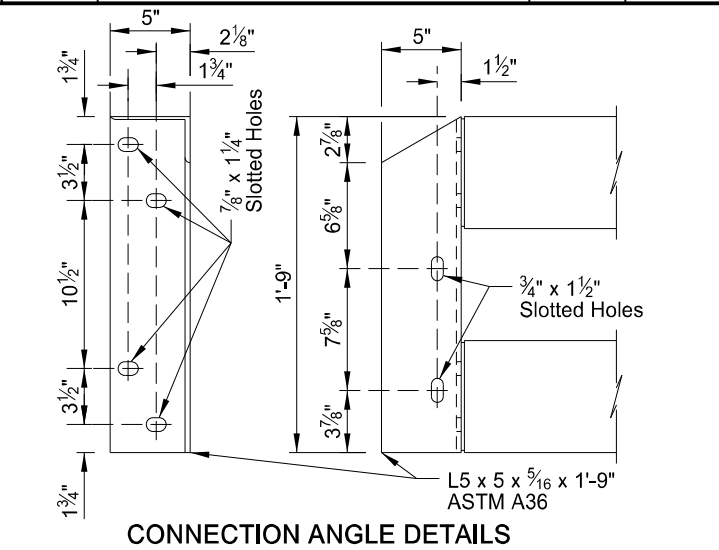
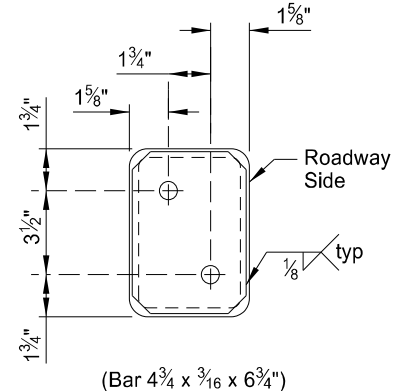
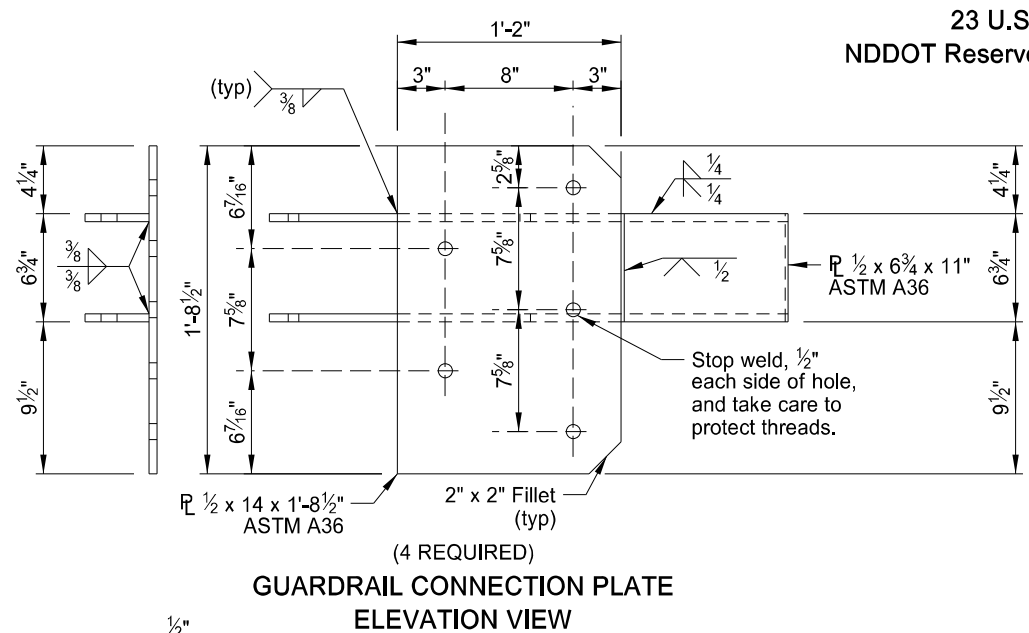
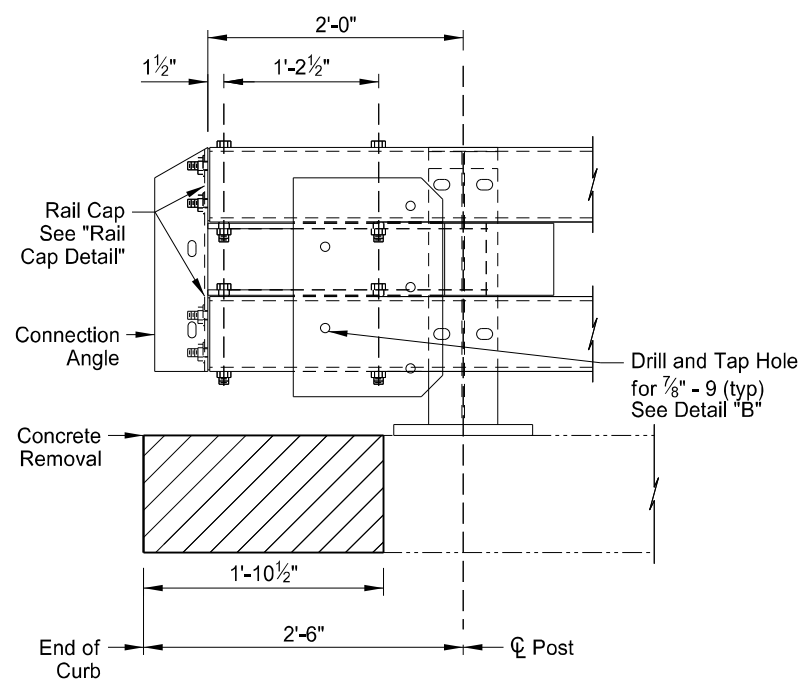
| QUANTITIES | |
|------------------|---------|
| OVERLAY CONCRETE | 28.4 CY |
| DECK CONCRETE | 8.1 CY |
| CLASS 1H REMOVAL | 584 SY |
| CLASS 2H REMOVAL | 117 SY |
| CLASS 3H REMOVAL | 30 SY |



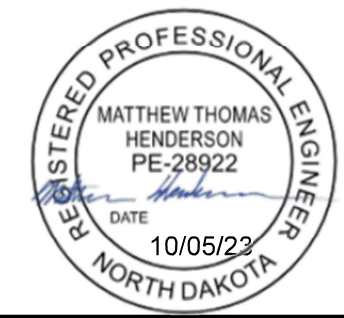
| |
|-------------------------|
| CANNONBALL RIVER BRIDGE |
| DECK OVERLAY DETAILS |

23 U.S.C. 407
NDDOT Reserves All Objections

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 16 |



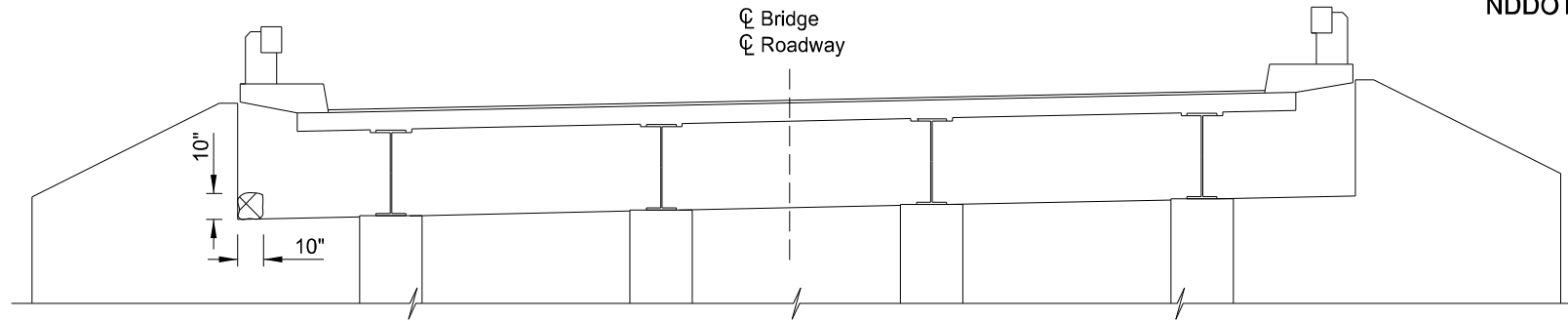
NOTES:
Provide reduced base studs in accordance with ASTM A108 Grade 1010.
Provide 7/8" ø Anchor Bolts in accordance with ASTM F1554, Grade 105.
Galvanize all steel components after fabrication according to Section 854.



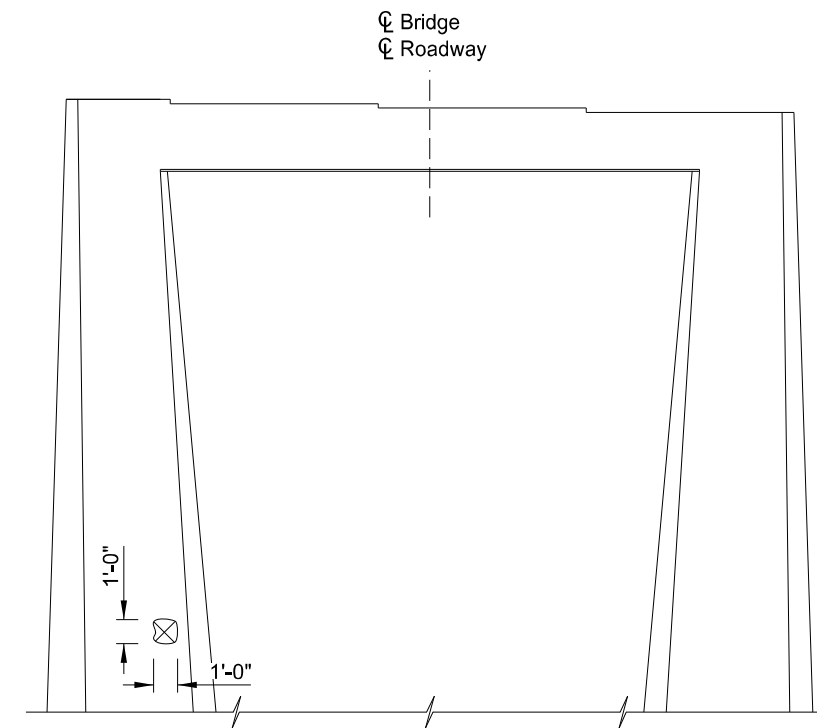
| QUANTITIES | |
|---|--------|
| RAIL RETROFIT - FREE STANDING | 350 LF |
| CANNONBALL RIVER BRIDGE | |
| DOUBLE BOX BEAM RAIL RETROFIT DETAILS (FREE STANDING) | |

23 U.S.C. 407
NDDOT Reserves All Objections

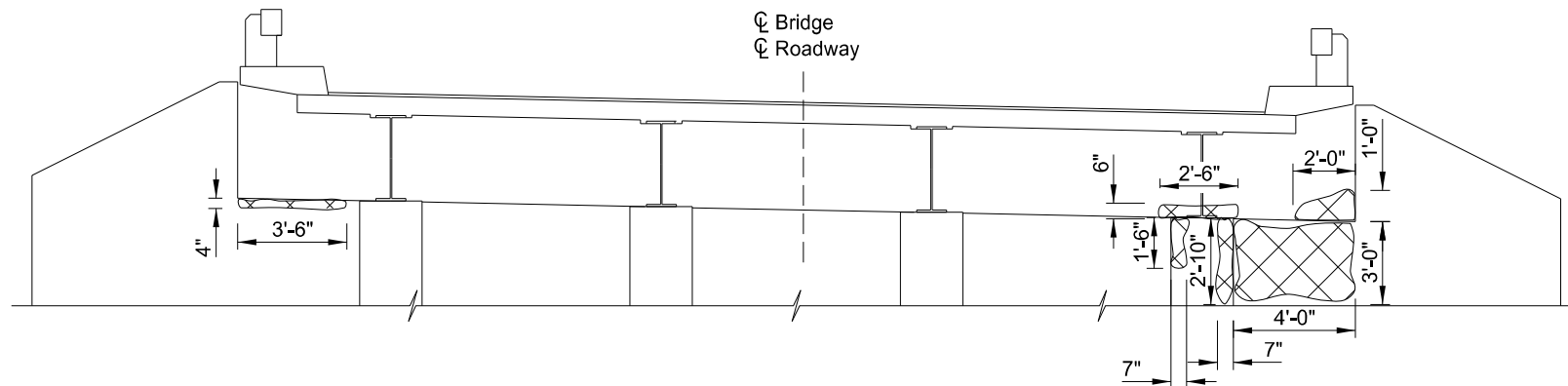
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 17 |



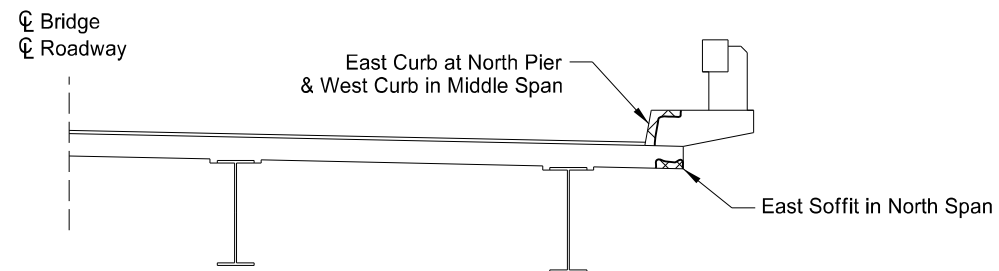
SOUTH ABUTMENT ELEVATION - FACING SOUTH



PIER 3 ELEVATION - FACING SOUTH



NORTH ABUTMENT ELEVATION - FACING NORTH

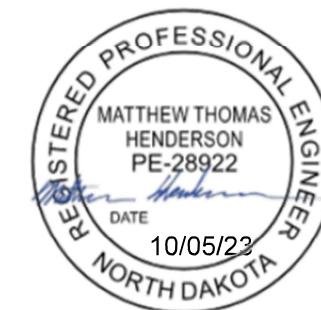


TYPICAL DECK AND GIRDER CROSS SECTION

| DECK AND CURB SPALL REPAIRS | | |
|-----------------------------|-------|-------|
| LOCATION | L | W |
| WEST CURB IN MIDDLE SPAN | 4'-0" | 0'-9" |
| EAST SOFFIT IN NORTH SPAN | 1'-0" | 1'-0" |
| EAST CURB AT NORTH PIER | 2'-0" | 2'-0" |

* L is measured in the direction of the roadway.

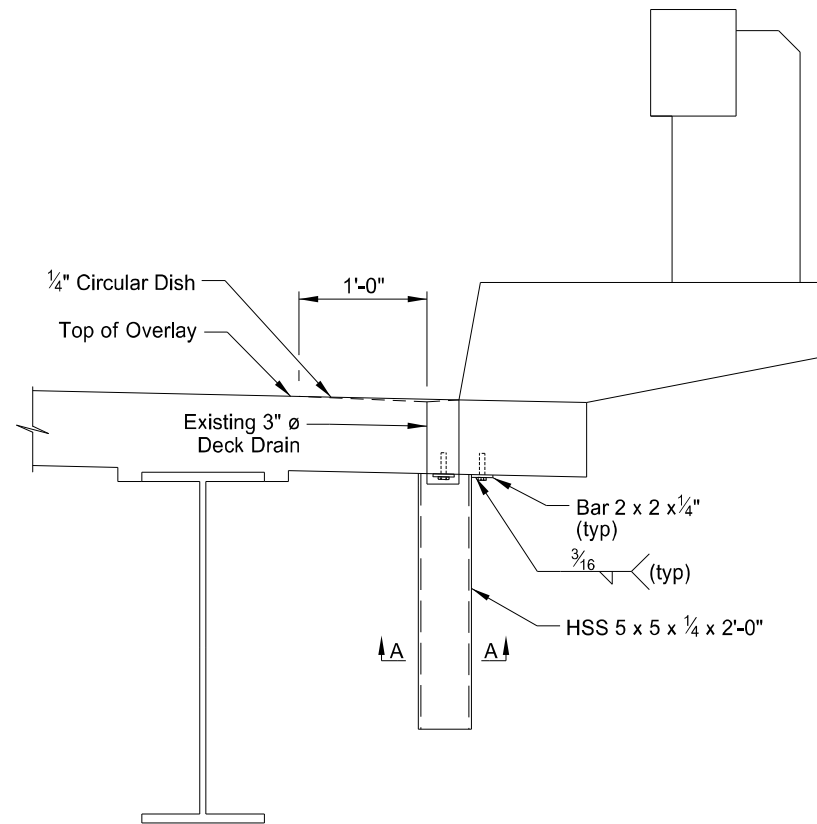
 Indicates spall repair area.



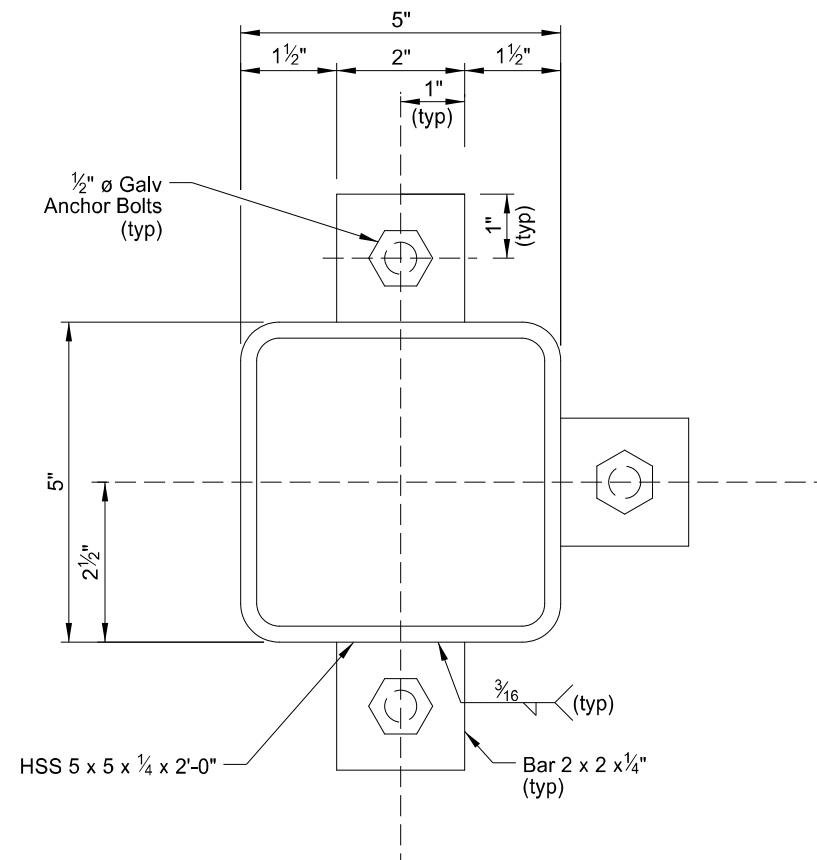
| QUANTITIES | |
|-------------------------|-------|
| SPALL REPAIR | 29 SF |
| CANNONBALL RIVER BRIDGE | |
| SPALL REPAIRS | |

23 U.S.C. 407
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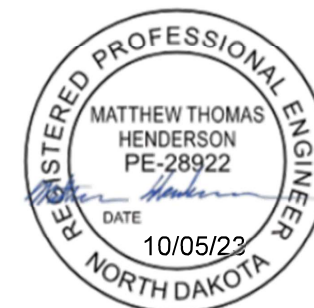
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 18 |



(6 Deck Drains)
 DECK DRAIN DETAILS



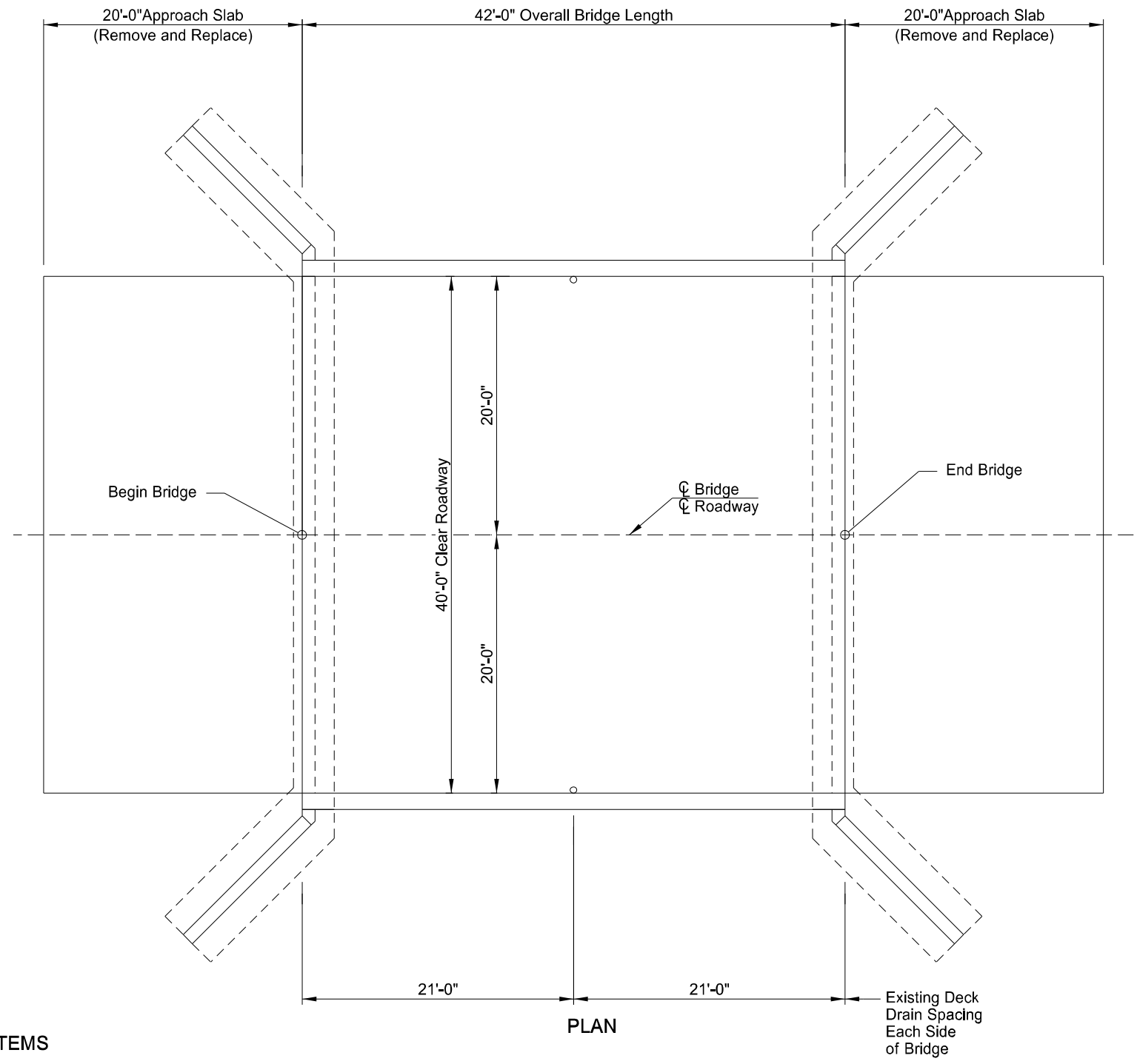
SECTION A-A



| QUANTITIES | |
|-------------------------|------|
| MODIFY DECK DRAINS | 6 EA |
| CANNONBALL RIVER BRIDGE | |
| DECK DRAIN DETAILS | |

23 U.S.C. 407
NDDOT Reserves All Objections

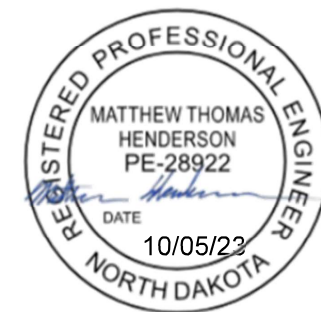
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 19 |



BRIDGE BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|---|------|----------|
| 602 | 1135 | BRIDGE APPROACH SLAB - REMOVE & REPLACE | SY | 184 |
| 602 | 1250 | PENETRATING WATER REPELLENT | SY | 365 |
| 602 | 7000 | SPECIAL SURFACE FINISH | SF | 380 |
| 650 | 0704 | OVERLAY CONCRETE | CY | 11.7 |
| 650 | 0707 | DECK CONCRETE | CY | 2.6 |
| 650 | 0710 | CLASS 1-H REMOVAL | SY | 187 |
| 650 | 0711 | CLASS 2-H REMOVAL | SY | 38 |
| 650 | 0712 | CLASS 3-H REMOVAL | SY | 10 |
| 650 | 0720 | CLASS 1 REMOVAL | SY | 187 |
| 930 | 9534 | MODIFY DECK DRAIN | EA | 2 |

PLAN



| | |
|--|---------------------------------|
| RUSSIAN SPRING CREEK | |
| BRIDGE LAYOUT | |
| ND DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION | |
| <i>Jason Thorenson</i> | Thorenson, Jason R. 10/05/23 |

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 20 |

NOTES

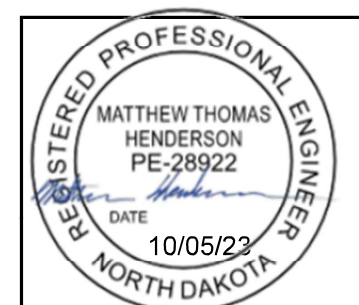
- 100 SCOPE OF WORK: This project consists of removing and replacing a concrete deck overlay, deck drain extensions, and removing and replacing approach slabs.
- 602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution top the top of deck and the top of the approach slabs. Apply penetrating water repellent solution prior to sealing any bridge deck overlay cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.
- After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs, and the approach slab and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.
- 602 SPECIAL SURFACE FINISH: Apply TexCote XL 70 BridgeCote with Silane to the inside and top surface of the existing bridge barriers and new approach curbs. Use gray surface finish color number 36424 meeting Aerospace Material Specification (AMS) Standard 595.
- 602 BRIDGE APPROACH SLAB – REMOVE & REPLACE: Remove and replace the 20'-0" approach slab at each end of the bridge. Do not damage the parts of the structure to remain in place. Include all labor, material, and equipment to remove and replace the approach slabs in the price bid for "Bridge Approach Slab – Remove & Replace."
- 650 OVERLAY CONCRETE: An additional ¼" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.
- The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.
- The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, and the end of each day.
- 930 MODIFY DECK DRAINS: Provide structural bars for the deck drain extensions meeting Section 834.01 A, except the Charpy V-notch test is waived. The HSS deck drainpipe must be ASTM A500 Grade B. Galvanize all structural bars and tubes according to Section 854.
- Provide anchor bolts meeting ASTM A 307 Grade A, nuts meeting ASTM A563 and washers meeting ASTM F 436. Galvanize bolts, nuts, and washers according to Section 854.
- Install the anchor bolts according to the manufacturer's recommendations with an expansive anchor bolt system capable of developing an allowable tensile load of 3,020 lbs in 3,000 psi concrete.

Include all labor, equipment, and materials required to install the anchor bolts into the underside of the deck and extend the deck drains in the bid item "Modify Deck Drains."

- 930 CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck overlay and approach slabs to determine the need for crack sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

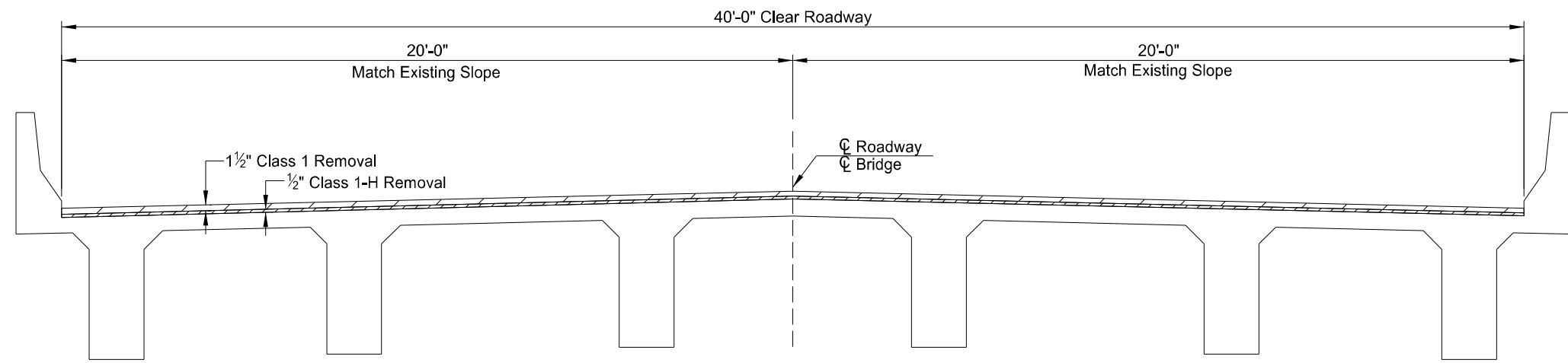
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase cracks with a sealant applicator to limits of crack, including those portions that are narrower than 0.007" wide. Use Paulco TE/2501 (Viking Paints, Inc), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.

Include the costs for crack sealing the deck overlay in the price bid for "Overlay Concrete" and the cost for crack sealing the approach slabs in the price bid for "Bridge Approach Slab – Remove & Replace."

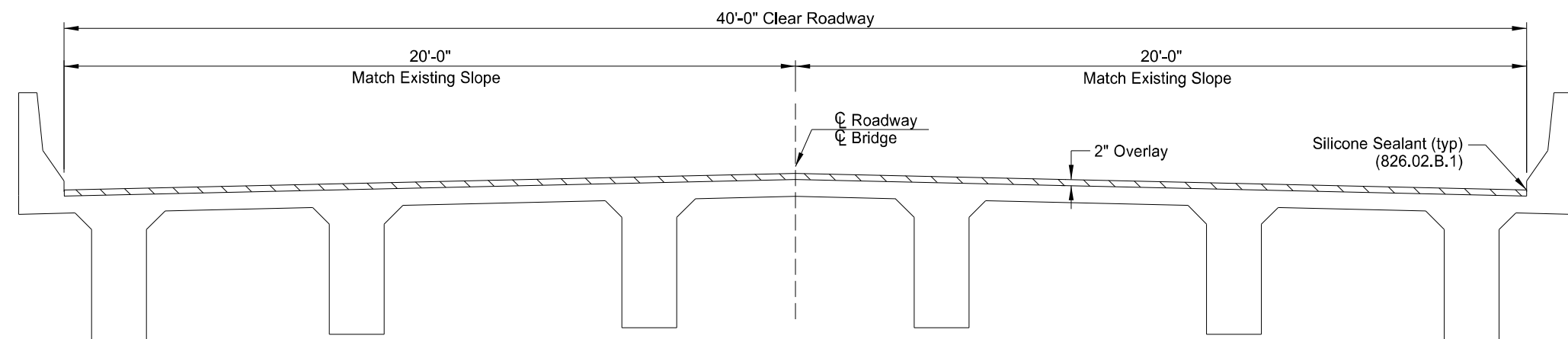


23 U.S.C. 407
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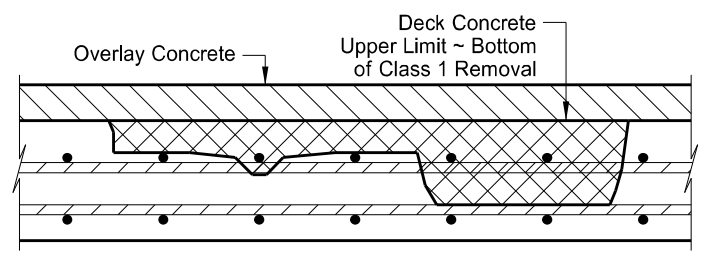
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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 21 |



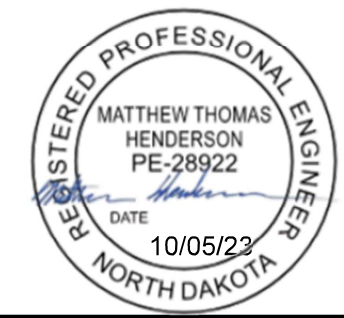
(SHOWING REMOVAL)
TYPICAL DECK SECTION



(SHOWING OVERLAY)
TYPICAL DECK SECTION



(DECK CONCRETE)
BRIDGE DECK SECTION



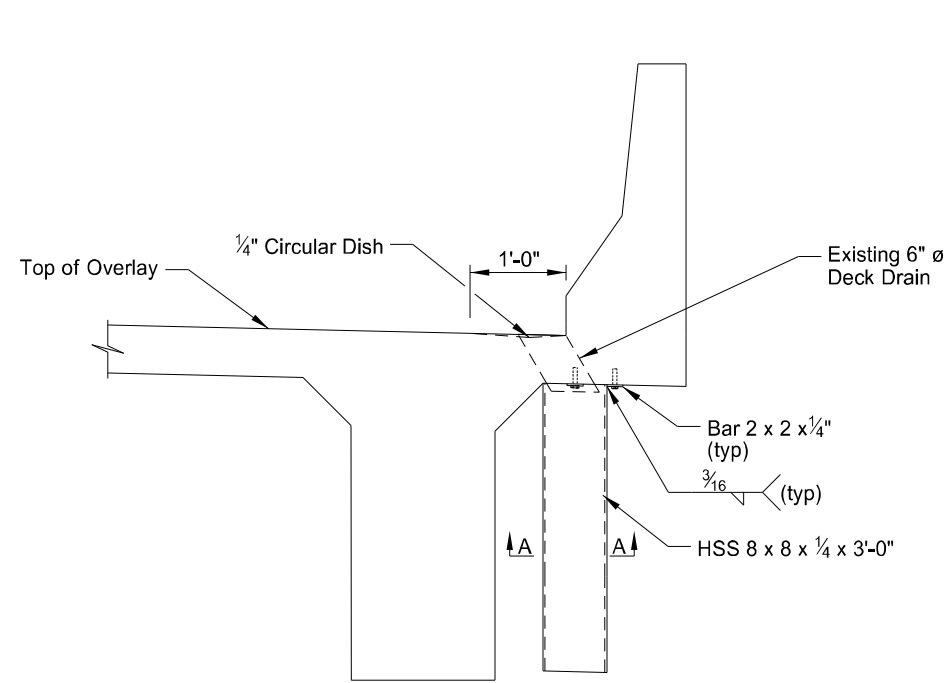
| QUANTITIES | |
|------------------|---------|
| OVERLAY CONCRETE | 11.7 CY |
| DECK CONCRETE | 2.6 CY |
| CLASS 1H REMOVAL | 187 SY |
| CLASS 2H REMOVAL | 38 SY |
| CLASS 3H REMOVAL | 10 SY |
| CLASS 1 REMOVAL | 187 SY |

RUSSIAN SPRING CREEK

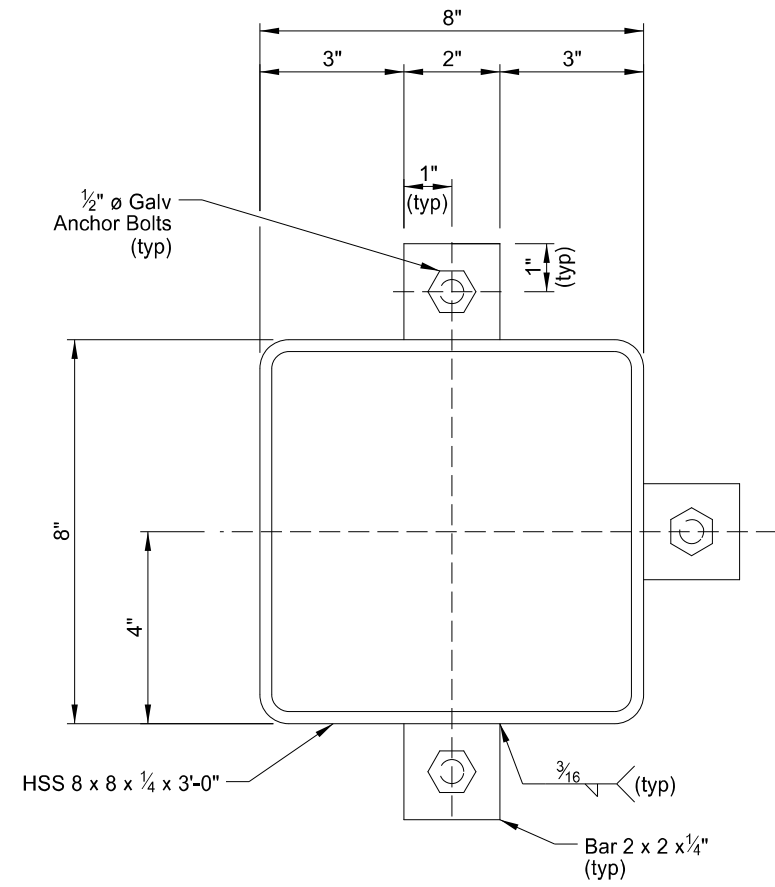
DECK OVERLAY DETAILS

23 U.S.C. 407
 NDDOT Reserves All Objections

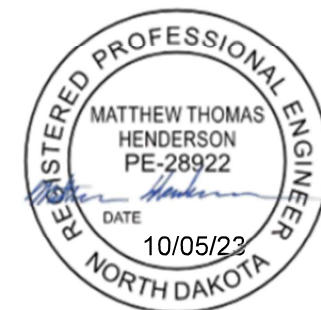
| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 22 |



(2 Deck Drains)
 DECK DRAIN DETAILS



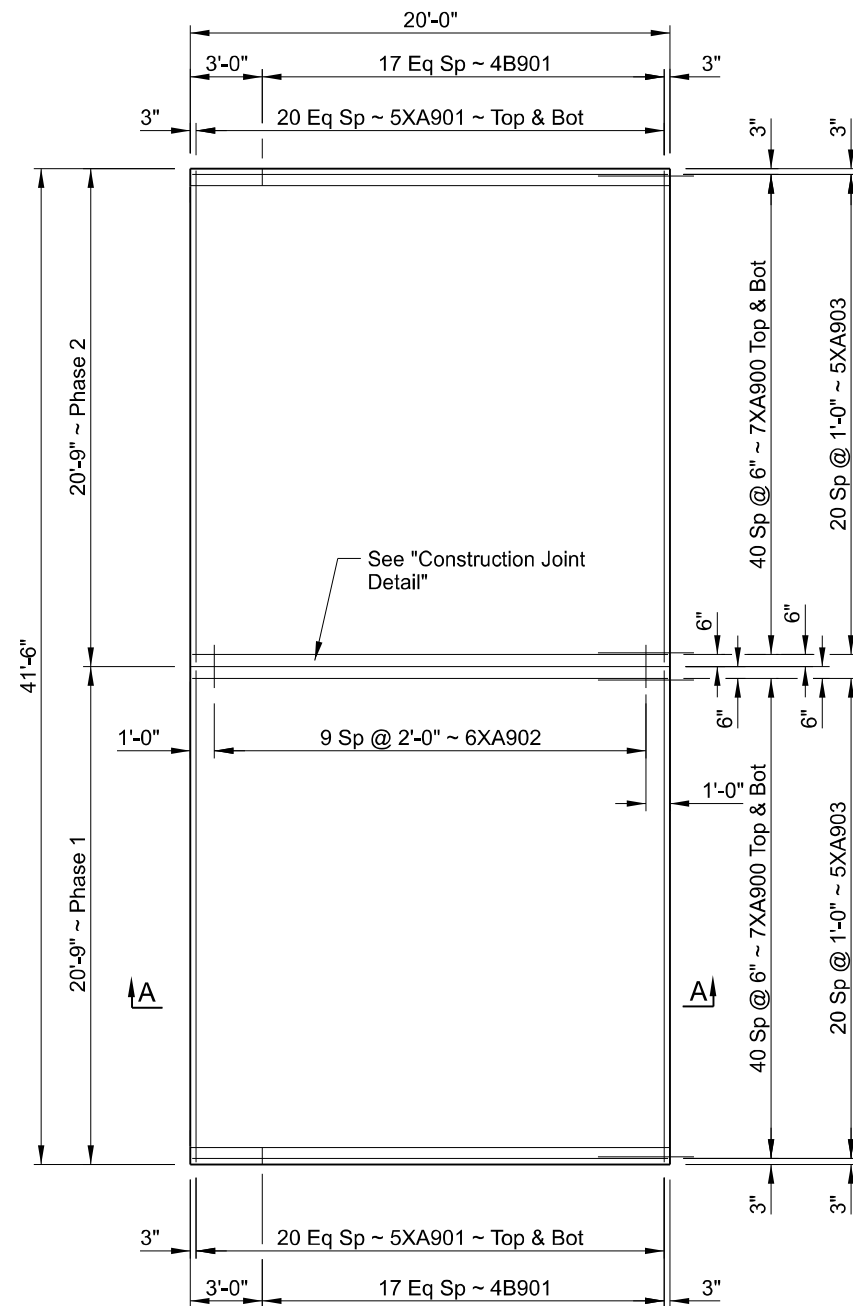
SECTION A-A



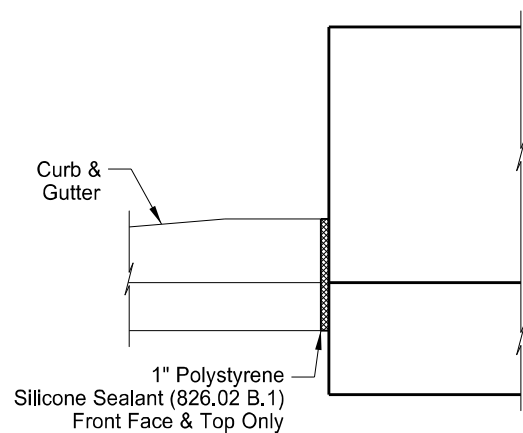
| QUANTITIES | |
|----------------------|------|
| MODIFY DECK DRAIN | 2 EA |
| RUSSIAN SPRING CREEK | |
| DECK DRAIN DETAILS | |

23 U.S.C. 407
 NDDOT Reserves All Objections

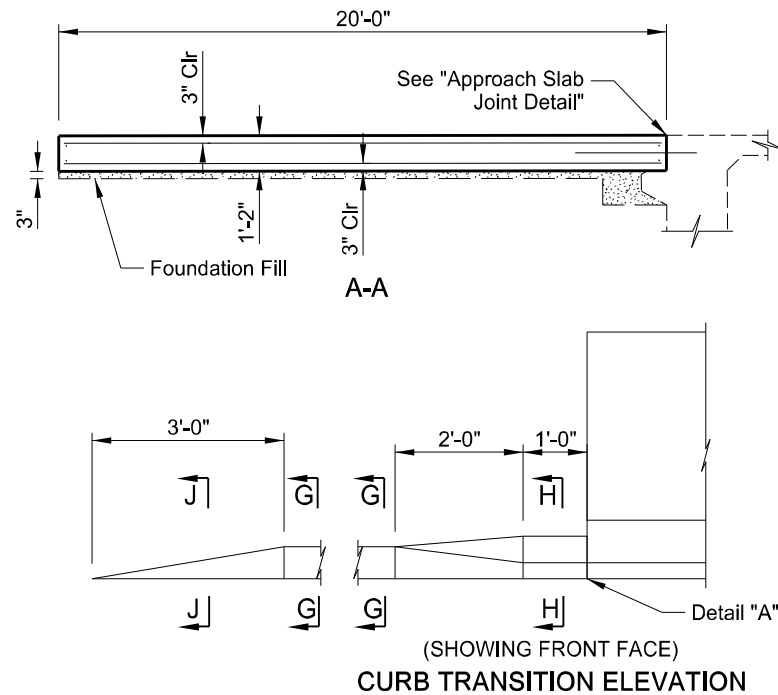
| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 23 |



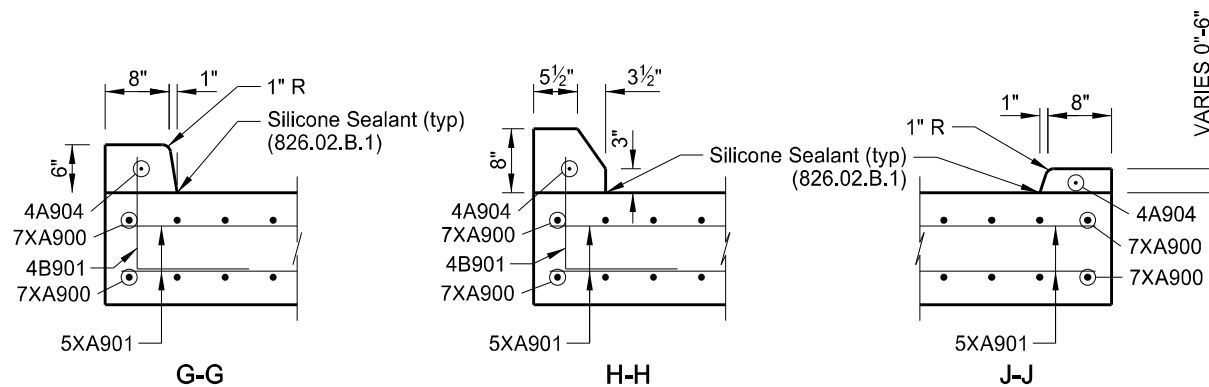
PLAN



DETAIL "A"



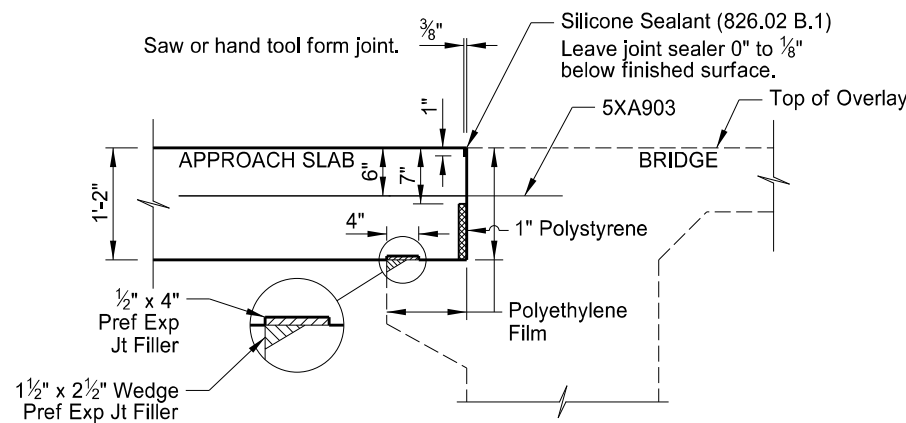
(SHOWING FRONT FACE)
 CURB TRANSITION ELEVATION



G-G

H-H

J-J



APPROACH SLAB JOINT DETAIL

NOTES:

The estimated material quantities shown are for information purposes only. Include the concrete, reinforcing bars, polyethylene film, preformed joint filler, polystyrene, silicone sealant, foundation fill, and labor required to build the approach slabs and curbs in the pay item "Bridge Approach Slab - Remove and Replace." Use Class AE-3 concrete and Grade 60 reinforcing steel. Provide reinforcing steel that meets the requirements of Section 612. Use polyethylene film that meets the requirements of ASTM C171.

The dimensions shown in the "Bent Bar Details" are out to out.

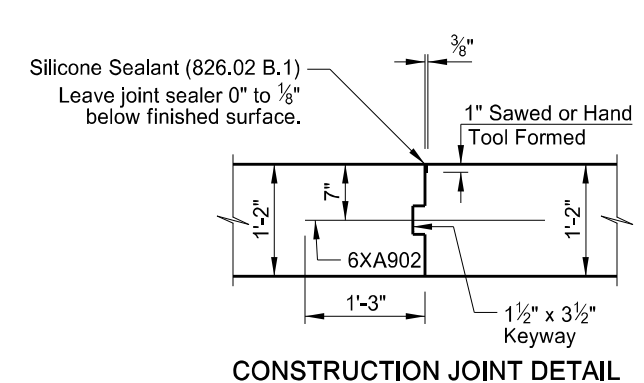
Install 5XA903 bars according to manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage (16k min. ultimate pullout) and that meets the requirements of Section 806.02. Provide an anchorage depth of 1'-0", or the depth as recommended by the manufacturer to achieve desired capacity, whichever is greater.

An "X" preceding a bar designation indicates an epoxy coated bar.

| SKEW ANGLE = 0° | | | |
|---------------------|--------|-----|--------|
| BAR LIST - ONE SLAB | | | |
| SIZE | MARK | NO. | LENGTH |
| 7 | XA900 | 164 | 19'-8" |
| 5 | XA901 | 84 | 20'-5" |
| 6 | XA902 | 10 | 2'-6" |
| 5 | XA903* | 42 | 4'-0" |
| 4 | B901 | 36 | 4'-0" |
| 4 | A904 | 2 | 19'-8" |

| ESTIMATED MATERIAL QUANTITIES | |
|-------------------------------|---------------|
| REINFORCING STEEL (LBS) | CONCRETE (CY) |
| 8,717 | 35.9 |

* Length may increase, depending on manufacturer's recommendations for anchorage. Provide a minimum length of 1'-0".



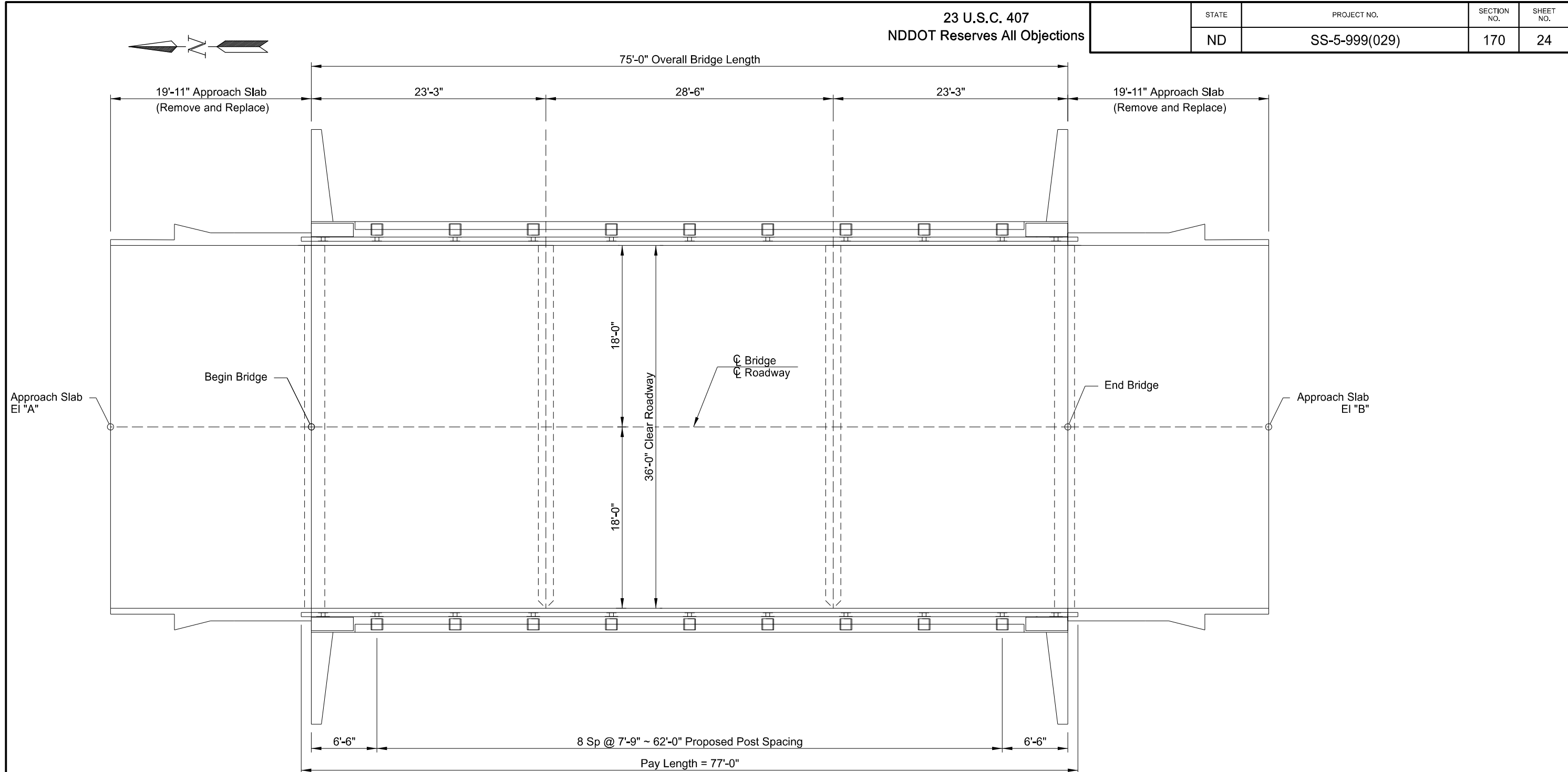
CONSTRUCTION JOINT DETAIL



| QUANTITIES | (ONE SLAB) |
|-----------------------|------------|
| APPROACH SLAB | 92 SY |
| RUSSIAN SPRING CREEK | |
| APPROACH SLAB DETAILS | |

23 U.S.C. 407
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 24 |

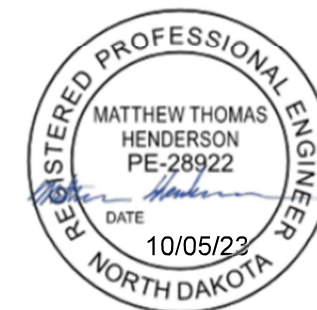


PLAN

BRIDGE BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|---|------|----------|
| 602 | 1135 | BRIDGE APPROACH SLAB - REMOVE & REPLACE | SY | 164 |
| 602 | 1210 | BRIDGE END POST MODIFICATION | EA | 4 |
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 466 |
| 602 | 7000 | SPECIAL SURFACE FINISH | SF | 943 |
| 624 | 3002 | DOUBLE BOX BEAM RAIL RETROFIT - E-RAIL | LF | 154 |
| 650 | 0704 | OVERLAY CONCRETE | CY | 15.1 |
| 650 | 0707 | DECK CONCRETE | CY | 4.2 |
| 650 | 0710 | CLASS 1-H REMOVAL | SY | 300 |
| 650 | 0711 | CLASS 2-H REMOVAL | SY | 60 |
| 650 | 0712 | CLASS 3-H REMOVAL | SY | 15 |

| APPROACH SLAB ELEVATIONS | |
|--------------------------|--------------------------------|
| El "A" | 0.08' higher than Begin Bridge |
| El "B" | 0.17' higher than End Bridge |



SOUTH BRANCH HEART RIVER

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Jason Thorenson Thorenson, Jason R.
10/05/23

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 25 |

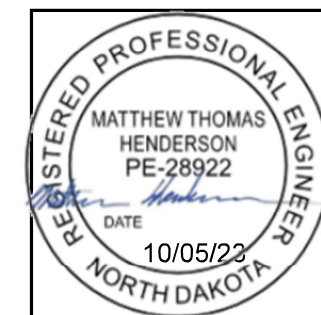
NOTES

- 100 SCOPE OF WORK: This project consists of removing an asphalt overlay, placing a concrete deck overlay, rail retrofit, and approach slab replacement.
- 602 BRIDGE APPROACH SLAB – REMOVE & REPLACE: Remove and replace the 19'-11" approach slab at each end of the bridge. Do not damage the parts of the structure to remain in place. Include all labor, material, and equipment to remove and replace the approach slabs in the price bid for "Bridge Approach Slab – Remove & Replace."
- 602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution to the top of deck and to the approach slabs. Apply penetrating water repellent solution prior to sealing any bridge deck overlay cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.
- After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.
- 602 SPECIAL SURFACE FINISH: Apply TexCote XL 70 BridgeCote with Silane to the new end post surfaces, front face and top surfaces of existing curbs, and existing posts and railing surfaces. Use gray surface finish color number 36424 meeting Aerospace Material Specification (AMS) Standard 595. Apply surface finish prior to installation of rail retrofit.
- 650 OVERLAY CONCRETE: An additional ¼" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.
- The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.
- The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, at the end of each day.
- 650 CLASS 1H REMOVAL: A 25 SY area at the south end of the bridge deck has been overlaid with +/- ½ inches of bituminous pavement. Include the cost of removal of the bituminous pavement in the price bid for the Class 1H Removal.
- 930 CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck overlay and approach slabs to determine the need for cracking sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase cracks with a sealant applicator to limits of

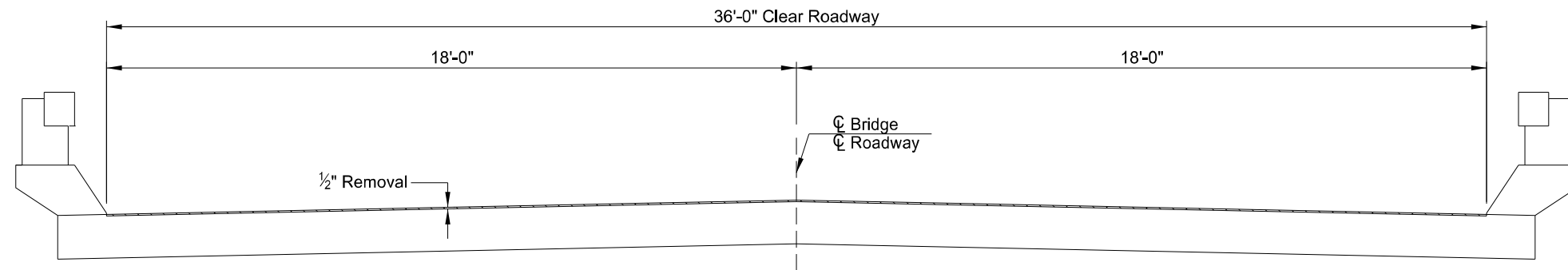
crack, including those portions that are narrower than 0.007" wide. Use Paulco TE/2501 (Viking Paints, Inc), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.

Include the costs for crack sealing the deck overlay in the price bid for "Overlay Concrete" and the cost for crack sealing the approach slabs in the price bid for "Bridge Approach Slab – Remove & Replace".

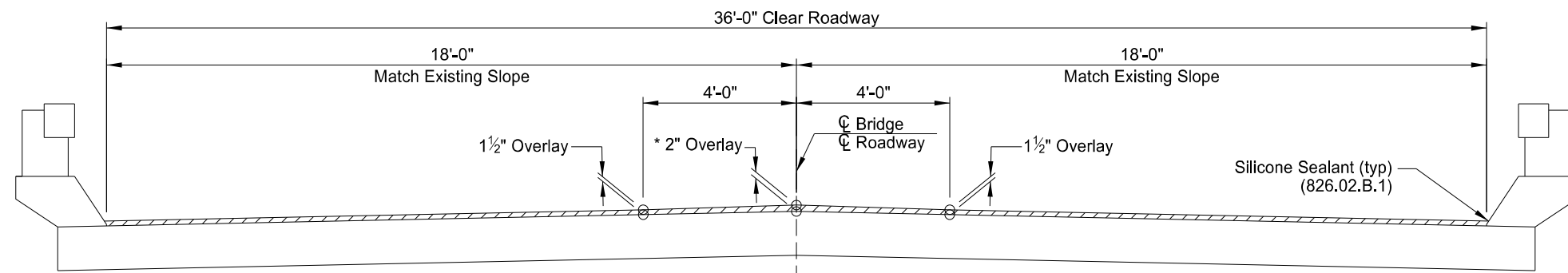


23 U.S.C. 407
NDDOT Reserves All Objections

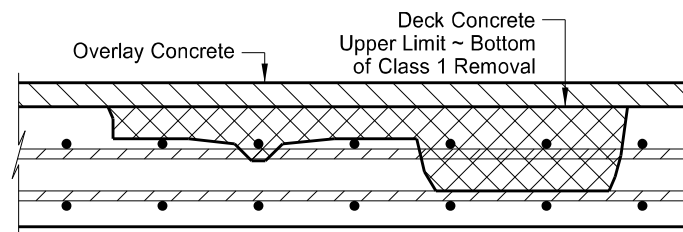
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|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 26 |



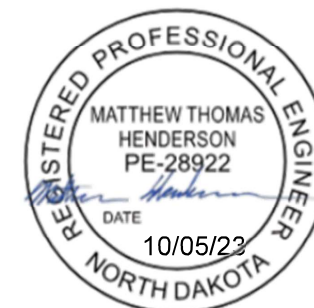
(SHOWING REMOVAL)
TYPICAL SECTION



(SHOWING OVERLAY)
TYPICAL SECTION



(DECK CONCRETE)
BRIDGE DECK SECTION



| QUANTITIES | |
|------------------|---------|
| OVERLAY CONCRETE | 15.1 CY |
| DECK CONCRETE | 4.2 CY |
| CLASS 1H REMOVAL | 300 SY |
| CLASS 2H REMOVAL | 60 SY |
| CLASS 3H REMOVAL | 15 SY |

| |
|--------------------------|
| SOUTH BRANCH HEART RIVER |
| DECK OVERLAY DETAILS |

BILL OF REINFORCING STEEL, GRADE 60

LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS

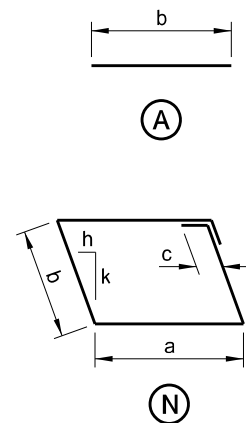
| LOCATION | SIZE | MARK | NO. EACH /SET | NOMINAL LENGTH | DETAILING DIMENSIONS | | | | | | | | | |
|-----------|------|------|---------------|----------------|----------------------|--------|----|---|---|---|---|---|----|--|
| | | | | | a | b | c | d | e | f | g | h | k | |
| END POSTS | 6 | A700 | 36 | 2'-10" | | 2'-10" | | | | | | | | |
| | 5 | A701 | 20 | 2'-4" | | 2'-4" | | | | | | | | |
| | 4 | N700 | 16 | 10'-10" | 1'-1" | 3'-10" | 6" | | | | | 0 | 12 | |
| | | | | | | | | | | | | | | |

ESTIMATED MATERIAL QUANTITIES

| REINFORCING STEEL (LBS) | CONCRETE (CY) |
|-------------------------|---------------|
| 318 | 1.7 |

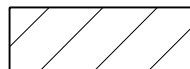
NOTES:

1. Verify the quantity, size, and shape of the bar reinforcement against the structure drawings and immediately notify the Engineer of any discrepancies. Discrepancies in the bar list will not be cause for adjustment of the contract unit price.
2. All dimensions are out to out of bars.
3. Nominal length of each bent bar or cut bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.
4. Install the 6A700 and 5A701 bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage (16k min. ultimate pullout) and that meets the requirements of Section 806.02. The "b" dimension of the 6A700 and 5A701 bars is based on the embedment shown. The actual "b" dimension will be based on embedment according to the chemical adhesive manufacturer's recommendations.
5. Provide reinforcing steel that meets the requirements of Section 612.

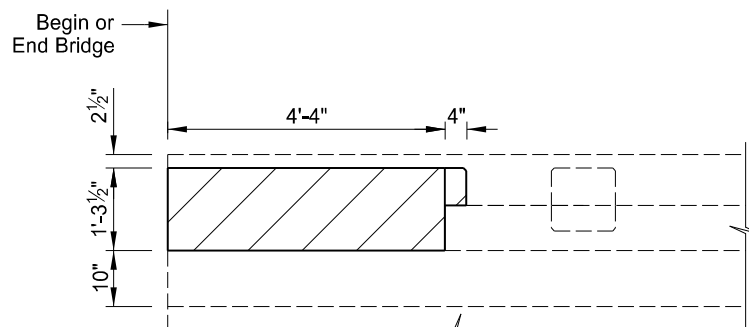


23 U.S.C. 407
NDDOT Reserves All Objections

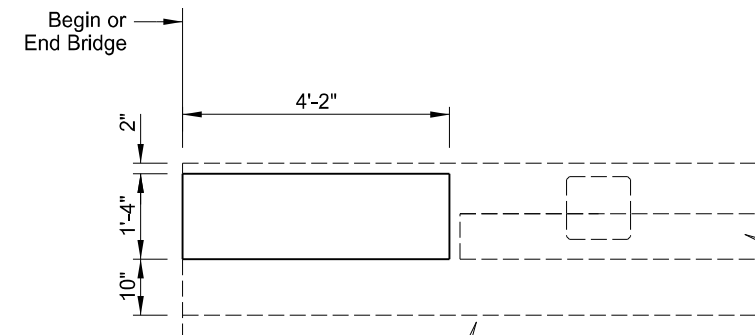
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|-------|---------------|-------------|-----------|
| ND | SS-5-999(029) | 170 | 27 |



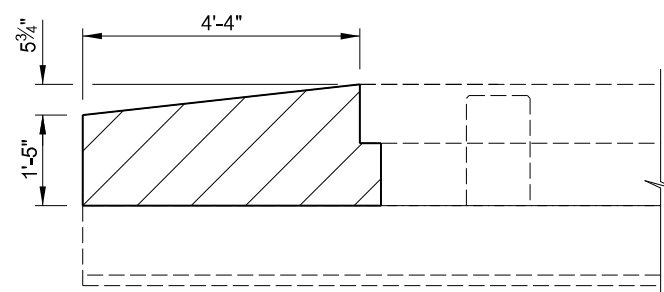
The hatched areas indicate concrete to be removed. Saw cut the concrete to a depth of 1" to provide a neat line prior to being removed. Carefully remove concrete to ensure no damage is done to the existing reinforcing steel that is to remain in place.



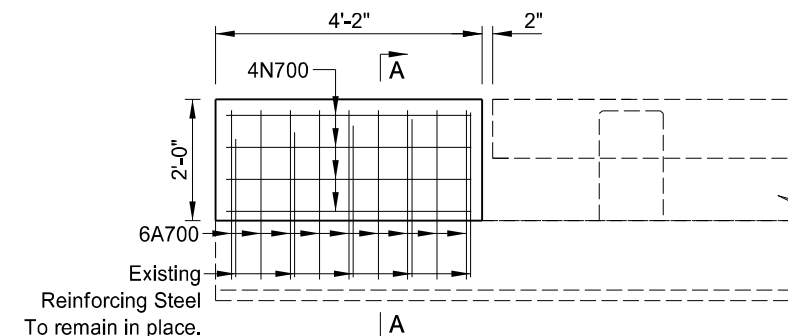
SHOWING REMOVAL
EXISTING CONCRETE END POST PLAN



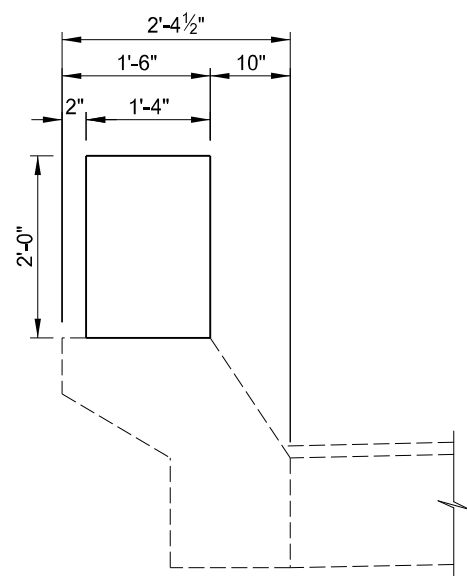
SHOWING DIMENSIONS
NEW CONCRETE END POST PLAN



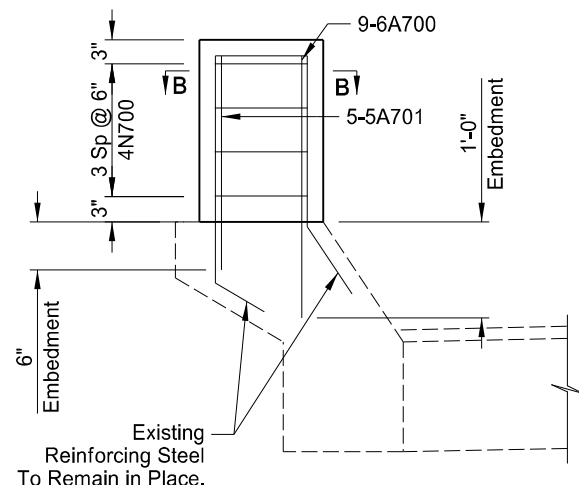
SHOWING REMOVAL
EXISTING CONCRETE END POST ELEVATION



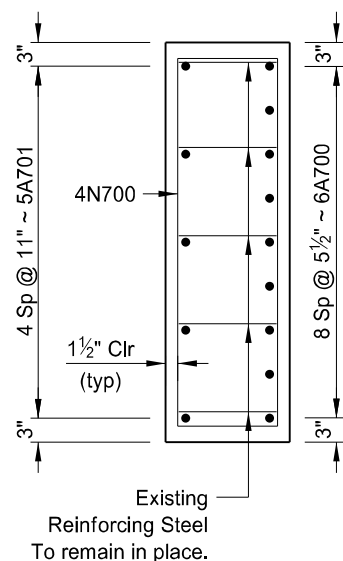
SHOWING REINFORCING
NEW CONCRETE END POST ELEVATION



SHOWING DIMENSIONS



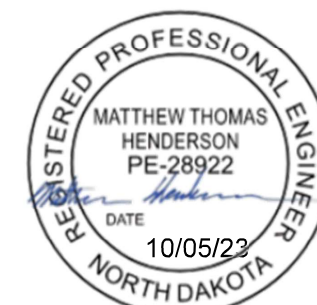
A-A



B-B

NOTES:

The estimated material quantities shown are for information purposes only. Include the post removal, concrete, reinforcing bars and labor required to build the end posts in the pay item "End Post Modification." Use Class AE-3 concrete and Grade 60 reinforcing steel. See existing bridge plans for additional information regarding existing concrete end posts.

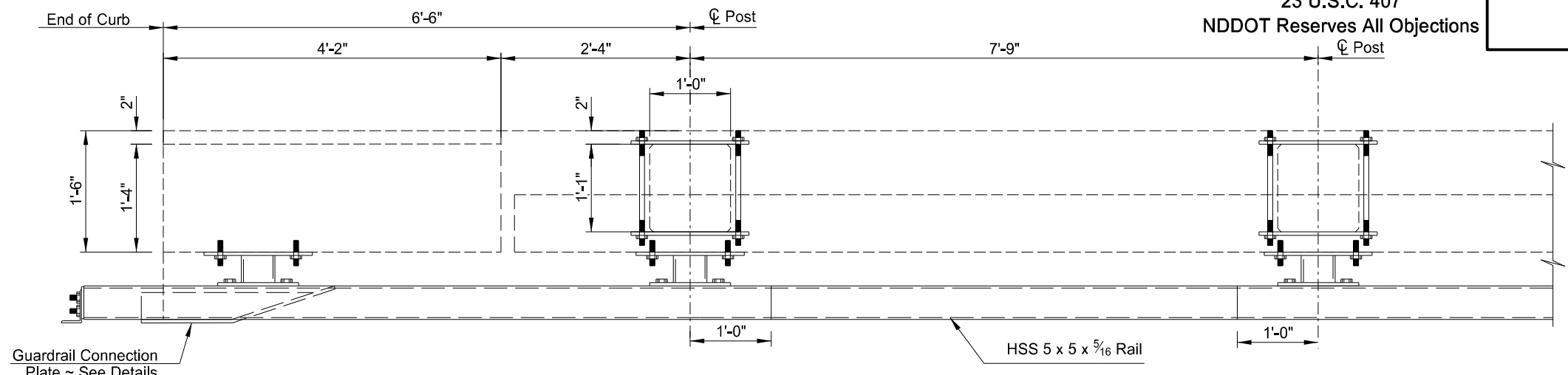


SOUTH BRANCH HEART RIVER

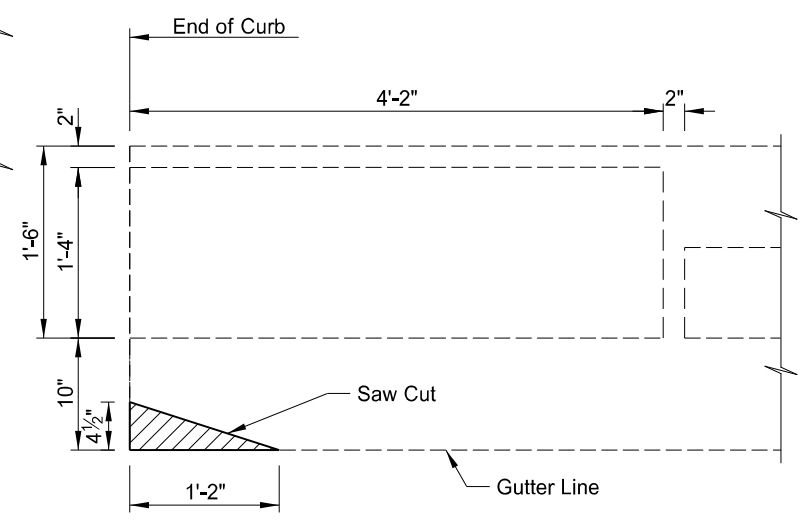
END POST MODIFICATION DETAILS
& REINFORCING BAR LIST

23 U.S.C. 407
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 28 |

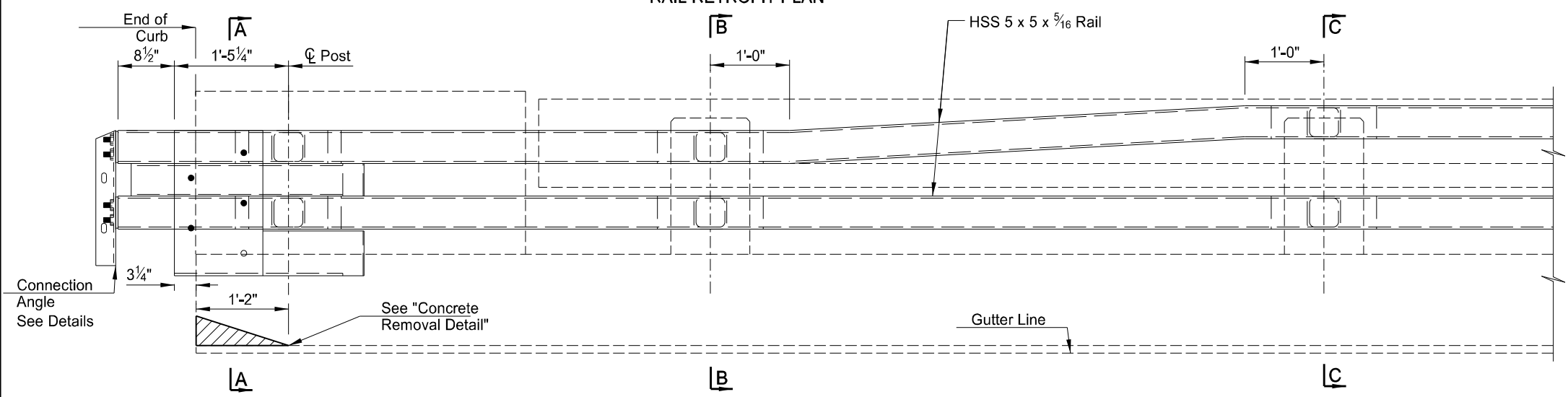


RAIL RETROFIT PLAN

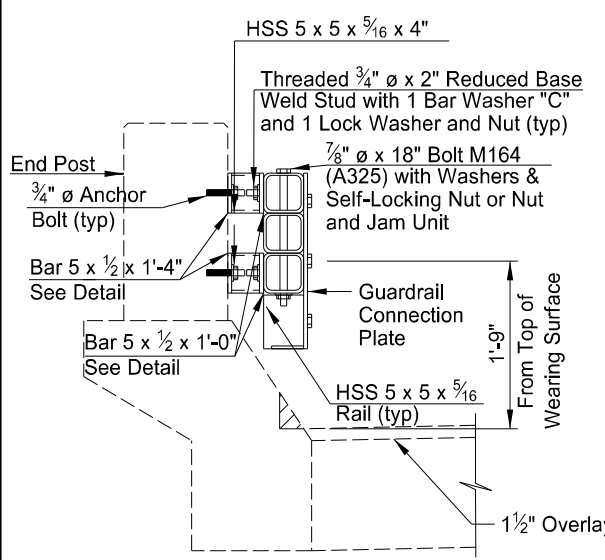


PLAN CONCRETE REMOVAL DETAIL

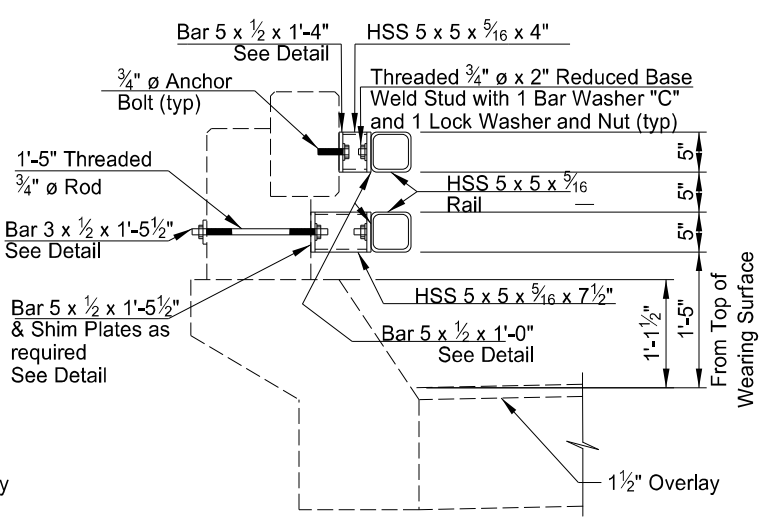
Indicates Concrete Removal



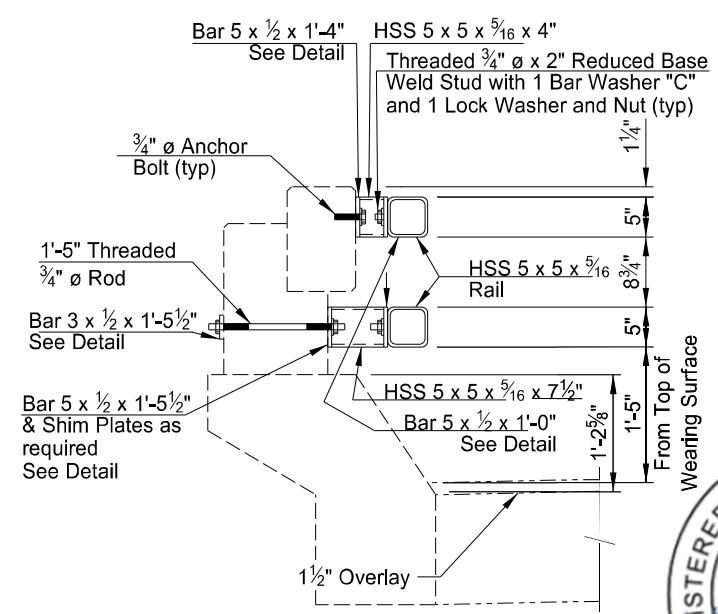
RAIL RETROFIT ELEVATION



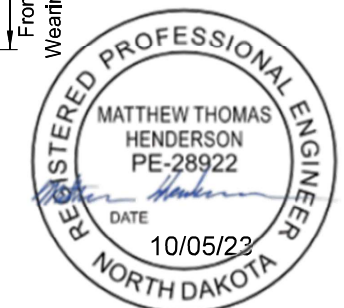
A-A



B-B



C-C



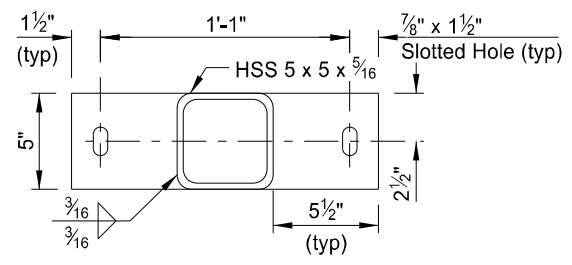
| QUANTITIES | |
|------------------------|--------|
| RAIL RETROFIT - E-RAIL | 154 LF |

SOUTH BRANCH HEART RIVER

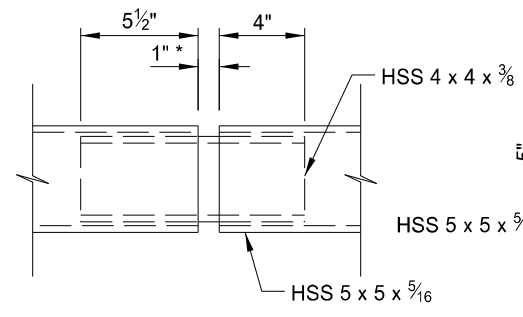
DOUBLE BOX BEAM
E-RAIL RETROFIT DETAILS 1 OF 2

23 U.S.C. 407
NDDOT Reserves All Objections

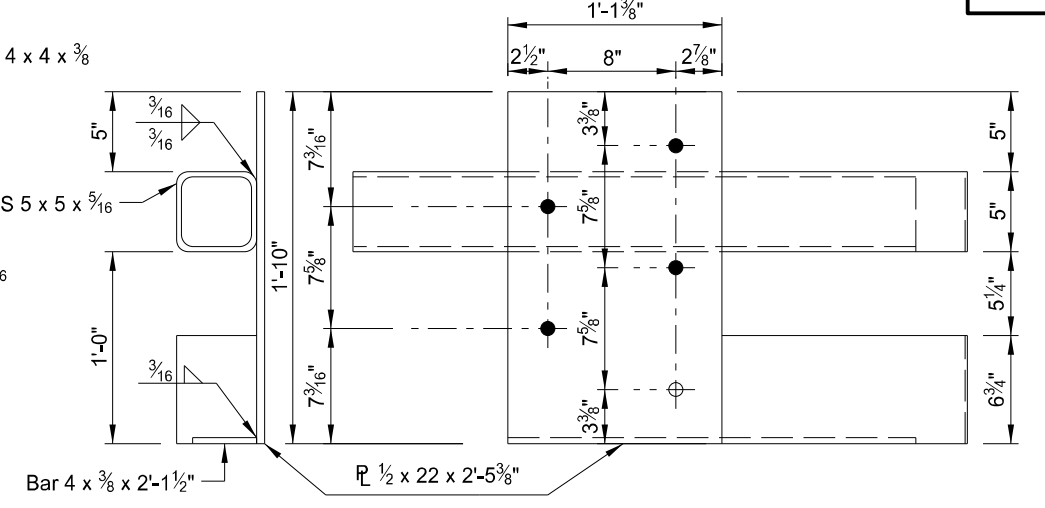
| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 29 |



(CONCRETE RAIL CONNECTION)
BAR 5 X 1/2 X 1'-4\"/>



* 2\"/>



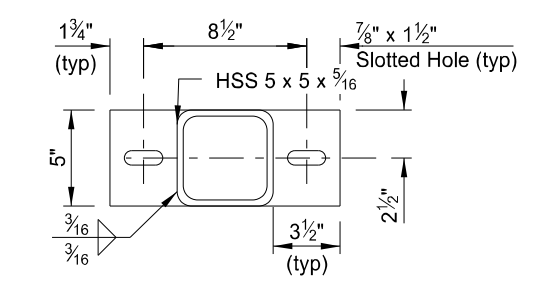
NOTES:
Galvanize all steel components after fabrication according to Section 854.

Provide reduced base studs in accordance with ASTM A108.

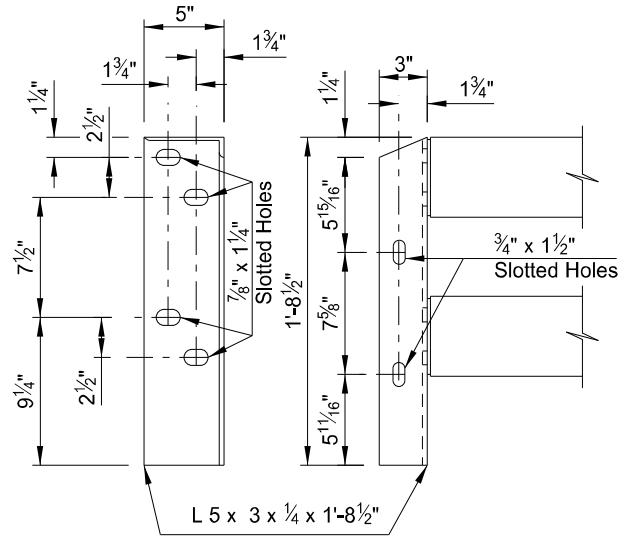
Tighten the threaded rods to provide a minimum tensile force of 2,500 lbs and a maximum tensile force of 2,700 lbs.

Embed anchor bolts into the concrete using a chemical adhesive system that can develop a tensile strength of at least 17,500 lbs.

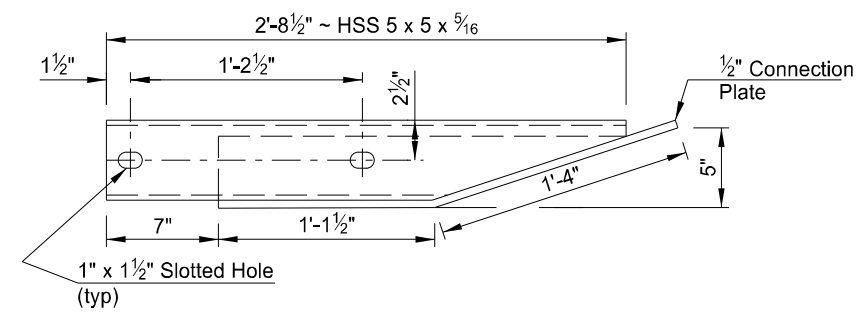
The filled circles indicate drilled and tapped holes for 7/8\"/>



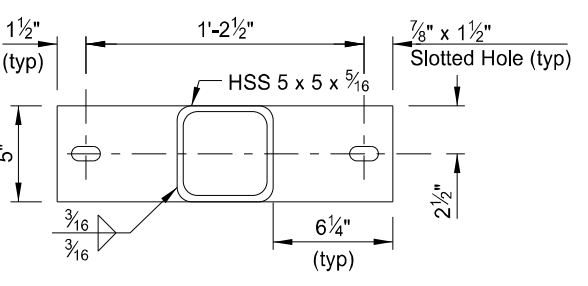
(RAIL CONNECTION)
BAR 5 X 1/2 X 1'-0\"/>



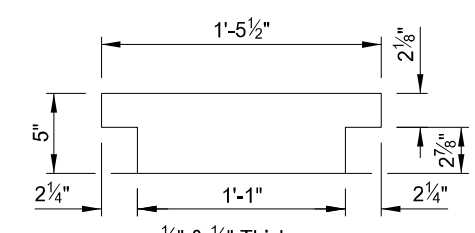
(4 REQUIRED)
CONNECTION ANGLE DETAILS



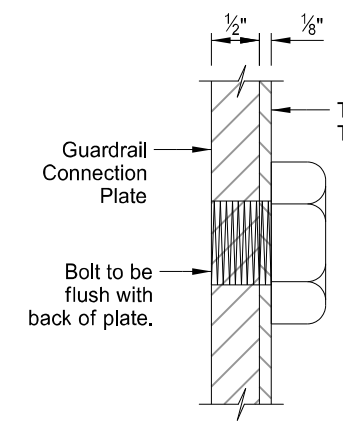
(4 REQUIRED)
GUARDRAIL CONNECTION ANGLE DETAILS



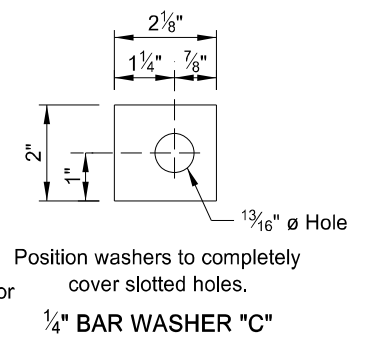
(CONCRETE POST CONNECTION)
BAR 5 X 1/2 X 1'-5 1/2\"/>



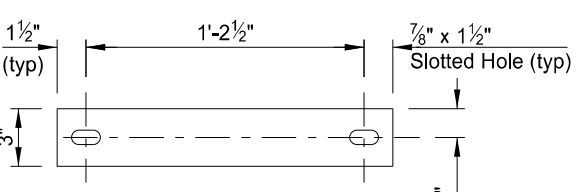
1/4\"/>



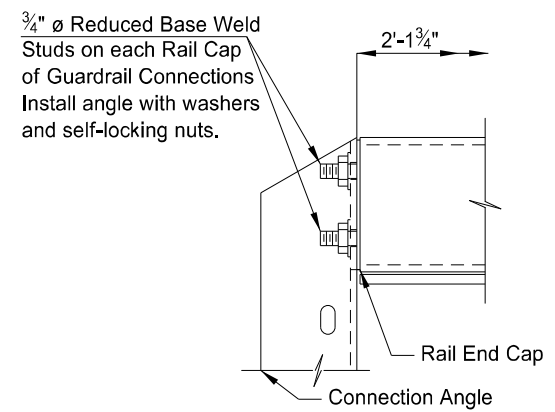
DETAIL "B"



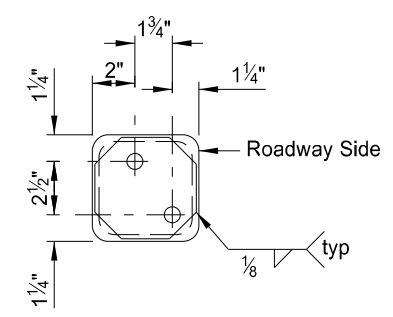
Position washers to completely cover slotted holes.
1/4\"/>



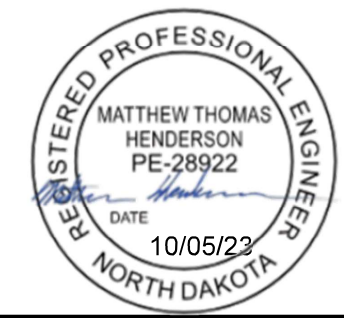
(CONCRETE POST CONNECTION)
BAR 3 X 1/2 X 1'-5 1/2\"/>



RAIL CAP DETAIL



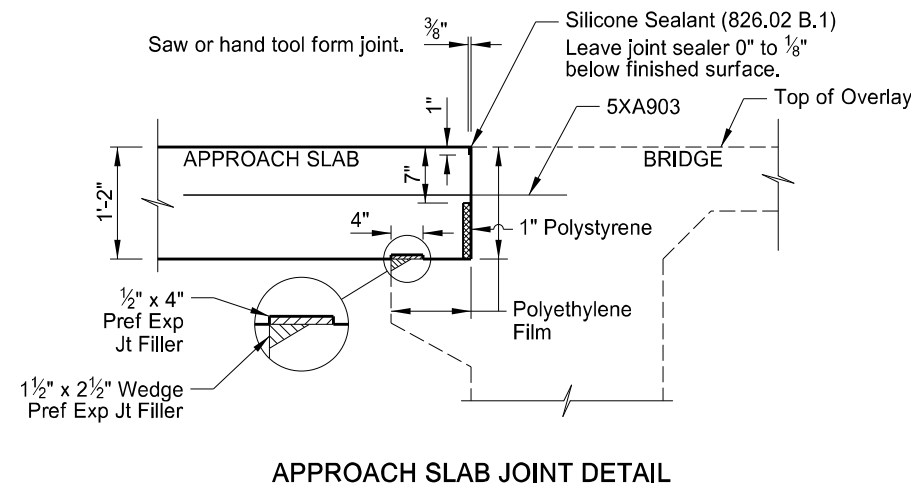
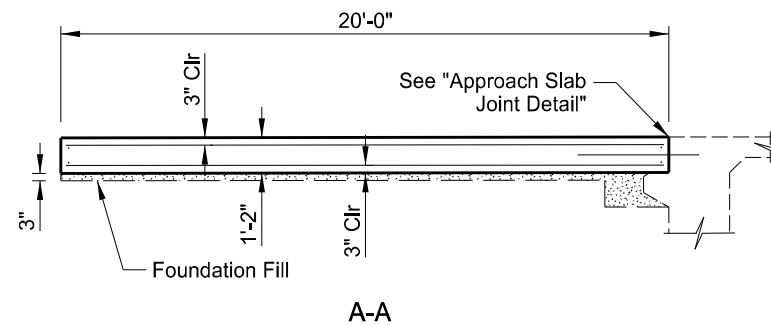
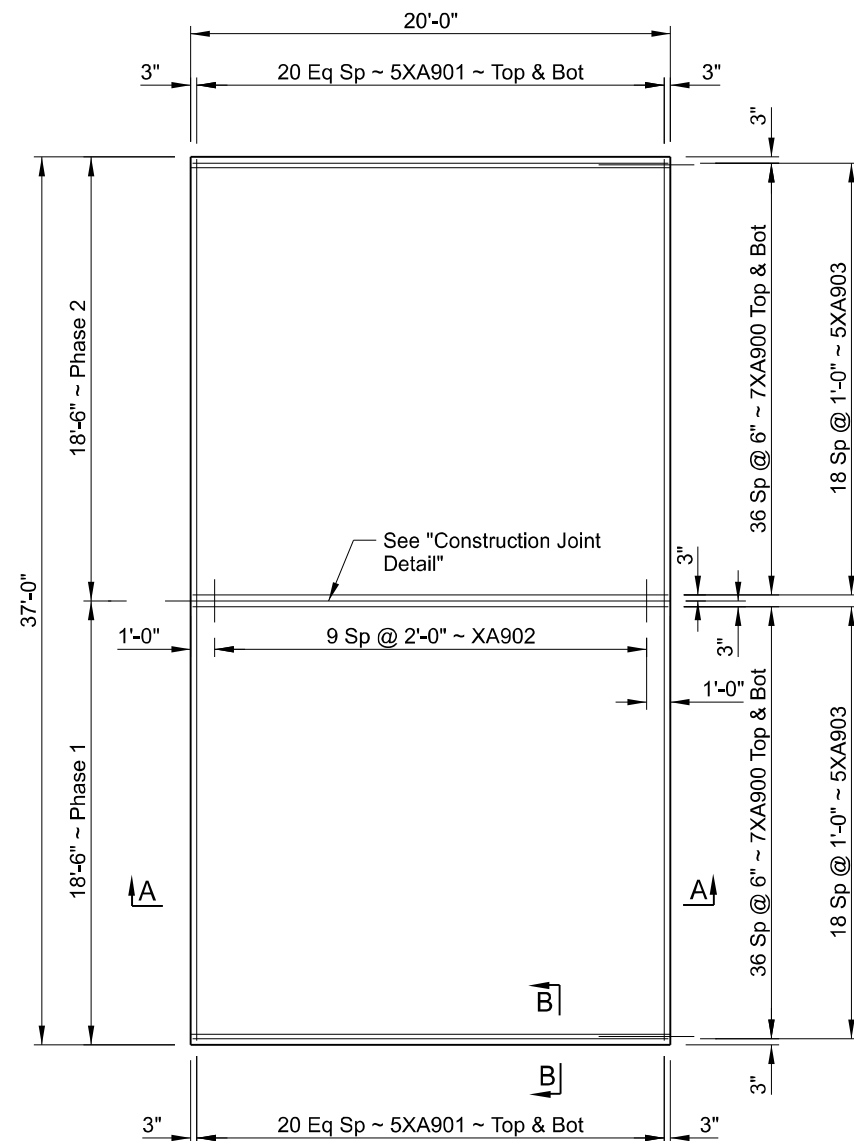
(Bar 4 3/4 x 1/2 x 4 3/4\"/>



| QUANTITIES | |
|---|------------------------|
| RAIL RETROFIT - E-RAIL | See Sheet 85-057.675-5 |
| SOUTH BRANCH HEART RIVER | |
| DOUBLE BOX BEAM E-RAIL RETROFIT DETAILS 2 OF 2 | |

23 U.S.C. 407
NDDOT Reserves All Objections

| | | | |
|-------|---------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | SS-5-999(029) | 170 | 30 |

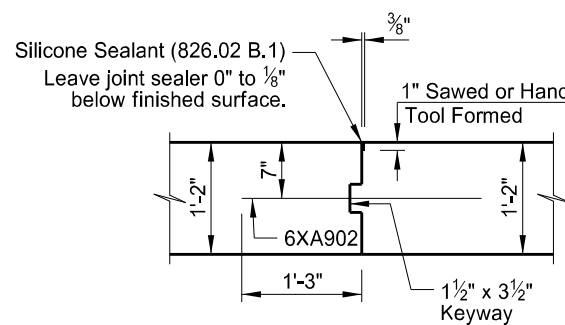
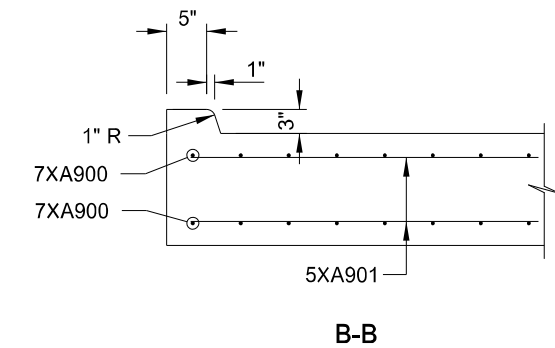


SKEW ANGLE = 0°

| BAR LIST - ONE SLAB | | | |
|---------------------|--------|-----|--------|
| SIZE | MARK | NO. | LENGTH |
| 7 | XA900 | 148 | 19'-8" |
| 5 | XA901 | 84 | 18'-2" |
| 6 | XA902 | 10 | 2'-6" |
| 5 | XA903* | 38 | 4'-0" |

| ESTIMATED MATERIAL QUANTITIES | |
|-------------------------------|---------------|
| REINFORCING STEEL (LBS) | CONCRETE (CY) |
| 7,737 | 32.1 |

* Length may increase, depending on manufacturer's recommendations for anchorage. Provide a minimum length of 1'-0".



CONSTRUCTION JOINT DETAIL

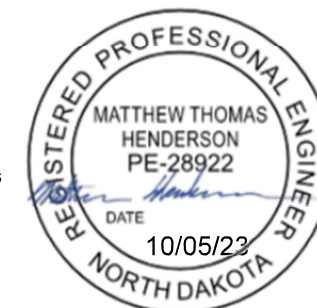
NOTES:

The estimated material quantities shown are for information purposes only. Include the concrete, reinforcing bars, polyethylene film, preformed joint filler, polystyrene, silicone sealant, foundation fill, and labor required to build the approach slabs and curbs in the pay item "Bridge Approach Slab - Remove and Replace." Use class AE-3 concrete and Grade 60 reinforcing steel. Provide reinforcing steel that meets the requirements of Section 612. Use polyethylene film that meets the requirements of ASTM C-171.

The dimensions shown in the "Bent Bar Details" are out to out.

Install 5XA903 bars according to manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage (16k min. ultimate pullout) and that meets the requirements of Section 806.02. Provide an anchorage depth of 1'-0", or the depth as recommended by the manufacturer to achieve desired capacity, whichever is greater.

An "X" preceding a bar designation indicates an epoxy coated bar.



| QUANTITIES | (ONE SLAB) |
|--------------------------|------------|
| APPROACH SLAB | 82 SY |
| SOUTH BRANCH HEART RIVER | |
| APPROACH SLAB DETAILS | |

NDDOT ABBREVIATIONS

D-101-1

? This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.

Abn abandoned
 Abut abutment
 Adj adjusted
 Aggr aggregate
 Ahd ahead
 ARV air release valve
 Align alignment
 Al alley
 Alt alternate
 Alum aluminum
 ADA Americans with Disabilities Act
 & and
 Appr approach
 Approx approximate
 ACP asbestos cement pipe
 Asph asphalt
 AC asphalt cement
 Assmd assumed
 @ at
 Atten attenuation
 ATR automatic traffic recorder
 Ave Avenue
 Avg average
 ADT average daily traffic

Bk back
 BF back face
 Balc balcony
 B Wire barbed wire
 Barr barricade
 Btry battery
 BI beehive inlet
 Beg begin
 BG below grade
 BM bench mark
 Bkwy bikeway
 Bit bituminous
 Blk block
 BH bore hole
 Bot bottom
 Blvd Boulevard
 Bndry boundary
 Brkwy breakaway
 Br bridge
 Bldg building
 Bus. business
 BV butterfly valve
 Byp bypass

C Gdrl cable guardrail
 Calc calculate
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 CL or C centerline
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 Comb. combination
 Coml commercial
 Compr compression
 CADD computer aided drafting & design
 Conc concrete
 CECB concrete erosion control blanket
 Cond conductor
 Const construction
 Cont continuous
 CSB continuous split barrel sample
 Contr contraction
 Contr contractor
 CP control point
 Coord coordinate
 Cor corner
 Corr corrected
 CAES corrugated aluminum end section
 CAP corrugated aluminum pipe
 CMES corrugated metal end section
 CMP corrugated metal pipe
 CPVCP corrugated poly-vinyl chloride pipe
 CSES corrugated steel end section
 CSFES corrugated steel flared end section
 CSP corrugated steel pipe
 CSTES corrugated steel traversable end section
 Co County
 Crse course
 Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd crossroad
 Crn crown

Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia or \emptyset diameter
 Dir direction
 Dist distance
 DM disturbed material
 DB ditch block
 DG ditch grade
 Dbl double
 Dn down
 Dwg drawing
 Dr drive
 Drwy driveway
 DI drop inlet
 D dry density

Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 Elec electric/al
 EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified
 ES end section
 Engr engineer
 ESS environmental sensor station
 Eq equal
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded

FOS factor of safety
 Fed Federal
 FP feed point
 Fn fence
 Fn P fence post
 FO fiber optic
 FD field drive
 F fill
 FAA fine aggregate angularity
 FH fire hydrant
 Fl flange
 Flrd flared
 FES flared end section
 F Bcn flashing beacon
 FA flight auger sample
 FL flow line
 Ftg footing
 FM force main
 Fnd found
 Fdn foundation
 Frac fractional
 Frwy freeway
 Frt front
 FF front face
 F Disp fuel dispenser
 FFP fuel filler pipes
 FLS fuel leak sensor
 Furn furnish/ed

| | |
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| 05-20-18 | General Revisions |
| 12-10-20 | General Revisions |
| 08-16-22 | General Revisions |



NDDOT ABBREVIATIONS

| | | | | | | | |
|--------|------------------------------|----------|--------------------------|-----------------|-------------------------------|----------|---|
| Galv | galvanized | Ln | lane | Obsc | obscure(d) | Qty | quantity |
| Gar | garage | Lg | large | Ocpd | occupied | Qtr | quarter |
| Gs L | gas line | Lat | latitude | Ocpy | occupy | | |
| G Reg | gas line regulator | Lt | left | O/s | offset | | |
| GMV | gas main valve | Lens | lenses | OC | on center | Rad or R | radius |
| G Mtr | gas meter | Lvl | level | C | one dimensional consolidation | RR | railroad |
| GSV | gas service valve | Lvng | leveling | OC | organic content | Rlwy | railway |
| GVP | gas vent pipe | Lht | light | Orig | original | Rsd | raised |
| GV | gate valve | LP | light pole | O To O | out to out | RC | rapid curing |
| Ga | gauge | Ltg | lighting | OD | outside diameter | Rec | record |
| Gov | government | Liq | liquid | OH | overhead | Recy | recycle |
| Grd | graded/grade | LL | liquid limit | | | RAP | recycled asphalt pavement |
| Grnd | ground | Loc | location | | | RPCC | recycled portland cement concrete |
| GWM | ground water monitor | Long. | longitude | PMT | pad mounted transformer | Ref | reference |
| Gdrl | guardrail | Lp | loop | Pg | pages | R Mkr | reference marker |
| Gtr | gutter | LD | loop detector | Pntd | painted | RM | reference monument |
| | | Lum | luminaire | Pr | pair | RP | reference point |
| | | | | Pnl | panel | Refl | reflectorized |
| H Plg | H piling | | | Pk | park | RCB | reinforced concrete box |
| Hdwl | headwall | Mb | mailbox | PSD | passing sight distance | RCES | reinforced concrete end section |
| Ht | height | ML | main line | Pvmt | pavement | RCFES | reinforced concrete flared end section |
| Hel | helical | MH | manhole | Ped | pedestal | RCP | reinforced concrete pipe |
| HDPE | high density polyethylene | Mkd | marked | Ped | pedestrian | RCPS | reinforced concrete pipe sewer |
| HM | high mast | Mkr | marker | PPP | pedestrian pushbutton post | RCTES | reinforced concrete traversable end section |
| HP | high pressure | Mkg | marking | Pen. | penetration | Reinf | reinforcement |
| HPS | high pressure sodium | MA | mast arm | Perf | perforated | Res | reservation |
| HTCG | high tension cable guardrail | Matl | material | Per. | perimeter | Res | residence |
| Hwy | highway | Max | maximum | Perm | permanent | Ret | retaining |
| Hor | horizontal | MC | meander corner | PL | pipeline | Rev | reverse |
| HBP | hot bituminous pavement | Meas | measure | PI | place | Rt | right |
| HMA | hot mix asphalt | Mdn | median | P&P | plan & profile | R/W | right of way |
| Hyd | hydrant | MD | median drain | PL | plastic limit | Riv | river |
| Ph | hydrogen ion content | MC | medium curing | Pl or \bar{P} | plate | Rd | road |
| | | MGS | Midwest Guardrail System | Pt | point | Rdbd | road bed |
| | | MM | mile marker | PE | polyethylene | Rdwy | roadway |
| Id | identification | MP | mile post | PVC | polyvinyl chloride | RWIS | roadway weather information system |
| Incl | inclinometer tube | Min | minimum | PCC | Portland Cement concrete | Rk | rock |
| IMH | inlet manhole | Misc | miscellaneous | PP | power pole | Rt | route |
| ID | inside diameter | Mon | monument | Preempt | preemption | | |
| Inst | instrument | Mnd | mound | Prefab | prefabricated | | |
| Intchg | interchange | Mtbl | mountable | Prfmd or Pref | performed | | |
| Intmdt | intermediate | Mtd | mounted | Prep | preparation | | |
| Intscn | intersection | Mtg | mounting | Press. | pressure | | |
| Inv | invert | Mk | muck | PRV | pressure relief valve | | |
| IP | iron pipe | | | Prestr | prestressed | | |
| | | | | Pvt | private | | |
| | | | | PD | private drive | | |
| Jt | joint | Neop | neoprene | Prod. | production/produce | | |
| Jct | junction | Ntwk | network | Prog | programmed | | |
| | | N | North | Prop. | property | | |
| | | NE | North East | Prop Ln | property line | | |
| | | NW | North West | Ppsd | proposed | | |
| | | NB | Northbound | PB | pull box | | |
| | | No. or # | number | | | | |

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| 08-16-22 | General Revisions |

08/16/22

NDDOT ABBREVIATIONS

D-101-3

| | | | |
|------------|----------------------------------|--------|------------------------------------|
| Salv | salvage(d) | Tel | telephone |
| San | sanitary sewer line | Tel B | Telephone Booth |
| Sec | section | Tel P | telephone pole |
| SL | section line | Tv | television |
| Sep | separation | Temp | temperature |
| Seq | sequence | Temp | temporary |
| Serv | service | TBM | temporary bench mark |
| Sht | sheet | T | thinwall tube sample |
| Shtng | sheeting | Ts | topsoil |
| Shldr | shoulder | Traf | traffic |
| Sw or Sdwk | sidewalk | TSCB | traffic signal control box |
| SD | sight distance | Tr | trail |
| SN | sign number | Transf | transformer |
| Sig | signal | Trans | transition |
| Sgl | single | TT | transmission tower |
| SRCP | slotted reinforced concrete pipe | TES | traversable end section |
| SC | slow curing | Trans | transverse |
| SS | slow setting | Trtd | treated |
| Sm | small | Trmt | treatment |
| S | South | Qc | triaxial compression |
| SE | South East | TERO | tribal employment rights ordinance |
| SW | South West | Tpl | triple |
| SB | Southbound | Typ | typical |
| Sp | spaces | | |
| Spcl | special | Qu | unconfined compressive strength |
| SA | special assembly | Ugrnd | underground |
| SP | special provisions | Util | utility |
| G | specific gravity | | |
| Spk | spike | VG | valley gutter |
| SB | split barrel sample | Vap | vapor |
| SH | sprinkler head | Vert | vertical |
| SV | sprinkler valve | VCP | vitrified clay pipe |
| Sq | square | Vol | volume |
| Stk | stake | VSFS | vehicle speed feedback sign |
| Std | standard | | |
| N | standard penetration test | Wkwy | walkway |
| Std Specs | standard specifications | W | water content |
| Stm L | steam line | WGV | water gate valve |
| SEC | steel encased concrete | WL | water line |
| SMA | stone matrix asphalt | WM | water main |
| SSD | stopping sight distance | WMV | water main valve |
| SD | storm drain | W Mtr | water meter |
| St | street | WSV | water service valve |
| SPP | structural plate pipe | WW | water well |
| SPPA | structural plate pipe arch | Wrng | wearing |
| Str | structure | WIM | weigh in motion |
| Subd | subdivision | W | west |
| Sub | subgrade | WB | westbound |
| Sub Prep | subgrade preparation | Wrng | wiring |
| Ss | subsoil | W/ | with |
| SS | supplement specification | W/o | without |
| Supp | supplemental | WC | witness corner |
| Surf | surfacing | | |
| Surv | survey | | |
| Sym | symmetrical | | |

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NDDOT ABBREVIATIONS

MEASUREMENTS

ac acres
 A ampere
 Bd Ft board feet
 Cd candela
 cm centimeter
 C coulomb
 CF cubic feet
 m3 cubic meter
 m3/s cubic meters per second
 CY cubic yard
 CY/mi cubic yards per mile
 D or Deg degree
 F Fahrenheit
 F farad
 ft feet/foot
 Gal gallon
 G giga
 Ha hectare
 H henry
 Hz hertz
 hr hour(s)
 in inch
 J joule
 K kelvin
 kN kilo newton
 kPa kilo pascal
 kg kilogram
 kg/m3 kilogram per cubic meter
 km kilometer
 K Kip(s)
 LF linear foot
 L litre
 Lm lumen
 L sum lump sum
 Lx lux
 M Hr man hour
 M mega
 m meter
 m/s meters per second
 mi mile
 mL milliliter
 mm millimeter
 mm/hr millimeters per hour
 n nano
 N newton
 Pa pascal
 lb pounds
 sec seconds
 S siemens
 SF square feet
 km2 square kilometer
 m2 square meter
 SY square yard
 Sta Yd station yards
 SI Systems International

T tesla
 T/mi tons per mile
 V volt
 W watt
 Wb weber

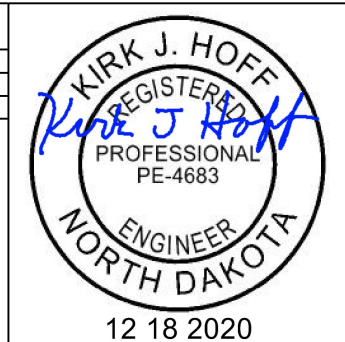
SURVEY DESCRIPTIONS

Az azimuth
 Bs backsight
 Brg bearing
 BP Cap blue plastic cap
 BS both sides
 BC brass cap
 CS curve to spiral
 Eq equation
 E external of curve
 FS far side
 FB field book
 Fs foresight
 Geod geodetic
 GIS Geographical Information System
 GPS Global Positioning System
 HI height of instrument
 IM iron monument
 I Pn iron pin
 LS Land Surveyor (licensed)
 LSIT Land Surveyor In Training
 L length of curve
 LC long chord
 LB level book
 Mer meridian
 M mid ordinate of curve
 NGS National Geodetic Survey
 NS near side
 Obsn observation
 Off Loc office location
 OP Cap orange plastic cap
 PK Parker-Kalon nail
 P Cap plastic cap
 PP Cap pink plastic cap
 PCC point of compound curve
 PC point of curve
 PI point of intersection
 PRC point of reverse curvature
 PT point of tangent
 POC point on curve
 POT point on tangent
 RTP random traverse point
 Rge range
 RP Cap red plastic cap
 SC spiral to curve
 ST spiral to tangent
 Sta station
 SE superelevation
 Tan tangent
 T tangent (semi)
 TS tangent to spiral
 Twp township
 TB transit book
 TP traverse point
 TP turning point
 USC&G US Coast & Geodetic Survey
 USGS US Geologic Survey
 VC vertical curve
 WGS World Geodetic System
 YP Cap yellow plastic cap
 Z zenith

SOIL TYPES

Cl clay
 Cl F clay fill
 Cl Hvy clay heavy
 Cl Lm clay loam
 Co S coal slack
 C Gr coarse gravel
 CS coarse sand
 FS fine sand
 Gr gravel
 Lig Co lignite coal
 Lig Sl lignite slack
 Lm loam
 Rk rock
 Sd sand
 Sdy Cl sandy clay
 Sdy Cl Lm sandy clay loam
 Sdy Fl sandy fill
 Sdy Lm sandy loam
 Sc scoria
 Sh shale
 Si Cl silt clay
 Si Cl Lm silty clay loam
 Si Lm silty loam

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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

| | | | | | |
|--------------------|---|--------------------|---|--------------------|---|
| 702COM | 702 Communications | GT PLNS NAT GAS | Great Plains Natural Gas Company | RED RIV COMM | Red River Rural Communications |
| ACCENT | Accent Communications | HALS TEL | Halstad Telephone Company | RESVTN TEL | Reservation Telephone |
| AGASSIZ WU | Agassiz Water Users Incorporated | IDEA1 | Idea1 | ROBRTS TEL | Roberts Company Telephone |
| AGC | Associated General Contractors of America | INT-COMM TEL | Inter-Community Telephone Company | R-RIDER ELEC | Roughrider Electric Cooperative |
| ALL PL | Alliance Pipeline | KANEB PL | Kaneb Pipeline Company | RRVW | Red River Valley & Western Railroad |
| ALL SEAS WU | All Seasons Water Users Association | KEM ELEC | Kem Electric Cooperative Incorporated | S CENT REG WD | South Central Regional Water District |
| AMOCO PI | Amoco Pipeline Company | KOCH GATH SYS | Koch Gathering Systems Incorporated | S E W U | South East Water Users Incorporated |
| AMRDA HESS | Amerada Hess Corporation | LKHD PL | Lakehead Pipeline Company | SCOTT CABLE | Scott Cable Television Dickinson |
| AT&T | AT&T Corporation | LNGDN RWU | Langdon Rural Water Users Incorporated | SHERDN ELEC | Sheridan Electric Cooperative |
| B PAW | Bear Paw Energy Incorporated | LWR YELL R ELEC | Lower Yellowstone Rural Electric | SHEYN VLY ELEC | Sheyenne Valley Electric Cooperative |
| BAKER ELEC | Baker Electric | MCKNZ CON | McKenzie Consolidated Telcom | SKYTECH | Skyland Technologies Incorporated |
| BASIN ELEC | Basin Electric Cooperative Incorporated | MCKNZ ELEC | McKenzie Electric Cooperative | SLOPE ELEC | Slope Electric Cooperative Incorporated |
| BEK TEL | Bek Communications Cooperative | MCKNZ WRD | McKenzie County Water Resource District | SOURIS RIV TELCOM | Souris River Telecommunications |
| BELLE PL | Belle Fourche Pipeline Company | MCLEOD | McLeod USA | ST WAT COMM | State Water Commission |
| BLM | Bureau of Land Management | MCLN ELEC | McLean Electric Cooperative | STATE LN WATER | State Line Water Cooperative |
| BNSF | Burlington Northern Santa Fe Railway | MCLN-SHRDN R WAT | McLean-Sheridan Rural Water | STER ENG | Sterling Energy |
| BOEING | Boeing | MDU | Montana-dakota Utilities | STUT RWU | Stutsman Rural Water Users |
| BRNS RWD | Barnes Rural Water District | MIDCO | MidContinent Communications | SW PL PRJ | Southwest Pipeline Project |
| BURK-DIV ELEC | Burke-Divide Electric Cooperative | MIDSTATE TEL | Midstate Telephone Company | T M C | Turtle Mountain Communications |
| BURL WU | Burleigh Water Users | MINOT CABLE | Minot Cable Television | TCI | TCI of North Dakota |
| CABLE ONE | Cable One | MINOT TEL | Minot Telephone Company | TESORO GHG PLNS PL | Tesoro High Plains Pipeline |
| CABLE SERV | Cable Services | MISS VALL COMM | Missouri Valley Communications | TRI-CNTY WU | Tri-County Water Users Incorporated |
| CAP ELEC | Capital Electric Cooperative Incorporat | MISS W W S | Missouri West Water System | TRL CO RWU | Traill County Rural Water Users |
| CASS CO ELEC | Cass County Electric Cooperative | MNKOTA PWR | Minnkota Power | UNTD TEL | United Telephone |
| CASS RWU | Cass Rural Water Users Incorporated | MOR-GRAN-SOU ELEC | Mor-gran-sou Electric Cooperative | UPPR SOUR WUA | Upper Souris Water Users Association |
| CAV ELEC | Cavalier Rural Electric Cooperative | MOUNT-WILLI ELEC | Mountrail-williams Electric Cooperative | US SPRINT | U.S. Sprint |
| CBLCOM | Cablecom Of Fargo | MRE LBTY TEL | Moore & Liberty Telephone | USAF MSL CABLE | U.S.A.F. Missile Cable |
| CENEX PL | Cenex Pipeline | MUNICIPAL | City Water And Sewer | USFWS | US Fish and Wildlife Service |
| CENT PL WATER DIST | Central Pipe Line Water District | MUNICIPAL | City Of '.....' | USW COMM | U.S. West Communications |
| CENT PWR ELEC | Central Power Electric Cooperative | N CENT ELEC | North Central Electric Cooperative | VRNDRY ELEC | Verendrye Electric Cooperative |
| CENTURYLINK | CenturyLink | N VALL W DIST | North Valley Water District | W RIV TEL | West River Telephone Incorporated |
| COE | Corps of Engineers | ND PKS & REC | North Dakota Parks And Recreation | WAPA | Western Area Power Administration |
| CONS TEL | Consolidated Telephone | ND TEL | North Dakota Telephone Company | WAWSA | Western Area Water Supply Authority |
| CONT RES | Continental Resource Inc | NDDOT | North Dakota Department of Transportation | WEB | W. E. B. Water Development Association |
| CPR | Canadian Pacific Railway | NDSU SOIL SCI DEPT | NDSU Soil Science Department | WILLI RWA | Williams Rural Water Association |
| D O E | Department Of Energy | NEMONT TEL | Nemont Telephone | WILSTN BAS PL | Williston Basin Interstate Pipeline Company |
| DAK CARR | Dakota Carrier Network | NODAK R ELEC | Nodak Rural Electric Cooperative | WLSH RWD | Walsh Water Rural Water District |
| DAK CENT TEL | Dakota Central Telephone | NOON FRMS TEL | Noonan Farmers Telephone Company | WOLVRTN TEL | Wolverton Telephone |
| DAK RWD | Dakota Rural Water District | NPR | Northern Plains Railroad | XLENER | Xcel Energy |
| DGC | Dakota Gasification Company | NSP | Northern States Power | YSVR | Yellowstone Valley Railroad |
| DICKEY R NET | Dickey Rural Networks | NTH PRAIR RW | Northern Prairie Rural Water Association | | |
| DICKEY RWU | Dickey Rural Water Users Association | NTHN BRDR PL | Northern Border Pipeline | | |
| DICKEY TEL | Dickey Telephone | NTHN PLNS ELEC | Northern Plains Electric Cooperative Incorporated | | |
| DNRR | Dakota Northern Railroad | NTHWSTRN REF | Northwestern Refinery Company | | |
| DOME PL | Dome Pipeline Company | NW COMM | Northwest Communication Cooperation | | |
| DVELEC | Dakota Valley Electric Cooperative | NWRWD | Northwest Rural Water District | | |
| DVMW | Dakota, Missouri Valley & Western | ONEOK | Oneok gas | | |
| ENBRDG | Enbridge Pipelines Incorporated | OSHA | Occupational Safety and Health Administration | | |
| ENVENTIS | Enventis Telephone | OTTR TL PWR | Otter Tail Power Company | | |
| EQUINOR | Equinor Pipeline | PAAP | Plains All American Pipeline | | |
| FALK MNG | Falkirk Mining Company | P L E M | Prairielands Energy Marketing | | |
| FHWA | Federal Highway Administration | POLAR COM | Polar Communications | | |
| G FKS-TRL WD | Grand Forks-traill Water District | PVT ELEC | Private Electric | | |
| GETTY TRD & TRAN | Getty Trading & Transportation | QWEST | Qwest Communications | | |
| GLDN W ELEC | Golden West Electric Cooperative | R&T W SUPPLY | R & T Water Supply Association | | |
| GRGS CO TEL | Griggs County Telephone | | | | |
| GTR RAMSEY WD | Greater Ramsey Water District | | | | |

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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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LINE STYLES

D-101-20

Existing Topography

- Void - Void - Void - V Existing Ground Void
- Existing Cemetary Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Riprap
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Railroad
- Existing Field Line
- Exst Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter

- Existing 3-Cable w Posts
- Site Boundary
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Existing Tree Boundary
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Existing W-Beam Guardrail with Posts
- Existing Railroad Switch
- Gravel Pit - Borrow Area
- Existing Wet Area-Vegetation Break
- Existing High Tension Cable Guardrail
- Existing High Tension Cable Guardrail with Posts

Proposed Topography

- 3-Cable w Posts
- Flow
- Fence
- Remove Line
- Wall
- Retaining Wall (Plan View)
- W-Beam w Posts
- High Tension Cable Guardrail with Posts

Existing Utilities

- Existing Electrical
- Existing Fiber Optic Line
- Existing TV Fiber Optic
- Existing Gas Pipe
- Existing Overhead Utility Line
- Existing Power
- Existing Fuel Pipeline
- Existing Undefined Above Ground Pipe Line
- Existing Sanitary Sewer
- Existing Sanitary Force Main
- Existing Storm Drain
- Existing Storm Drain Force Main
- Existing Culvert
- Existing Telephone Line
- Existing TV Line
- Existing Water or Steam Line
- Existing Under Drain
- Existing Slotted Drain
- Existing Conduit
- Existing Conductor
- Existing Down Guy Wire Down Guy
- Existing Underground Vault or Lift Station

Proposed Utilities

- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain

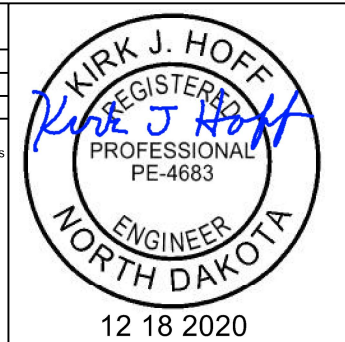
Traffic Utilities

- Conductor
- Fiber Optic
- Existing Loop Detector
- Existing Double Micro Loop Detector
- Micro Loop Detector Double
- Existing Micro Loop Detector
- Micro Loop Detector
- Signal Head with Mast Arm
- Existing Signal Head with Mast Arm

Sign Structures

- Existing Overhead Sign Structure
- Existing Overhead Sign Structure Cantilever
- Overhead Sign Structure Cantilever

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|---|
| 07-01-14 REVISIONS | |
| DATE | CHANGE |
| 09-23-16 | Added and Revised Items, Organized by Functional Groups General Revisions |
| 12-18-20 | |



LINE STYLES

D-101-21

Right Of Way

- Easement
- Existing Easement
- Right of Way
- Existing Right of Way
- Existing Right of Way Railroad
- Existing Right of Way Not State Owned
- Existing Government Lot Line
- Existing Adjacent Block Lines
- Existing Adjacent Lot Lines
- Existing Adjacent Property Line
- Existing Adjacent Subdivision Lines
- Sight Distance Triangle Line
- Dimension Leader

Boundary Control

- ////// Existing City Corporate Limits or Reservation Boundary
- Existing State or International Line
- Existing Township
- Existing County
- Existing Section Line
- Existing Quarter Section Line
- Existing Sixteenth Section Line
- Existing Centerline
- Tangent Line

Cross Sections and Typical

- Existing Ground
- Existing Topsoil (Cross Section View)
- void - void - void - v Existing Ground Void (Not Surveyed)
- Existing Concrete
- Existing Aggregate (Cross Section View)
- Existing Curb and Gutter (Cross Section View)
- Existing Asphalt (Cross Section View)
- Existing Reinforcement Rebar

Geotechnical

- D ----- D ----- Geotextile Fabric Type D
- **Geo** ----- **Geo** ----- Geogrid
- R ----- R ----- Geotextile Fabric Type R
- R ----- R ----- Geotextile Fabric Type R1
- RR ----- RR ----- Geotextile Fabric Type RR
- S ----- S ----- Geotextile Fabric Type S

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

- Centerline Pavement Marking
- ===== Barrier with Centerline Pavement Marking
- ===== Barrier Pavement Marking
- - - - - Stripe 4 IN Dotted Extension White
- - - - - Stripe 8 IN Dotted Extension White
- - - - - Stripe 8 IN Lane Drop

Pavement Joints

- ===== Doweled Joint
- +++++ Tie Bar 30 Inch 4 Foot Center to Center
- +++++ Tie Bar 18 Inch 3 Foot Center to Center
- +++++ Tie Bar at Random Spacing

Bridge Details

- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Existing Conditions Object
- Centerline Main
- Centerline Secondary
- Excavation Limits
- Proposed Ground
- Sheet Piling

Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- s ----- s ----- Floating Silt Curtain
- SF ----- SF ----- Silt Fence
- Excavation Limits
- Fiber Rolls

Environmental

- Wetland Mitigation
- Existing Wetland Easement USFWS
- Existing Wetland Jurisdictional
- Existing Wetland
- Tree Row

| | |
|--|---|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 07-01-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 09-23-16 | Added and Revised Items, Organized by Functional Groups General Revisions |
| 12-18-20 | |



SYMBOLS



North Arrow (Half Scale)



Alignment Data Point



Alignment Monument



Spot Elevation



Existing Miscellaneous Spot



Existing Access Control Arrow



Existing Benchmark



Reset USGS Marker



Iron Monument Found



Iron Pin R/W Monument



Property Corner



Iron Pin Reference Monument



Right of Way Marker (Exst, Ppsd, Reset)



Existing Federal Reference Corner



Existing Section Corner (Full, Quarter, Sixteenth, Meander)



Existing Witness Corner



Existing Control Point (CP, GPS-RTK, TRI)



Existing Traverse PI Aerial Panel



Existing Reference Marker Point NGS



Existing EFB Misc



Existing Bush or Shrub



Existing Large Evergreen Tree



Existing Small Evergreen Tree



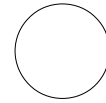
Existing Large Tree



Existing Small Tree



Existing Tree Trunk



Cairn or Stone Circle



Existing Artifact



Existing Satellite Dish



Existing Weather Station



Existing Windmill or Tower



Reinforced Pavement



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Standard Penetration Test



Inclinometer Tube



Excavation Unit



















































































Existing Ground Water Well Bore Hole

| | |
|--|-------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 07-01-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-18-20 | General Revisions |

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 REGISTERED
 PROFESSIONAL
 PE-4683
 ENGINEER
 NORTH DAKOTA
 12 18 2020

SYMBOLS

D-101-32

| | | |
|---|---|--|
|  Existing Luminaire  Luminaire LED  Existing Light Standard Luminaire  Relocate Light Standard  Light Standard Light LED Luminaire  Light Standard 35 Watt High Pressure Sodium Vapor Luminaire  Light Standard 50 Watt High Pressure Sodium Vapor Luminaire  Light Standard 70 Watt High Pressure Sodium Vapor Luminaire  Light Standard 100 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 Watt High Pressure Sodium Vapor Luminaire  Light Standard 200 Watt High Pressure Sodium Vapor Luminaire  Light Standard 250 Watt High Pressure Sodium Vapor Luminaire  Light Standard 310 Watt High Pressure Sodium Vapor Luminaire  Light Standard 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Emergency Vehicle Detector  Video Detection Camera |   High Mast Light Standard 3 Luminaire (Exst, Ppsd)   High Mast Light Standard 4 Luminaire (Exst, Ppsd)   High Mast Light Standard 5 Luminaire (Exst, Ppsd)   High Mast Light Standard 6 Luminaire (Exst, Ppsd)   High Mast Light Standard 7 Luminaire (Exst, Ppsd)   High Mast Light Standard 8 Luminaire (Exst, Ppsd)   High Mast Light Standard 9 Luminaire (Exst, Ppsd)   High Mast Light Standard 10 Luminaire (Exst, Ppsd)   Overhead Sign Structure Load Center (Exst, Ppsd)   Traffic Signal Controller (Exst, Ppsd)   Pad Mounted Traffic Signal Controller (Exst, Ppsd)   Flashing Beacon (Exst, Ppsd)   Concrete Foundation (Exst, Ppsd)   Pipe Mounted Flasher (Exst, Ppsd)   Pad Mounted Feed Point (Exst, Ppsd)   Pipe Mounted Feed Point with Pad (Exst, Ppsd)   Pole Mounted Feed Point (Exst, Ppsd)   Junction Box (Exst, Ppsd)  Existing Pedestrian Head with Number  Existing Signal Head  Pole Mounted Head  Existing Lighting Standard Pole |  Existing Traffic Signal Standard    Pull Box (Exst-Ppsd-Undefined)   Intelligent Transportation Pull Box (Exst, Ppsd)   Transformer (Exst, Ppsd)    Power Pole (Exst-Ppsd-with Transformer)   Wood Pole (Exst, Ppsd)   Pedestrian Push Button Post (Exst, Ppsd)  Existing Pole  Existing Telephone Pole  Existing Post     Connection Conductor (Ground, Neutral, Phase 1, Phase 2) |
|---|---|--|

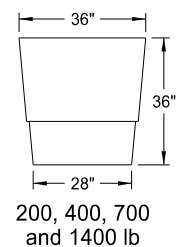
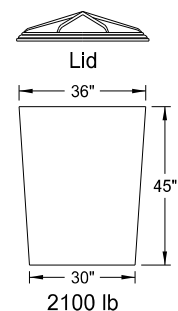
| | |
|--|-------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 07-01-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-18-20 | General Revisions |



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12 18 2020

ATTENUATION DEVICE



Outer Containers



200 lb

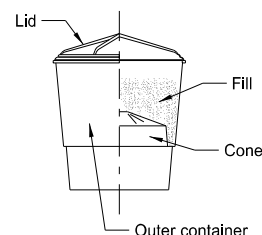


400 lb

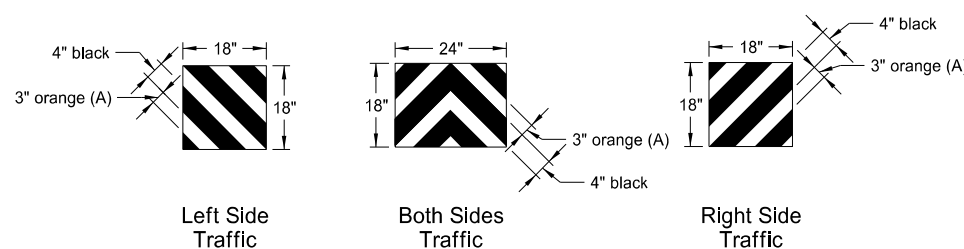


700 lb

Typical Module Construction Detail



Typical Assembly

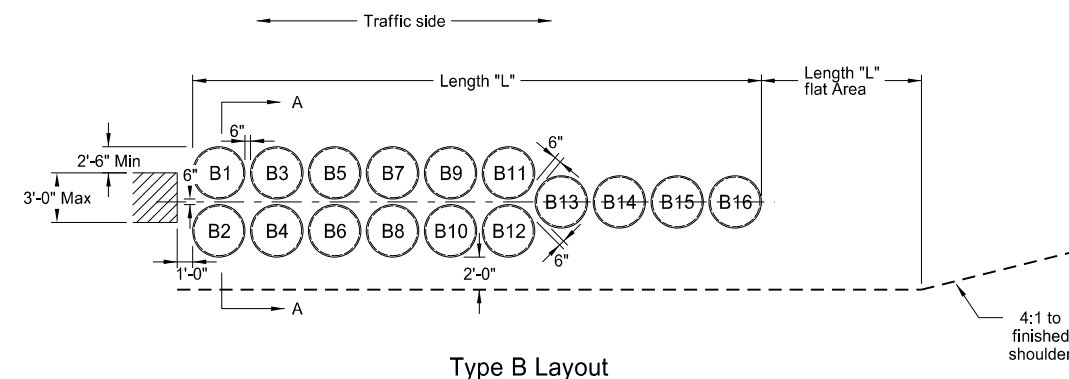


Reflective Sheet Detail

Note:
Apply Type IV reflective sheeting (as specified in the NDDOT Standard Specifications) directly to the outer container of the last attenuation device facing traffic, following the details above. Or apply the sheet to a metallic sheet and attach it to the container with approved fasteners.

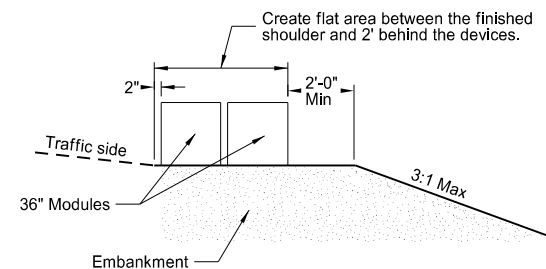
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

| | Fill Chart | | | | |
|------------------------|----------------------|----|----|----|----|
| | Module Weights (LBS) | | | | |
| Distance from top edge | 8 1/2" | 5" | 4" | 3" | 0" |



Type B Layout

Note:
Angle attenuation devices 10 degrees towards traffic when placed at piers offset from roadway.



Section A-A (Type B Layout)

| Type B Attenuation Device | | | | | | | | | | | | |
|---------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| Module Number | Dash Number | | | | | | | | | | | |
| | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | |
| Module Weights (LBS) | | | | | | | | | | | | |
| B1 | 2100 | | | | | | | | | | | |
| B2 | 2100 | | | | | | | | | | | |
| B3 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | | | |
| B4 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | 2100 | | | |
| B5 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | |
| B6 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | |
| B7 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | |
| B8 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | |
| B9 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | |
| B10 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | |
| B11 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | |
| B12 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | |
| B13 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | 700 | |
| B14 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| B15 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| B16 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | |
| Length (L) | 34.2' | 30.7' | 30.7' | 30.7' | 30.7' | 30.7' | 30.7' | 30.7' | 30.7' | 27.2' | 27.2' | |
| Module Weights (LBS) | Replacement Module | | | | | | | | | | | |
| | 2100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 1400 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 700 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| | 400 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 200 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | |

Notes:

- Materials
 - Use modules manufactured from frangible polyethylene material which shatters upon impact.
 - Fill modules with class 43 aggregate meeting NDDOT Standard Specifications aggregate requirements. Use fill with a unit weight of at least 100 pounds per cubic foot. Use fill with a moisture content of 2% or less when left over winter.
- Modules

Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.

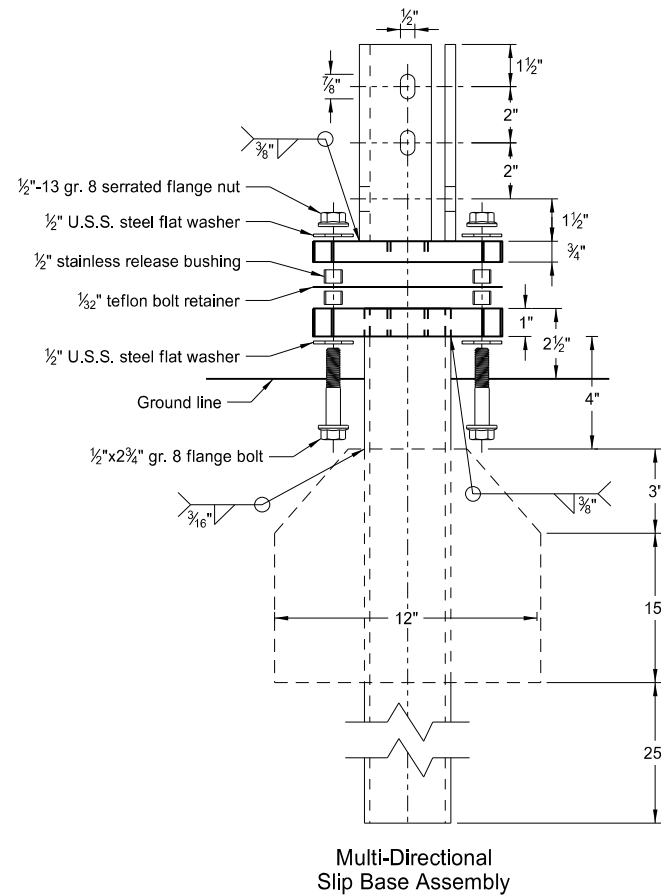
 - Provide three components for 2, 4, or 7 cubic foot module containers:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - A variable cone-shaped supporting insert capable of supporting 200, 400, or 700 pounds of sand mass to allow for three sizes of modules. Place cone inserts inside the 14 cubic foot container.
 - Provide two components for the 14 cubic foot module container:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - Provide two components for the 21 cubic foot module container:
 - A 36" height X 36" width yellow outer container.
 - A black lid which locks securely over the top of the container.
- For temporary installations use Energite or Fitch attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal modules. As an option, place attenuation devices on 3 1/2" maximum thickness pallets to facilitate maintenance.
- For permanent installations use Barrel Attenuation Device consisting of one-piece outer sand container modules with separate detachable lid. Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal meet these requirements.
- The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. Provide any required layouts and details from other sand filled attenuation module manufacturers which differ from those shown here.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 9-25-12 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-18-14 | Revised sheeting in reflective sheet detail |
| 9-27-17 | Update to active voice |
| 10-03-19 | New Design Engr PE Stamp |

This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 10/03/19 and the original document is stored at the
 North Dakota Department
 of Transportation

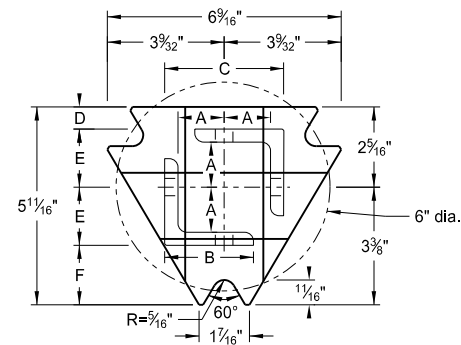
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

Perforated Tube



Multi-Directional Slip Base Assembly

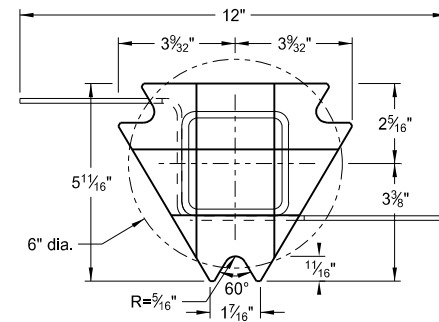
Traffic Flow



Top Post Receiver

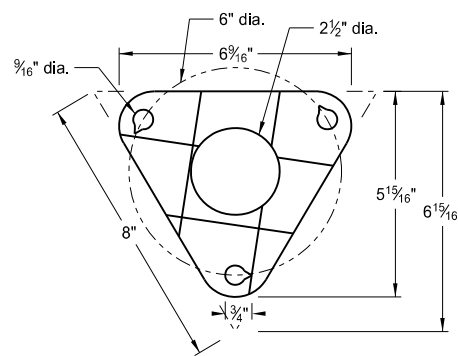
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

Traffic Flow



Bottom Soil Stub

Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50



Bolt Retainer for Base Connection
Bolt Retainer- 1/2" Reprocessed Teflon

Notes:

1. Torque slip base bolts as specified by manufacturer.
2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
4. In concrete sidewalk, use same anchor without wings.
5. Provide more than 7' between the first and fourth posts of a four post sign.

Telescoping Perforated Tube

| Number of Posts | Post Size in. | Wall Thickness Gauge | Sleeve Size in. | Wall Thickness Gauge | Slip Base | Anchor Size without Slip Base in. |
|-----------------|---------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|
| 1 | 2 | 12 | | | No | 2 1/4 |
| 1 | 2 1/4 | 12 | | | No | 2 1/2 |
| 1 | 2 1/2 | 12 | | | (A) | 3 |
| 1 | 2 1/2 | 10 | | | Yes | |
| 1 | 2 1/2 | 12 | 2 | 12 | Yes | |
| 1 | 2 1/2 | 12 | 2 1/4 | 12 | Yes | |
| 2 | 2 | 12 | | | No | 2 1/4 |
| 2 | 2 1/4 | 12 | | | No | 2 1/2 |
| 2 | 2 1/2 | 12 | | | Yes | |
| 2 | 2 1/2 | 12 | | | Yes | |
| 2 | 2 1/4 | 10 | 2 | 12 | Yes | |
| 2 | 2 1/2 | 12 | 2 1/4 | 12 | Yes | |
| 3 & 4 | 2 1/2 | 12 | | | Yes | |
| 3 & 4 | 2 1/2 | 10 | | | Yes | |
| 3 & 4 | 2 1/2 | 12 | 2 1/4 | 12 | Yes | |
| 3 & 4 | 2 1/4 | 12 | 2 | 12 | Yes | |
| 3 & 4 | 2 1/2 | 10 | 2 3/16 | 10 | Yes | |

Properties of Telescoping Perforated Tube

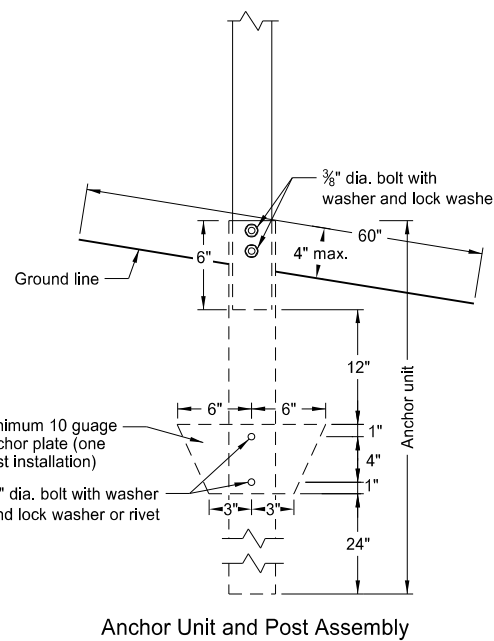
| Tube Size in. | Wall Thickness in. | U.S. Standard Gauge | Weight per Foot lbs. | Moment of Inertia in. ⁴ | Cross Sec. Area in. ² | Section Modulus in. ³ |
|-----------------|--------------------|---------------------|----------------------|------------------------------------|----------------------------------|----------------------------------|
| 1 1/2 x 1 1/2 | 0.105 | 12 | 1.702 | 0.129 | 0.380 | 0.172 |
| 2 x 2 | 0.105 | 12 | 2.416 | 0.372 | 0.590 | 0.372 |
| 2 1/4 x 2 1/4 | 0.105 | 12 | 2.773 | 0.561 | 0.695 | 0.499 |
| 2 3/16 x 2 3/16 | 0.135 | 10 | 3.432 | 0.605 | 0.841 | 0.590 |
| 2 1/2 x 2 1/2 | 0.105 | 12 | 3.141 | 0.804 | 0.803 | 0.643 |
| 2 1/2 x 2 1/2 | 0.135 | 10 | 4.006 | 0.979 | 1.010 | 0.785 |

Top Post Receiver Data Table

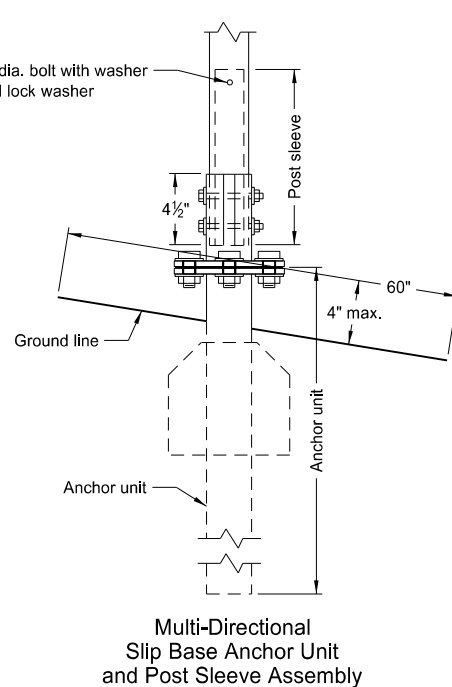
| Square Post Sizes (B) | A | B | C | D | E | F |
|-----------------------|---------|--------|---------|---------|----------|--------|
| 2 3/16" x 10 ga. | 1 5/16" | 2 1/2" | 3 1/2" | 2 5/32" | 1 33/64" | 1 7/8" |
| 2 1/2" x 10 ga. | 1 3/32" | 2 1/2" | 3 5/16" | 5/8" | 1 21/32" | 1 3/4" |

(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

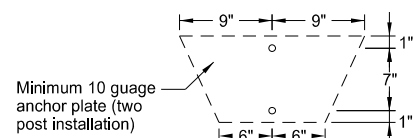
(B) For additional wind load, insert the 2 3/16" x 10 ga. into 2 1/2" x 10 ga.



Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly

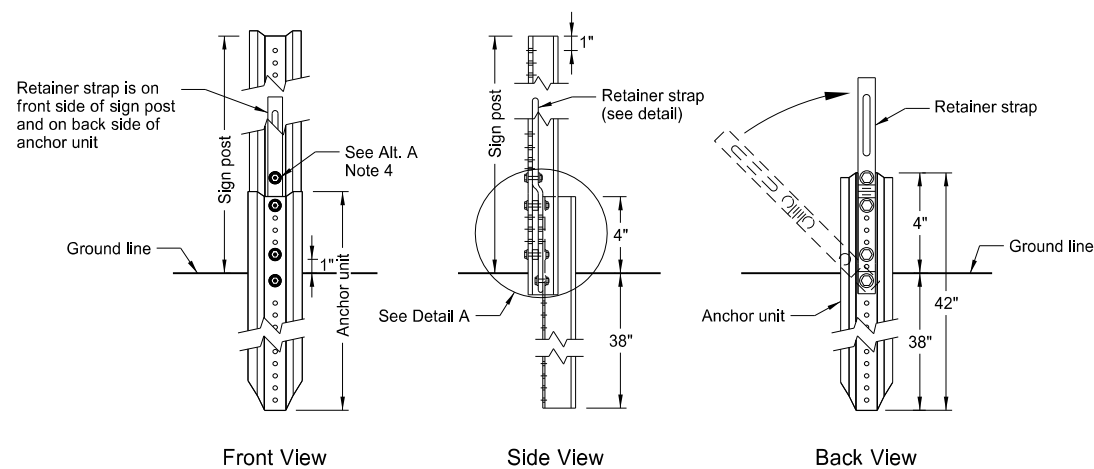
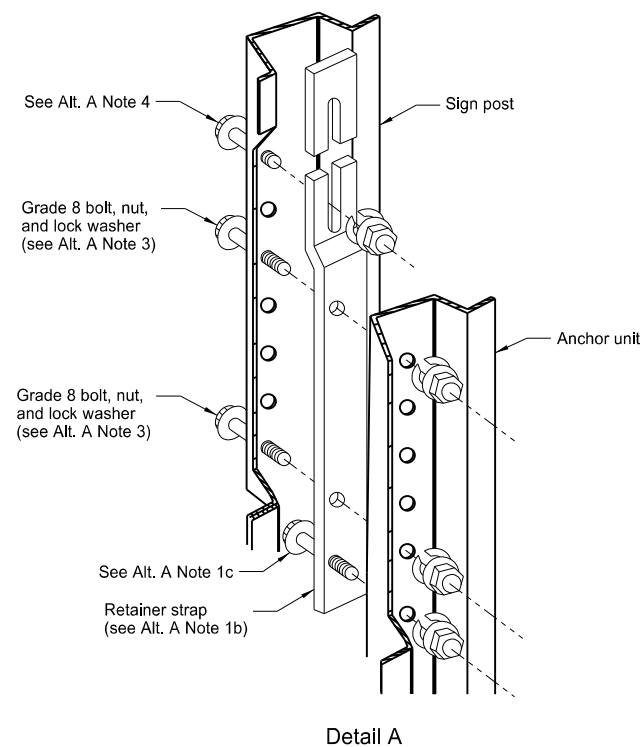


Minimum 10 gauge anchor plate (two post installation)

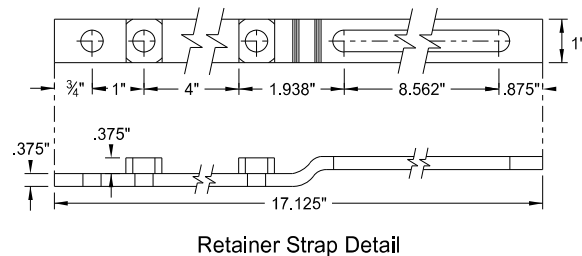
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|--------------------------|
| 2-28-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 9-27-17 | Updated to active voice |
| 10-03-19 | New Design Engr PE Stamp |

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Registration Number
PE- 4683,
on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

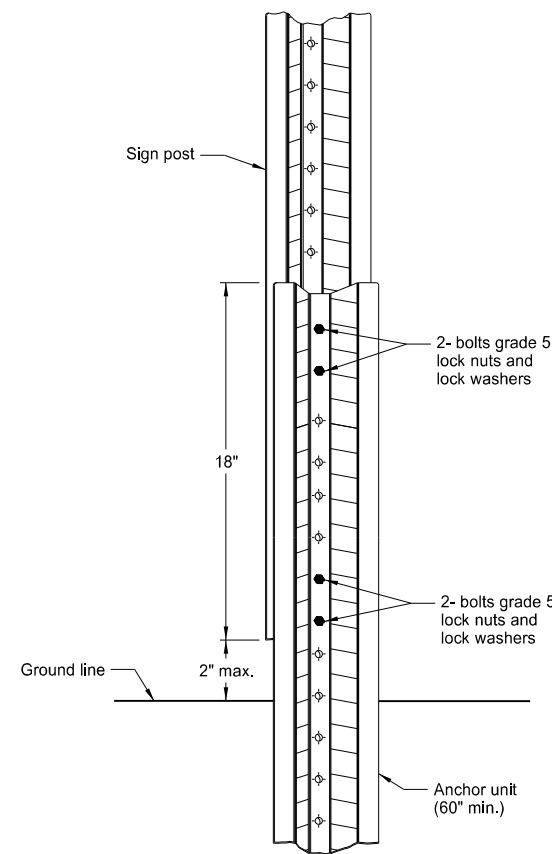
U-Channel Post



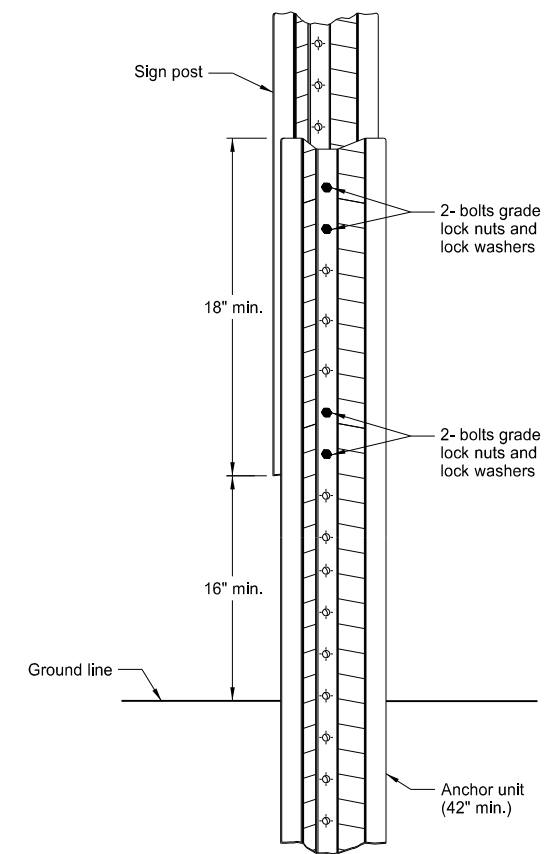
Breakaway U-Channel Detail Alternate A
Install a maximum of 2 posts within 7'.



Retainer Strap Detail



Breakaway U-Channel Splice Detail Alternate B
(2.5 and 3 lb/ft)
Install a maximum of 3 posts within 7'.



Breakaway U-Channel Splice Detail Alternate C
(2.5 and 3 lb/ft)
Install a maximum of 3 posts within 7'.

Alternate A Steps of Installation:

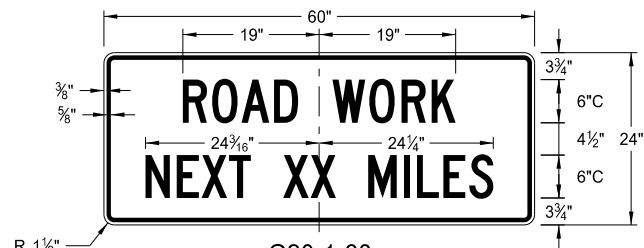
- Drive anchor unit to within 12" of ground level.
 - Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
 - Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
 - Rotate strap 90° to left.
- Drive anchor unit to 4" above ground.
 - Rotate strap to vertical position.
- Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
 - Alternately tighten two connector bolts.
- Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
- Properly nest base post, strap, and sign post. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post at the bolts have full contact across the entire width.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|---|
| 2-28-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 9-27-17 10-03-19 | Updated to active voice New Design Engr PE Stamp |

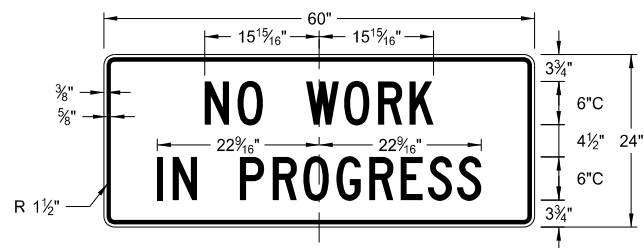
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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

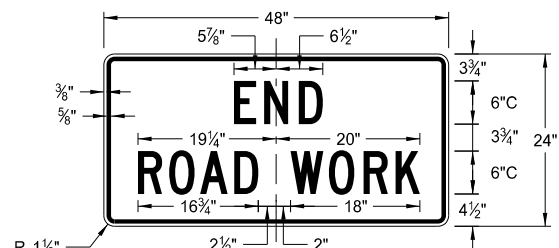
D-704-9



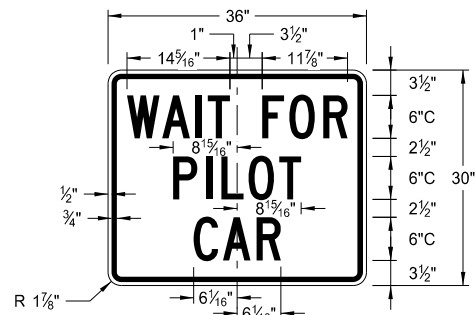
G20-1-60
Legend: black (non-refl)
Background: orange



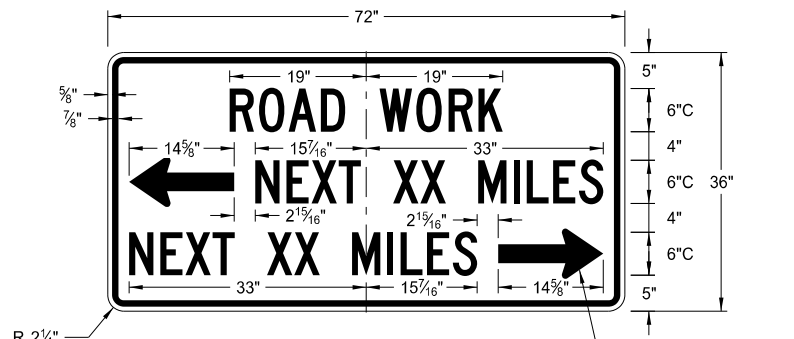
G20-1b-60
Legend: black (non-refl)
Background: orange



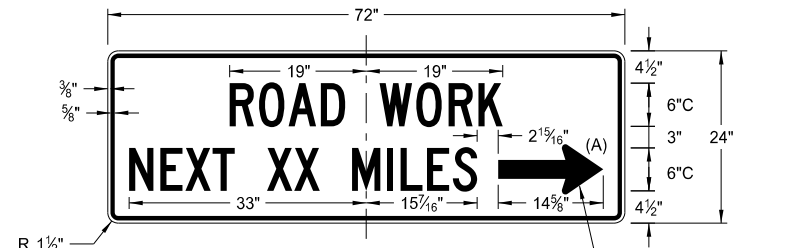
G20-2-48
Legend: black (non-refl)
Background: orange



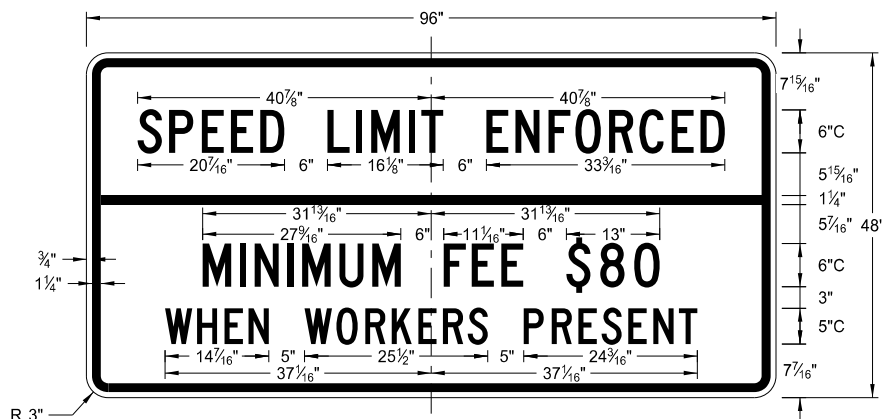
G20-4b-36
Legend: black (non-refl)
Background: orange



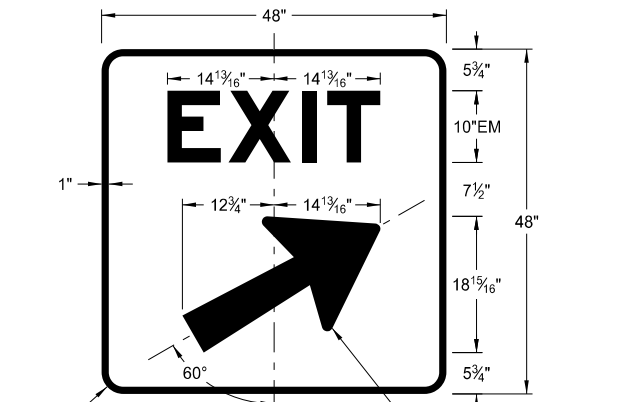
G20-50a-72
Legend: black (non-refl)
Background: orange



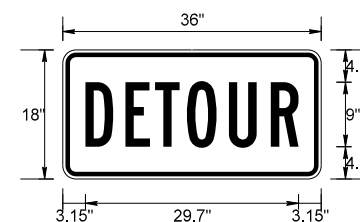
G20-52a-72
Legend: black (non-refl)
Background: orange



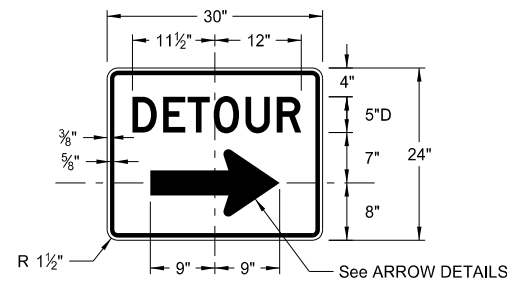
G20-55-96
Legend: black (non-refl)
Background: orange



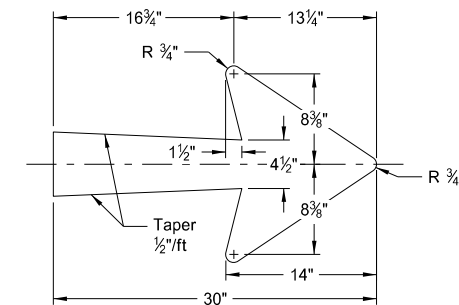
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



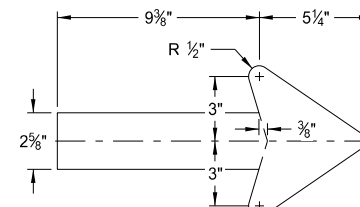
M4-8-36
Legend: black (non-refl)
Background: orange



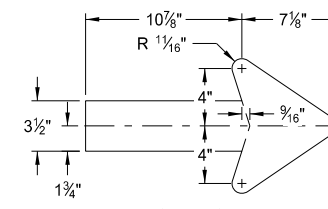
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



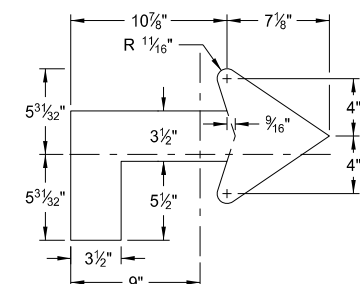
E5-1-48



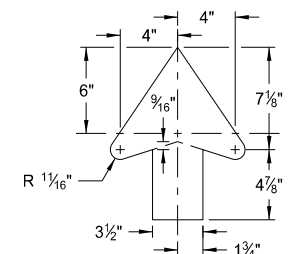
G20-50a-72
G20-52a-72



M4-9(L or R)-30
Right or Left



M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight

ARROW DETAILS

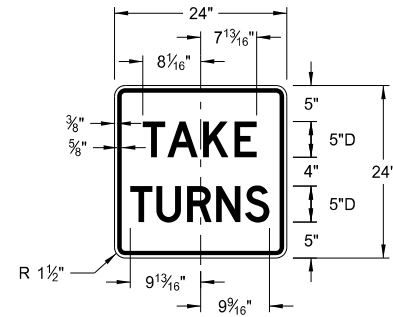
NOTES:

(A) Arrow may be right or left of the legend to indicate construction to the right or left.

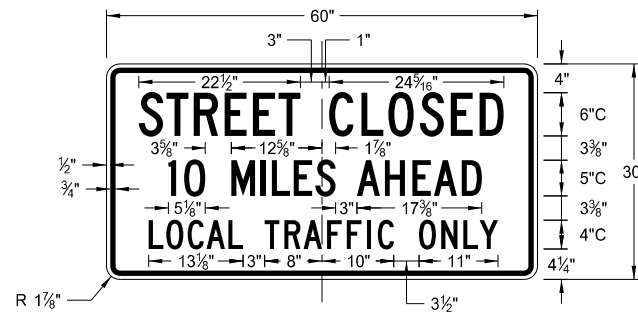
| | |
|--|---|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 8-13-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-17-17 10-03-19 | Added sign & background color New Design Engineer PE Stamp |

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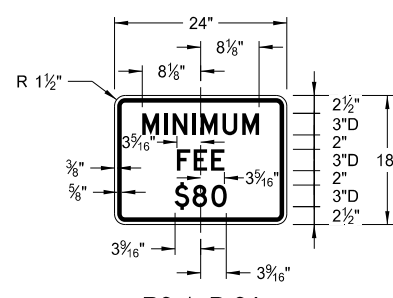
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



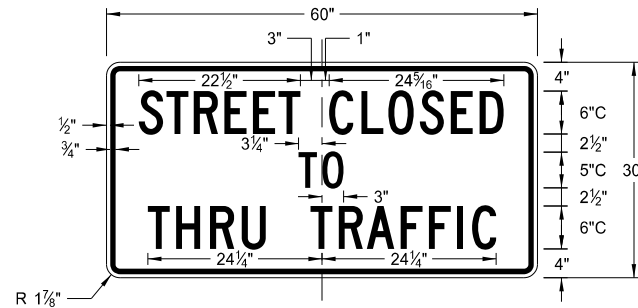
R1-50P-24
Legend: black (non-refl)
Background: white



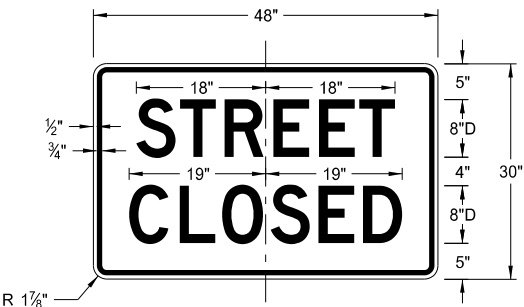
R11-3c-60
Legend: black (non-refl)
Background: white



R2-1aP-24
Legend: black (non-refl)
Background: white



R11-4a-60
Legend: black (non-refl)
Background: white

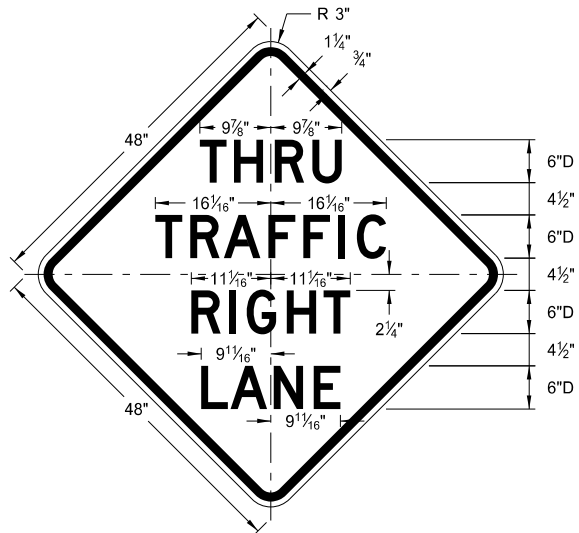


R11-2a-48
Legend: black (non-refl)
Background: white

| | |
|--|------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 8-13-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-17-17 | Revised sign number |
| 10-03-19 | New Design Engineer PE Stamp |

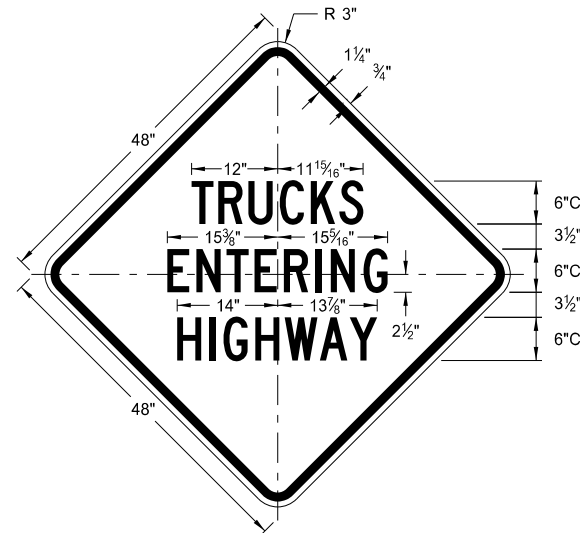
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CONSTRUCTION SIGN DETAILS
WARNING SIGNS



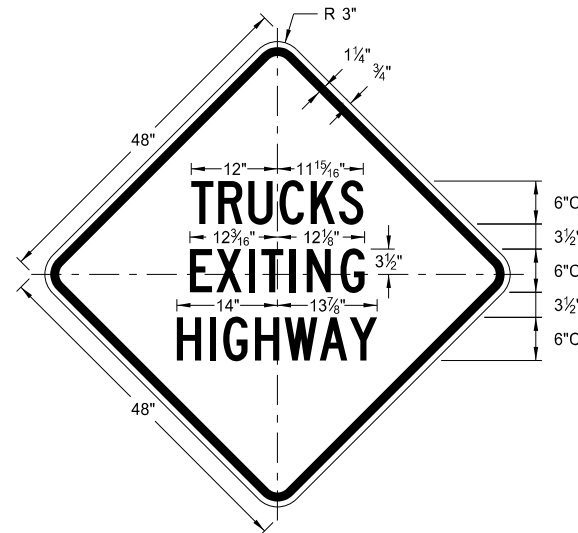
W5-8-48

Legend: black (non-refl)
Background: orange



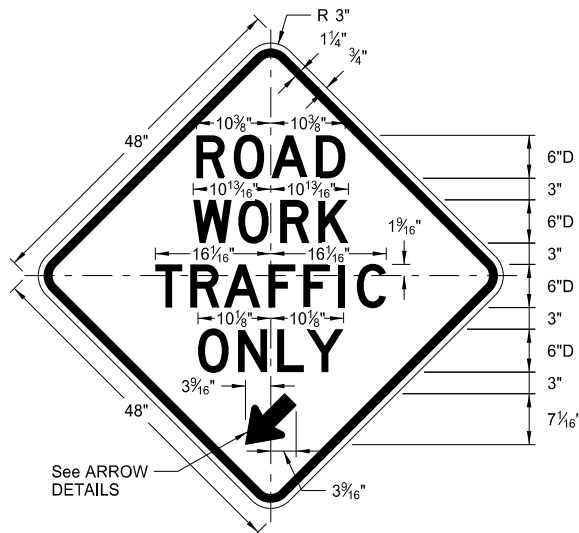
W8-53-48

Legend: black (non-refl)
Background: orange



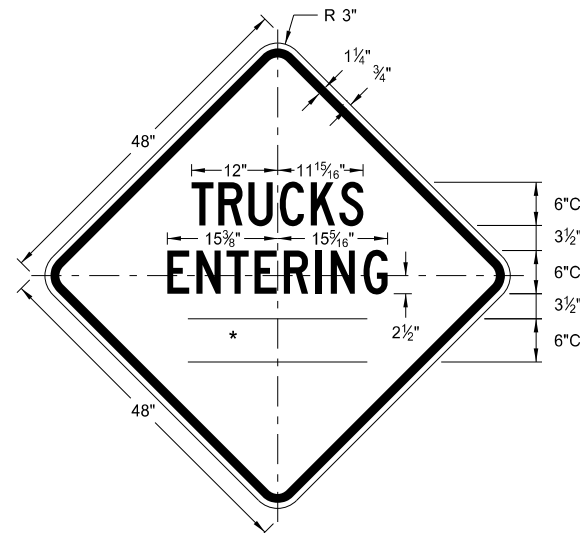
W8-56-48

Legend: black (non-refl)
Background: orange



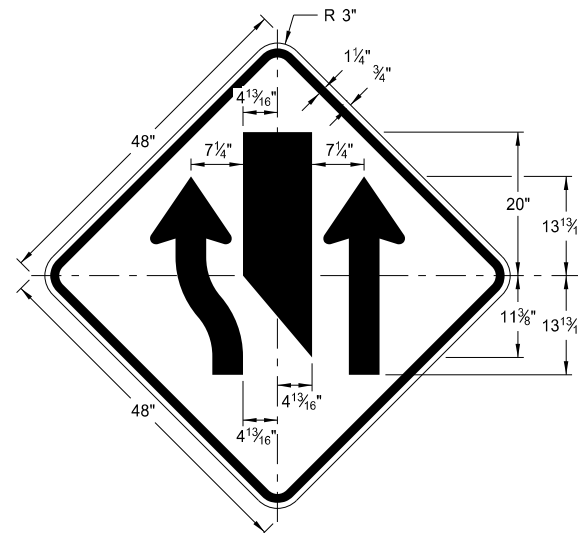
W5-9-48

Legend: black (non-refl)
Background: orange



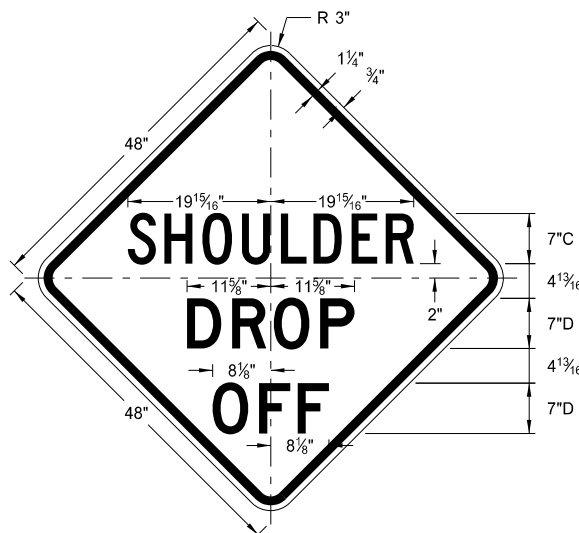
W8-54-48

Legend: black (non-refl)
Background: orange



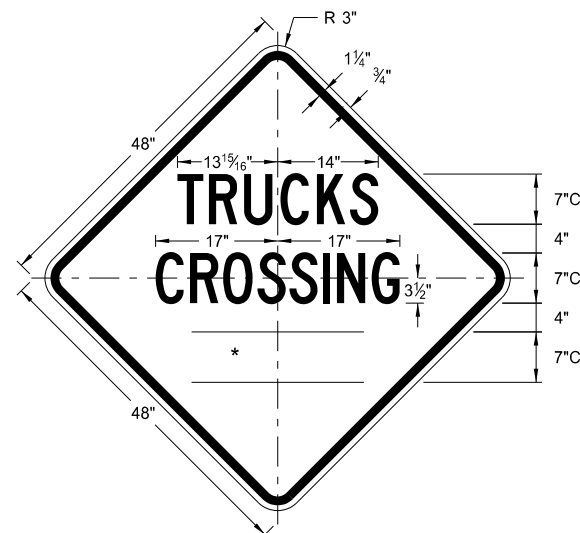
W9-3a-48

Legend: black (non-refl)
Background: orange



W8-9a-48

Legend: black (non-refl)
Background: orange

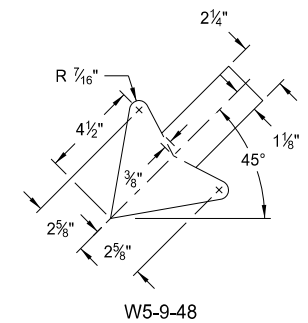


W8-55-48

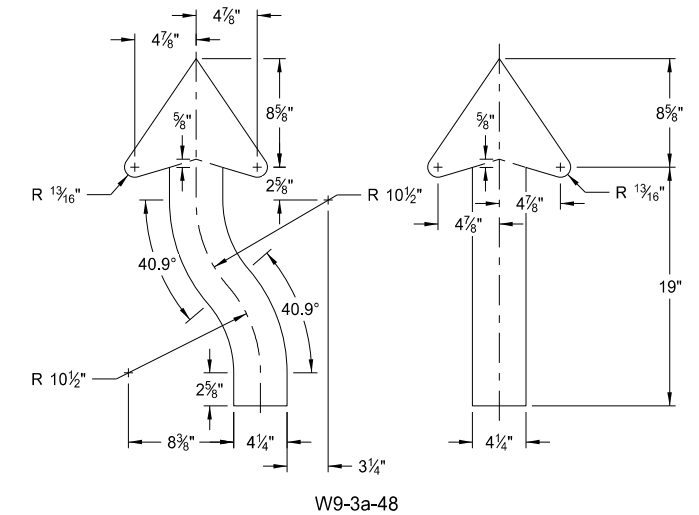
Legend: black (non-refl)
Background: orange

| WORD | LETTER SPACING |
|----------|----------------|
| AHEAD | Standard |
| 200 FT | Standard |
| 350 FT | Standard |
| 500 FT | Standard |
| 1000 FT | Reduce 40% |
| 1500 FT | Reduce 40% |
| 1/2 MILE | Reduce 50% |
| 1 MILE | Standard |

* DISTANCE MESSAGES



W5-9-48



W9-3a-48

ARROW DETAILS

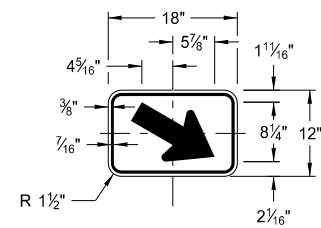
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|--------------------------------|
| 8-13-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-17-17 | Updated sign number |
| 5-31-18 | Revised sign and arrow details |
| 10-03-19 | New Design Engineer PE Stamp |

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CONSTRUCTION SIGN DETAILS
WARNING SIGNS

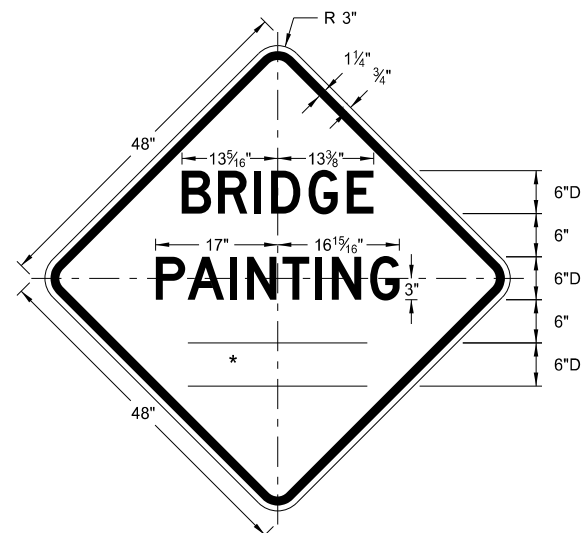
| WORD | LETTER SPACING |
|---------|----------------|
| AHEAD | Standard |
| 200 FT | Standard |
| 350 FT | Standard |
| 500 FT | Standard |
| 1000 FT | Reduce 40% |
| 1500 FT | Reduce 40% |
| ½ MILE | Reduce 50% |
| 1 MILE | Standard |

* DISTANCE MESSAGES



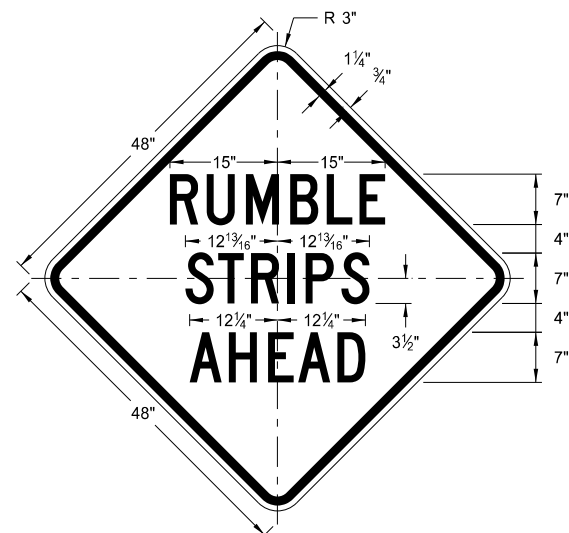
W16-7aP-18

Legend: black (non-refl)
Background: orange



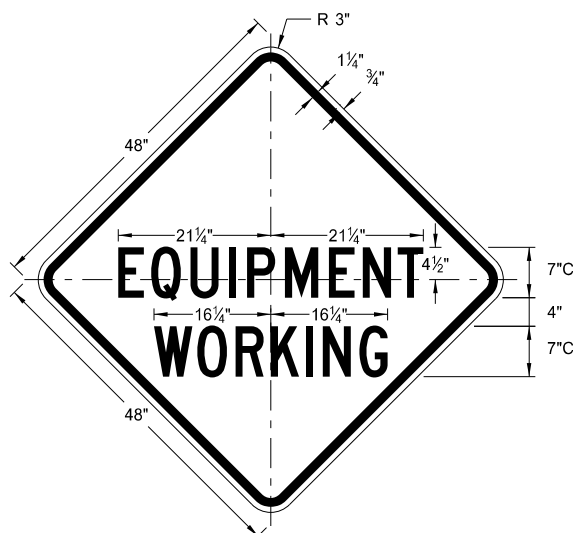
W21-50-48

Legend: black (non-refl)
Background: orange



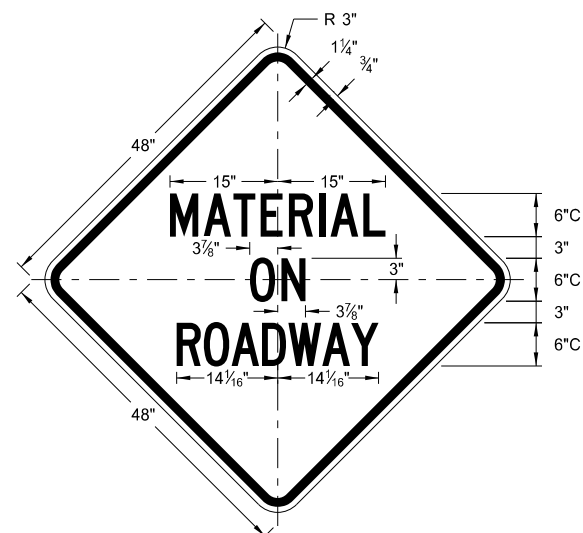
W21-53-48

Legend: black (non-refl)
Background: orange



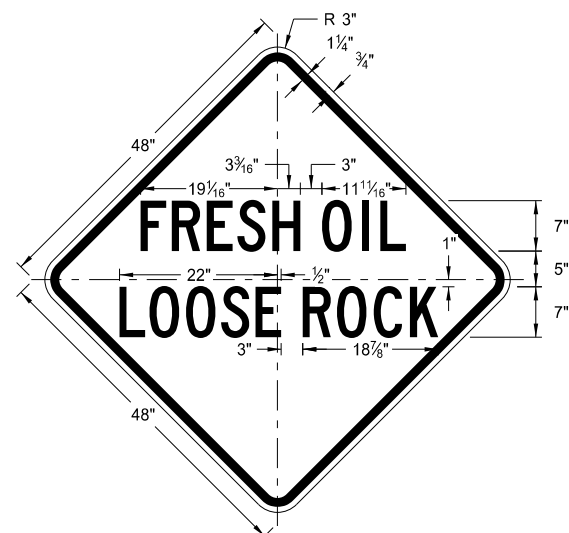
W20-51-48

Legend: black (non-refl)
Background: orange



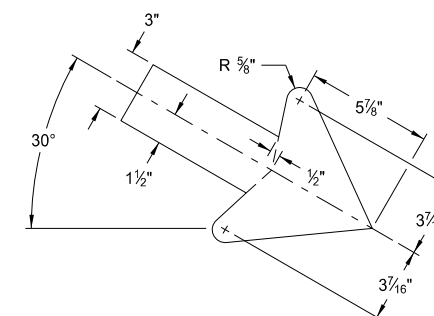
W21-51-48

Legend: black (non-refl)
Background: orange



W22-8-48

Legend: black (non-refl)
Background: orange

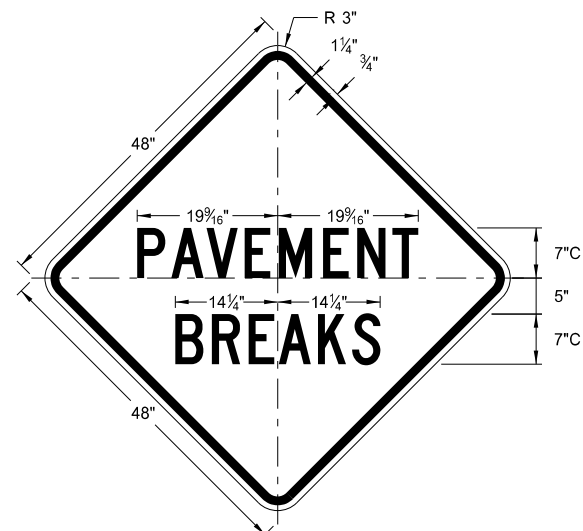


W16-7aP-18



W20-52P-54

Legend: black (non-refl)
Background: orange



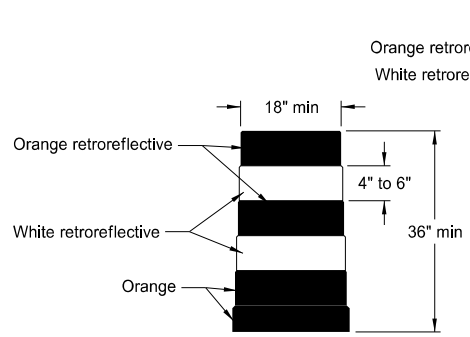
W21-52-48

Legend: black (non-refl)
Background: orange

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|------------------------------------|
| 5-31-18 | |
| REVISIONS | |
| DATE | CHANGE |
| 11-01-19 | Added details for sign W16-7aP-18. |

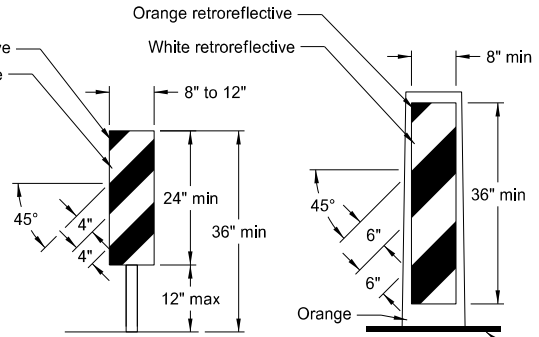
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BARRICADE AND CHANNELIZING DEVICE DETAILS



DELINEATOR DRUM

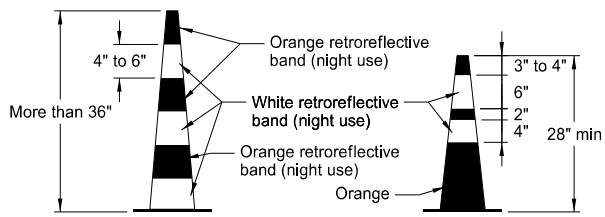
Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectORIZED spaces between the horizontal orange and white stripes. Avoid placement of stripes on drum ribs or indentations. Use closed top drums that will not allow collection of debris. Do not place ballast on the top of drum.



BACK TO BACK VERTICAL PANEL STACKABLE

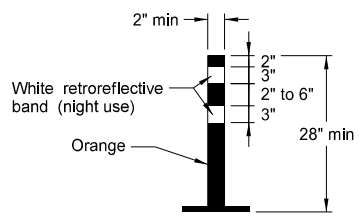
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, use a stripe width of 6 inches.

Molded rubber base (min weight 30 lbs)



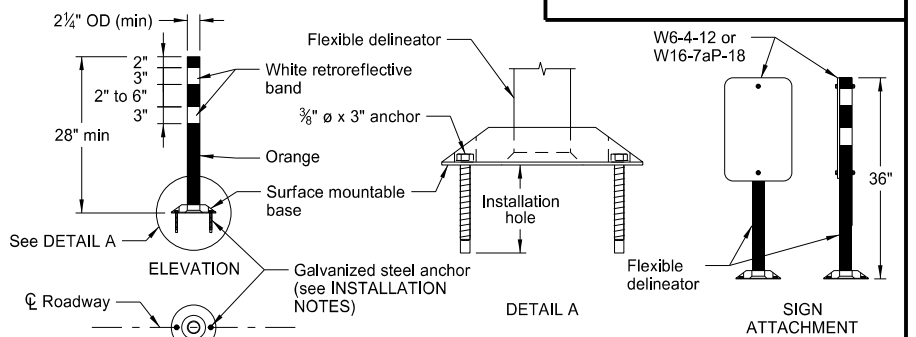
TRAFFIC CONE

Provide retroreflectORIZATION of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectORIZED space between the orange and white stripes.



TUBULAR MARKER

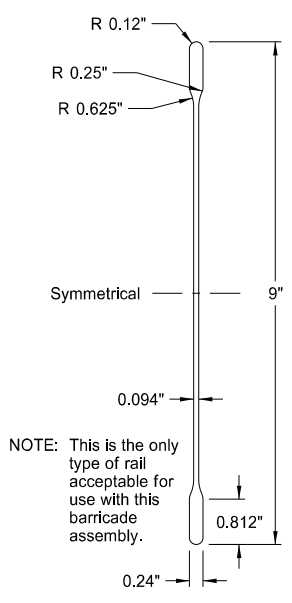
Provide retroreflectORIZATION of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

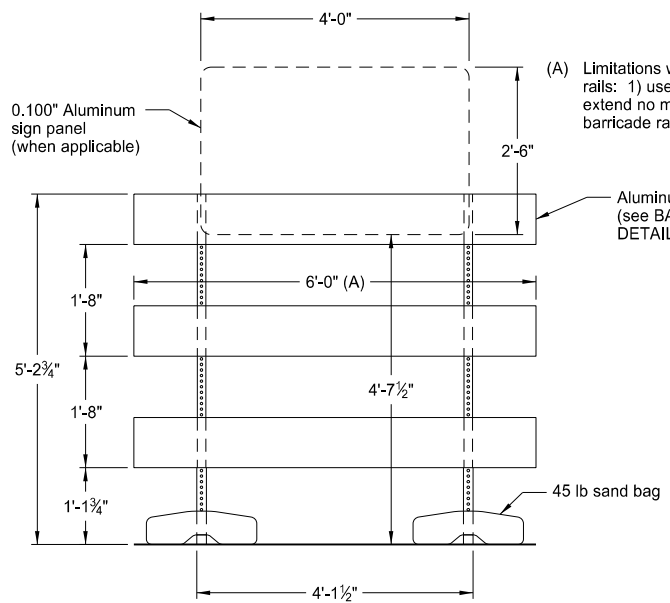
INSTALLATION NOTES:

1. Drill installation holes to diameter and depth required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl. Remove butyl as close as possible to pavement surface.

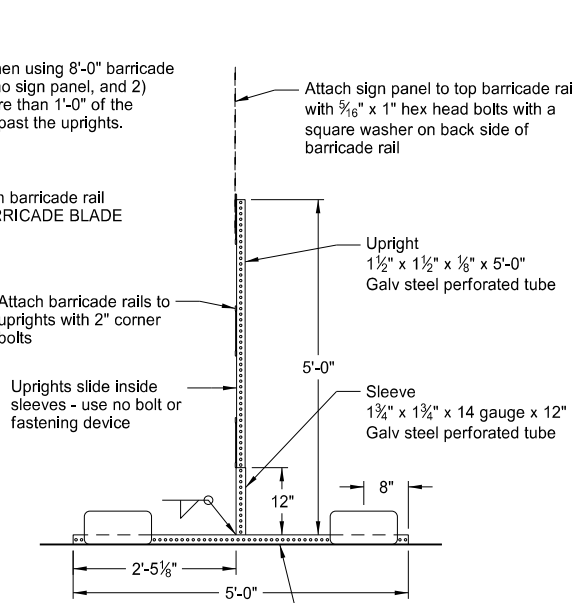


BARRICADE BLADE DETAIL

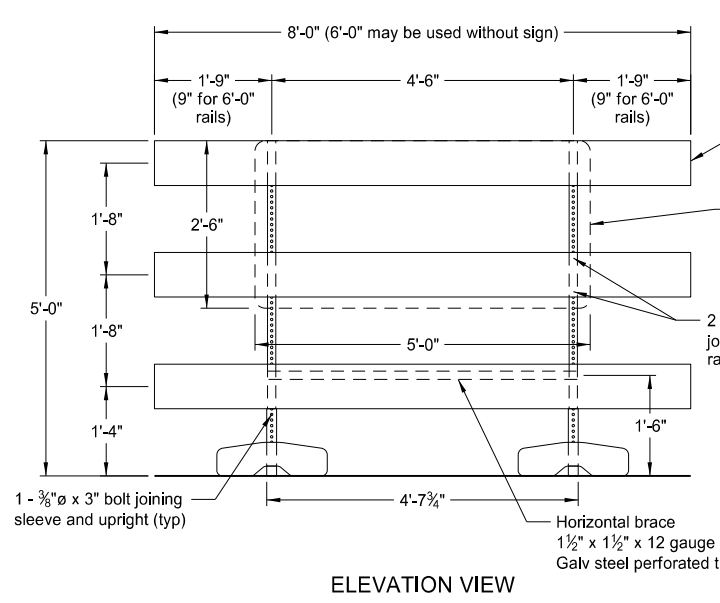
NOTE: This is the only type of rail acceptable for use with this barricade assembly.



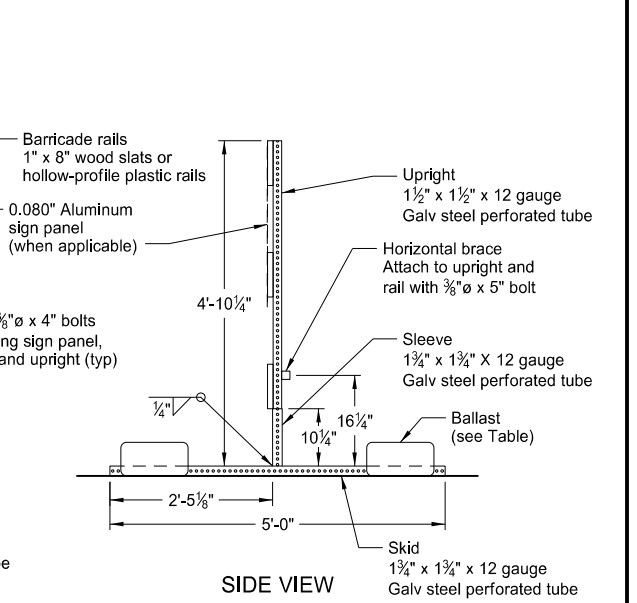
ELEVATION VIEW BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)



SIDE VIEW BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)



ELEVATION VIEW BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)



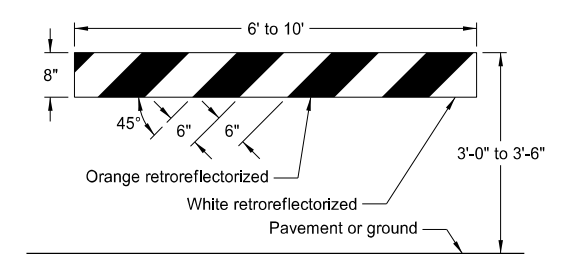
SIDE VIEW BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

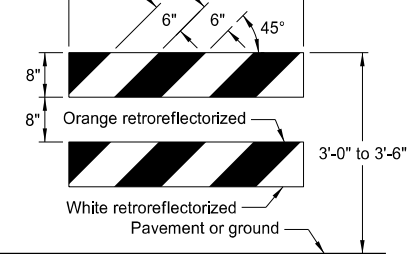
MINIMUM BALLAST (For each side of barricade support)

| | |
|--------------|--------------------|
| Without Sign | 4 - 25 lb sandbags |
| With Sign | 6 - 25 lb sandbags |

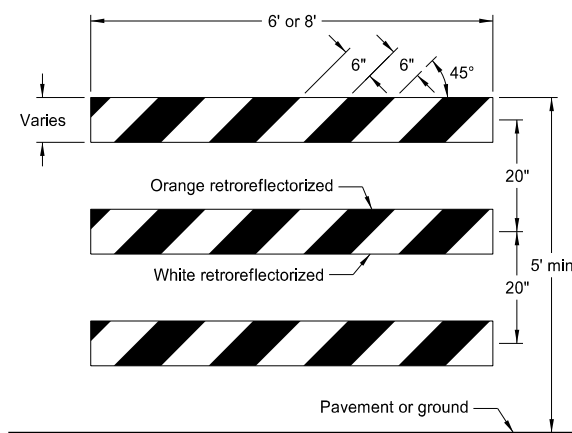
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.



TYPE I BARRICADE

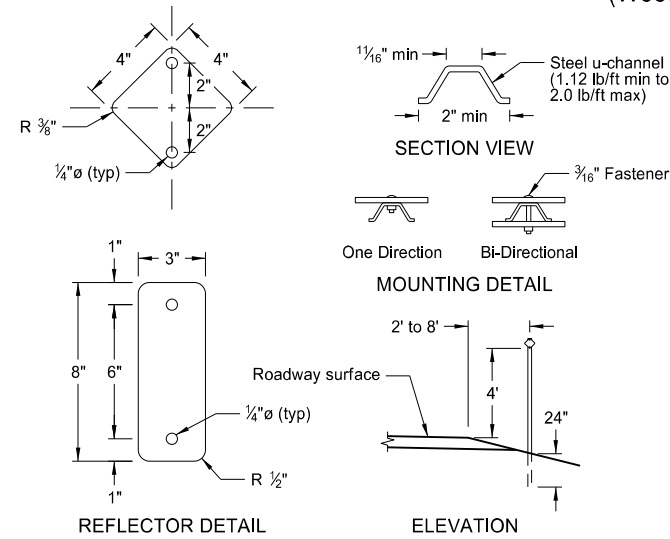


TYPE II BARRICADE



TYPE III BARRICADE

BARRICADE RAIL DETAILS



REFLECTOR DETAIL

ELEVATION

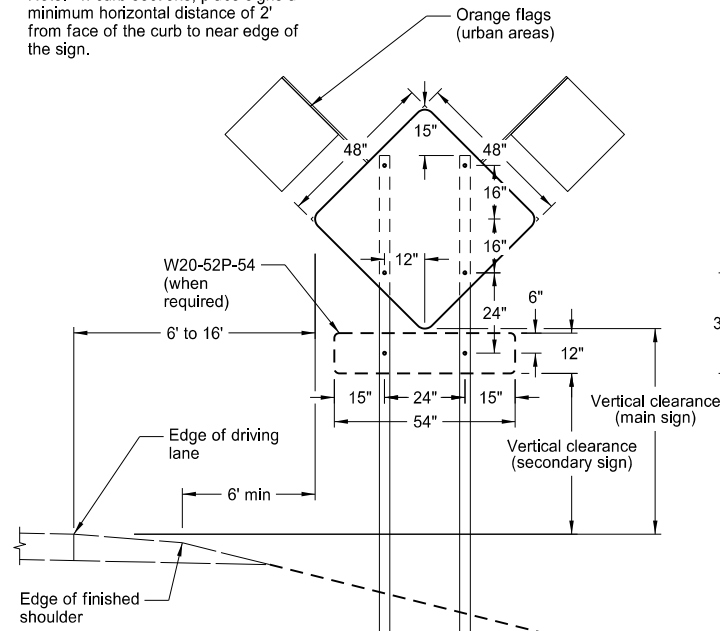
DELINEATORS

| | |
|---|---|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 9-27-17 | Updated to active voice |
| 11-01-19 | Revised details for Flexible Delineator |

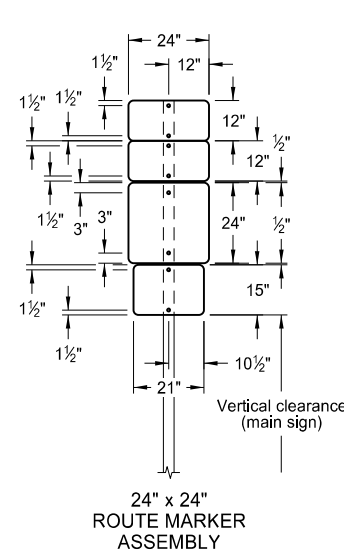
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

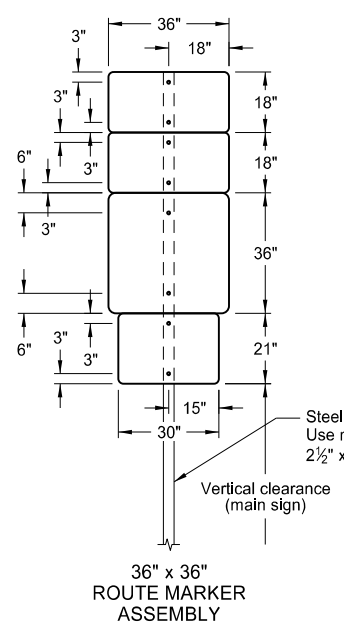
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



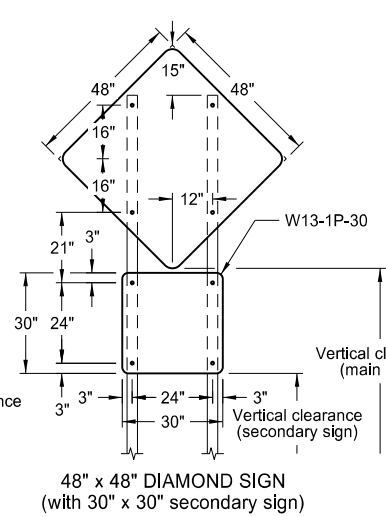
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



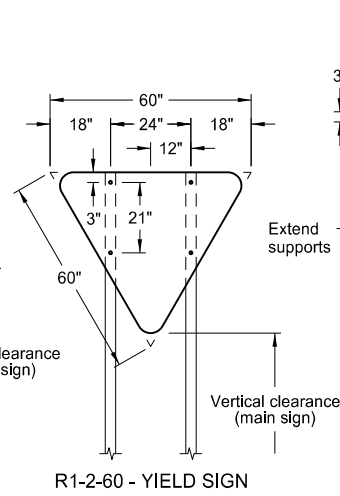
24" x 24" ROUTE MARKER ASSEMBLY



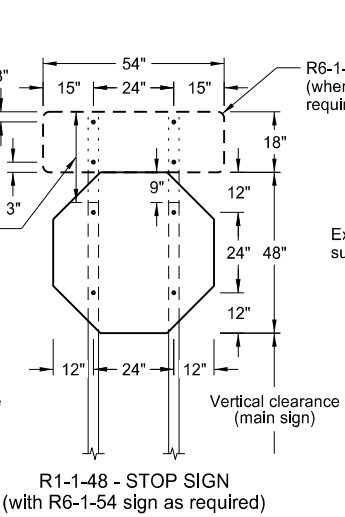
36" x 36" ROUTE MARKER ASSEMBLY



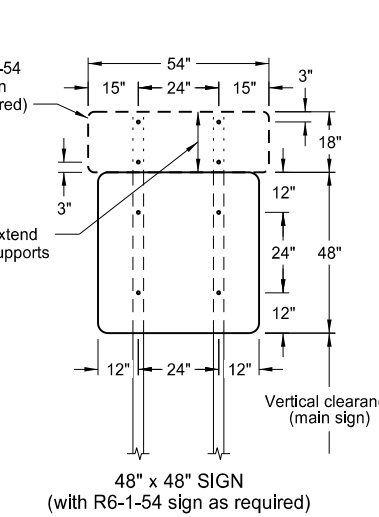
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



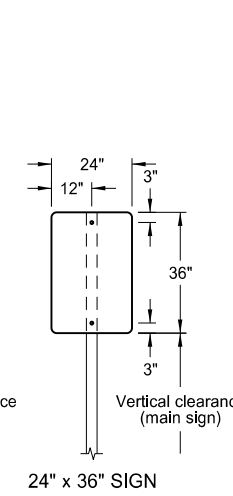
R1-2-60 - YIELD SIGN



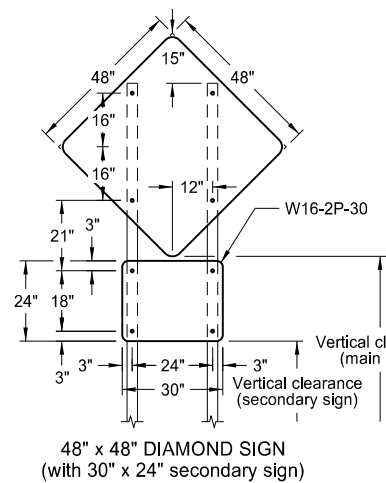
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



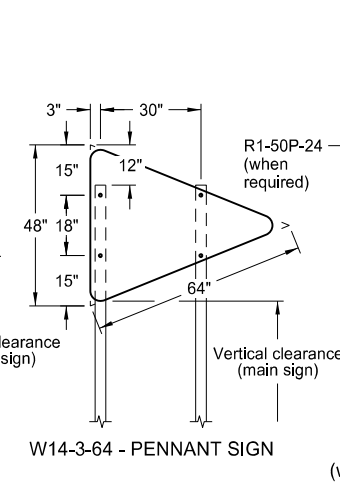
48" x 48" SIGN
(with R6-1-54 sign as required)



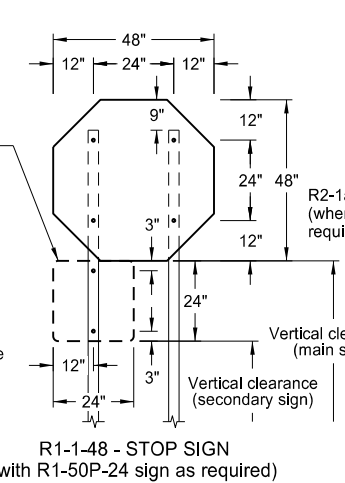
24" x 36" SIGN



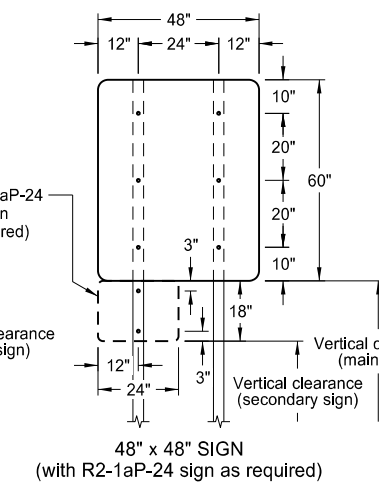
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



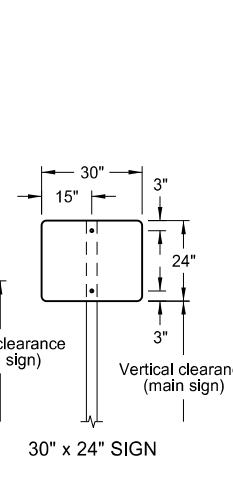
W14-3-64 - PENNANT SIGN



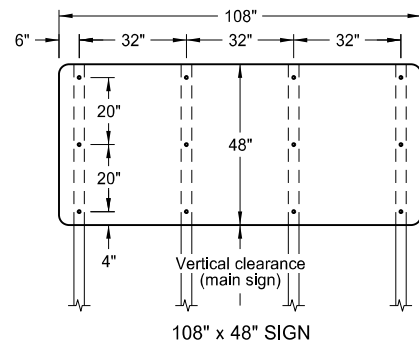
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



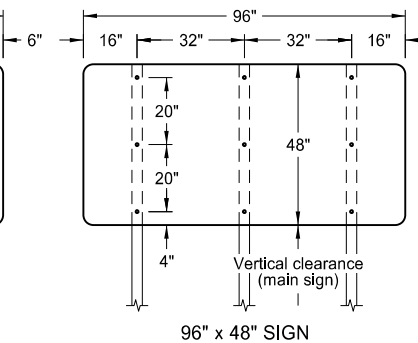
48" x 48" SIGN
(with R2-1aP-24 sign as required)



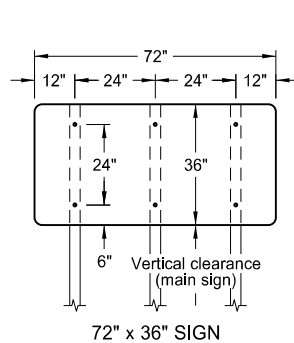
30" x 24" SIGN



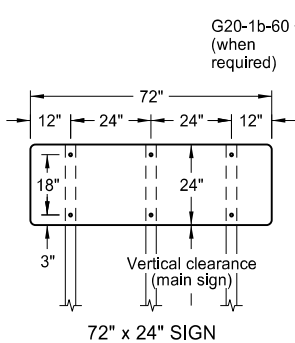
108" x 48" SIGN



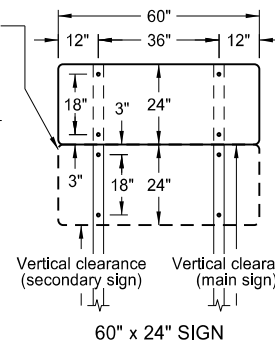
96" x 48" SIGN



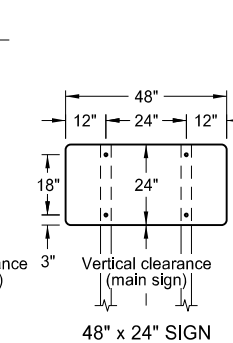
72" x 36" SIGN



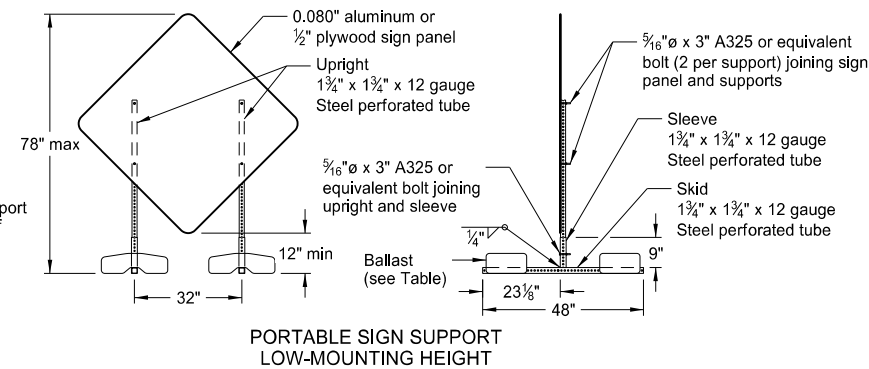
72" x 24" SIGN



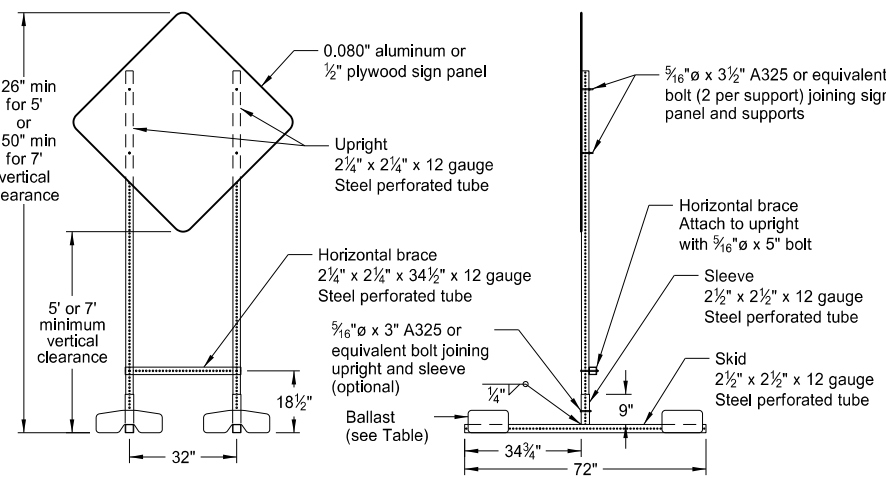
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

- Sign Supports: Galvanize or paint supports. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes based on a wind speed of 55 MPH.

Place signs over 50 square feet on 2½" x 2½" perforated tube supports as a minimum.

Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.
- Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. Punch all holes round for ⅝" bolts.
- Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)
- Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

Interstate - white legend on blue background
Interstate Business Loop - white legend on green background
US and State - black legend on white background
County - yellow legend on blue background

- Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

The vertical clearance to secondary signs is 1'-0" less than the vertical clearance stated above.

Provide a minimum clearance of 7'-0" from the ground at the post for signs with an area exceeding 50 square feet.

- Portable Signs: Provide portable signs that meet the vertical clearance stated above when it is necessary to place signs within the pavement surface.

Use of low-mounting height (minimum 12" vertical clearance) portable signs for 5 days or less, is allowed as long as the view of the sign is not obstructed. Time delays caused by unforeseen circumstances, such as equipment breakdowns, rain, subgrade failures, etc., will not accrue towards the 5 day period. Use of R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 is allowed for longer than 5 days.

Restrict signs mounted on portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT details to a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

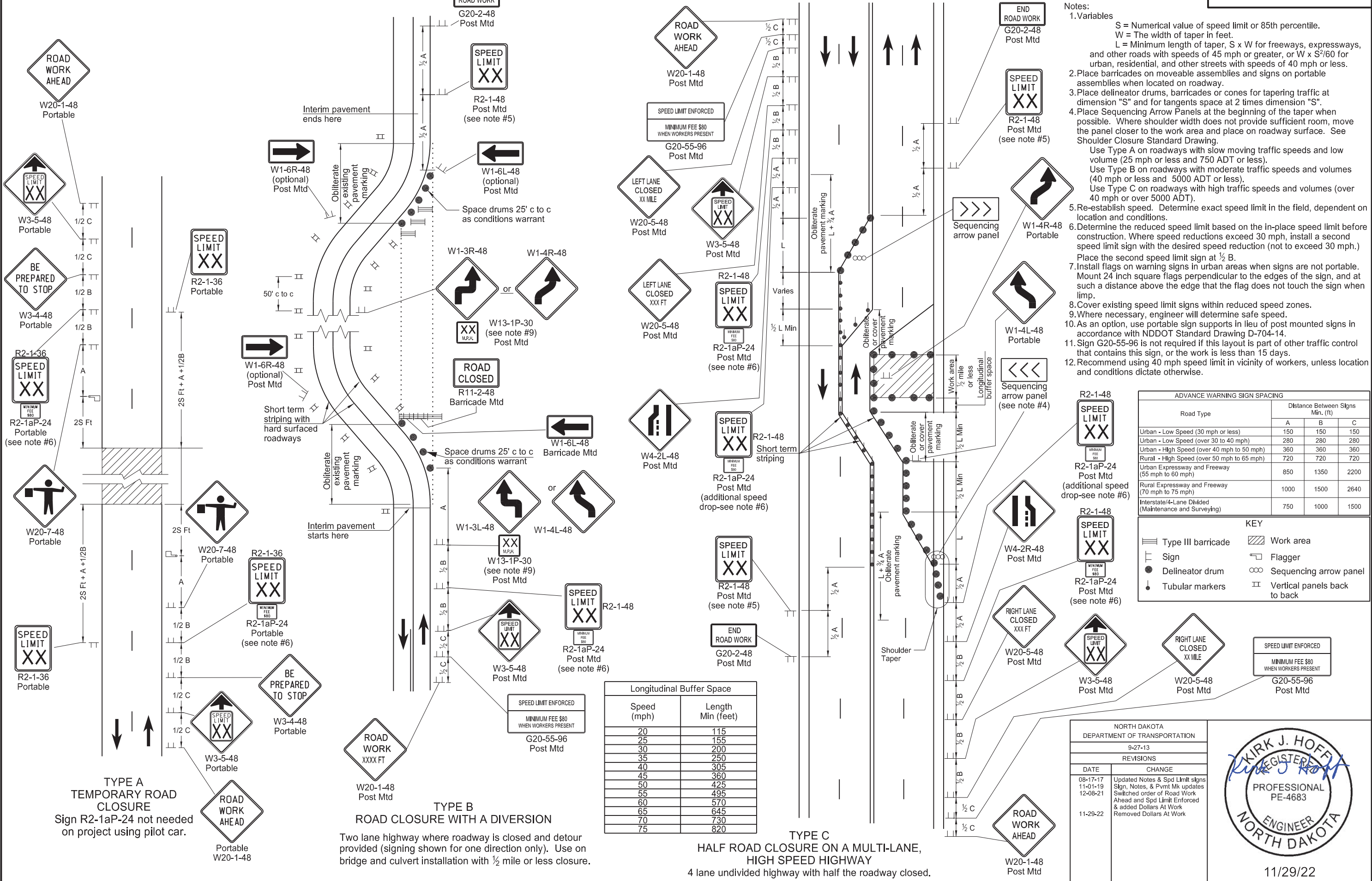
| Sign Panel Mounting Height (ft) | Number of 25 lb sandbags for 4' x 4' sign panel |
|---------------------------------|---|
| 1' | 6 |
| 5' | 8 |
| 7' | 10 |

Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|-----------------------------|
| 10-4-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 11-14-13 | Revised Note 6 |
| 9-27-17 | Updated to active voice |
| 11-01-19 | Revised 60"x24" sign detail |

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE-4683,
on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS



- Notes:
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper in feet.
 - L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
 - Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on roadway surface. See Shoulder Closure Standard Drawing.
 - Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 - Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 - Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
 - Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
 - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 - Cover existing speed limit signs within reduced speed zones.
 - Where necessary, engineer will determine safe speed.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

| Road Type | Distance Between Signs Min. (ft) | | |
|---|----------------------------------|------|------|
| | A | B | C |
| Urban - Low Speed (30 mph or less) | 150 | 150 | 150 |
| Urban - Low Speed (over 30 to 40 mph) | 280 | 280 | 280 |
| Urban - High Speed (over 40 mph to 50 mph) | 360 | 360 | 360 |
| Rural - High Speed (over 50 mph to 65 mph) | 720 | 720 | 720 |
| Urban Expressway and Freeway (55 mph to 60 mph) | 850 | 1350 | 2200 |
| Rural Expressway and Freeway (70 mph to 75 mph) | 1000 | 1500 | 2640 |
| Interstate/4-Lane Divided (Maintenance and Surveying) | 750 | 1000 | 1500 |

KEY

| | | | |
|--|--------------------|--|------------------------------|
| | Type III barricade | | Work area |
| | Sign | | Flagger |
| | Delineator drum | | Sequencing arrow panel |
| | Tubular markers | | Vertical panels back to back |

| Speed (mph) | Length Min (feet) |
|-------------|-------------------|
| 20 | 115 |
| 25 | 155 |
| 30 | 200 |
| 35 | 250 |
| 40 | 305 |
| 45 | 360 |
| 50 | 425 |
| 55 | 495 |
| 60 | 570 |
| 65 | 645 |
| 70 | 730 |
| 75 | 820 |

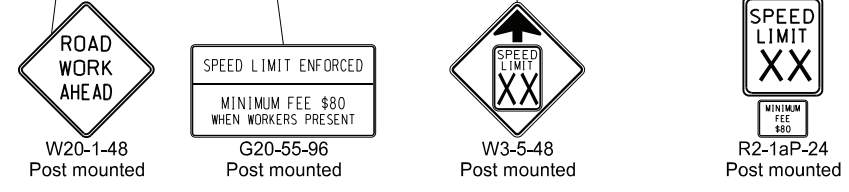
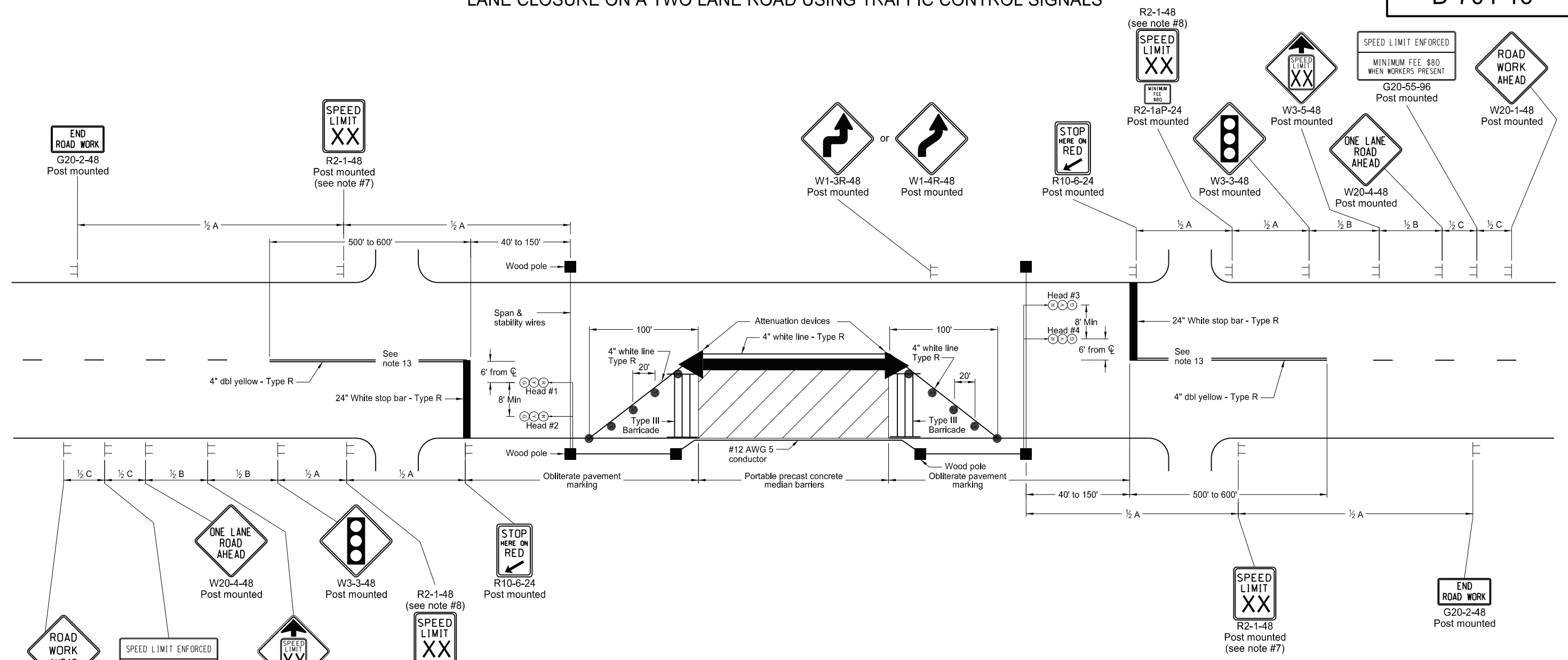
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|--|
| 9-27-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 08-17-17 | Updated Notes & Spd Limit signs |
| 11-01-19 | Sign, Notes, & Pmnt Mk updates |
| 12-08-21 | Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work |
| 11-29-22 | Removed Dollars At Work |



11/29/22

LANE CLOSURE ON A TWO LANE ROAD USING TRAFFIC CONTROL SIGNALS

D-704-16



| KEY | |
|-----|--------------------|
| | Work Area |
| | Type III Barricade |
| | Sign |
| | Delineator Drum |
| | Wood Pole |

Notes:

1. Span conductor overhead between poles except on bridges, where it may alternately be attached and supported by the bridge structure. When conductor is supported by the bridge structure, attach conductor to avoid interference with bridge construction. Attach conductor on either side of bridge as determined by field personnel.
2. Locate controller on a wood pole in the cable run between signal heads for through traffic movements.
3. The timing schedule is suggested trial setting. Check signals in operation frequently to obtain the most efficient timing schedule.
4. Place wood poles a minimum of 16 feet from edge of driving lane. Provide a minimum 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
5. Place traffic signal heads with 12 inch red, yellow and green lenses and 5 inch louvered backplates.
6. See standard drawing "Span Wire Mounted Traffic Signals" for interim traffic construction details.
7. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
8. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at 1/2 B. and at such a distance above the edge that the flag does not touch the sign when limp.
9. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
10. Cover existing speed limit signs within a reduced speed zone.
11. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Continue double yellow centerline thru private drives.
14. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
15. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
16. As an option, use solar powered signals instead of wood pole signal system.

| ADVANCE WARNING SIGN SPACING | | | |
|---|----------------------------------|------|------|
| Road Type | Distance Between Signs Min. (ft) | | |
| | A | B | C |
| Urban - Low Speed (30 mph or less) | 150 | 150 | 150 |
| Urban - Low Speed (over 30 to 40 mph) | 280 | 280 | 280 |
| Urban - High Speed (over 40 mph to 50 mph) | 360 | 360 | 360 |
| Rural - High Speed (over 50 mph to 65 mph) | 720 | 720 | 720 |
| Urban Expressway and Freeway (55 mph to 60 mph) | 850 | 1350 | 2200 |
| Rural Expressway and Freeway (70 mph to 75 mph) | 1000 | 1500 | 2640 |
| Interstate/4-Lane Divided (Maintenance and Surveying) | 750 | 1000 | 1500 |

| SUGGESTED TIMING AND SIGNAL SEQUENCE | | | | | | |
|--------------------------------------|-------|------------------|--------|------------------|------|------------------|
| Heads 1 & 2 Heads 3 & 4 | Green | | Yellow | | Red | |
| | Time | Percent of Cycle | Time | Percent of Cycle | Time | Percent of Cycle |
| Time | 18.0 | 4.5 | 22.5 | 18.0 | 4.5 | 22.5 |
| Cycle = 90 seconds | 20 | 5 | 25 | 20 | 5 | 25 |

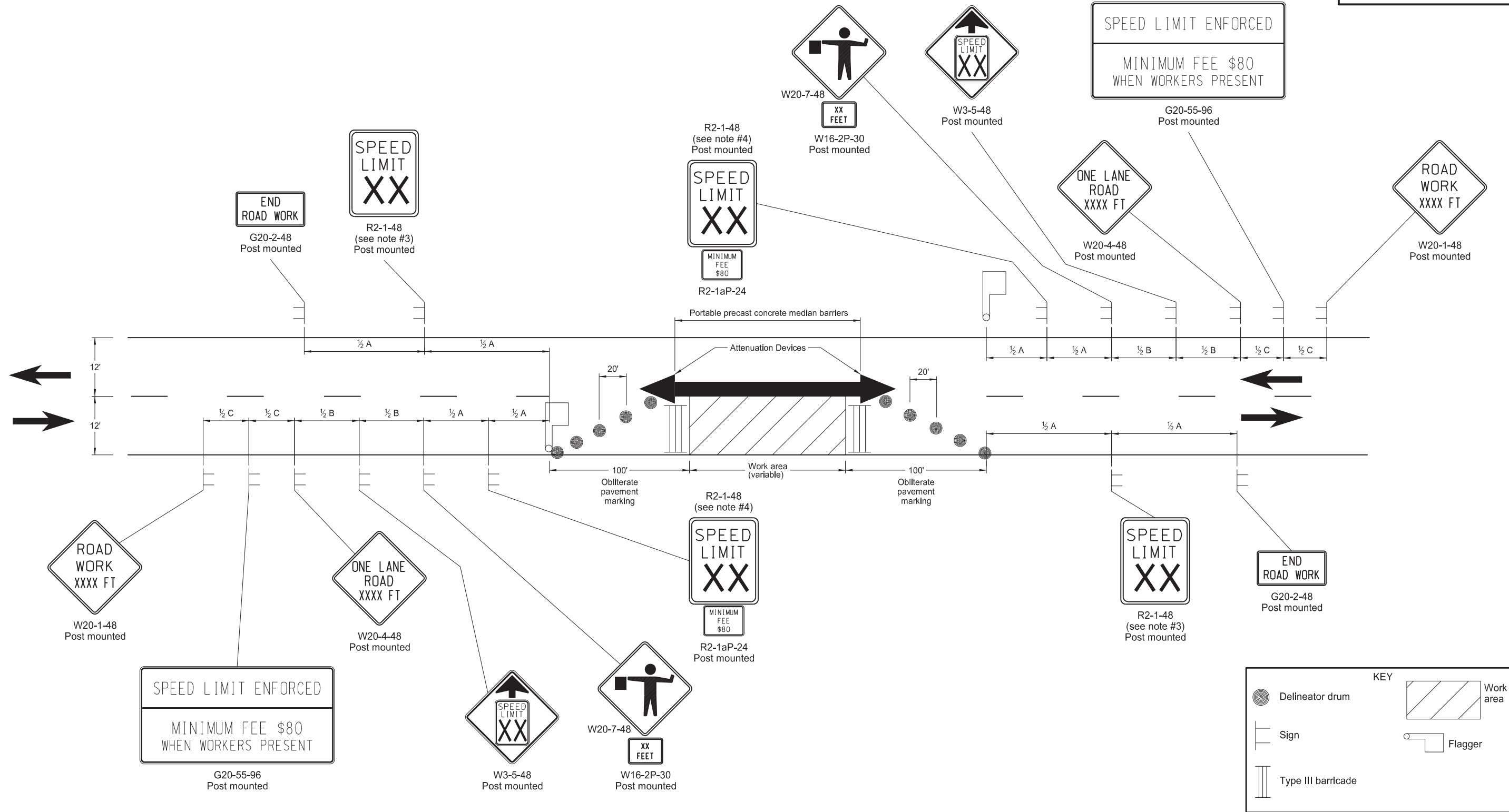
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 9-27-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 11-20-15 | Revised Note 6 & Renumbered Minimum Fee plaque. |
| 08-17-17 | Revised notes & added note. |
| 11-01-19 | Revised sign #s & p/mt mk type. |
| 12-08-21 | Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work. |
| 11-29-22 | Removed Dollars At Work. |
| 08-31-23 | Corrected Note 14 grammar. |



08/31/23

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes:

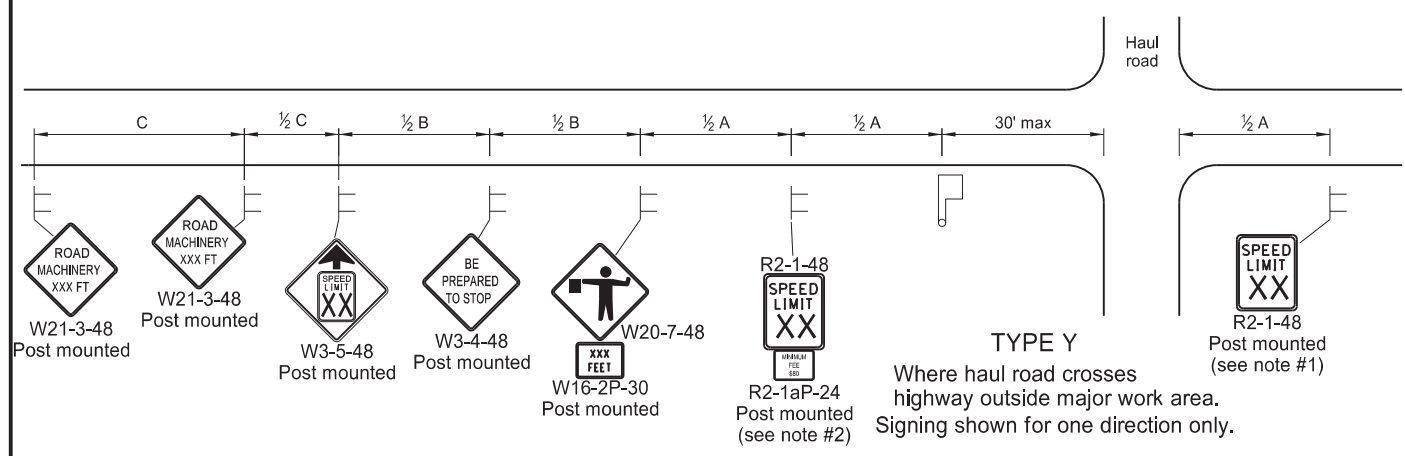
1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Remove existing striping as required. Use back to back delineators when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Place back to back vertical panels when roadways have steep slopes and alignment is not visible to approaching traffic.
3. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
4. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at 1/2 B.
5. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
6. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
7. Cover existing speed limit signs within a reduced speed zone.
8. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
9. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

| ADVANCE WARNING SIGN SPACING | | | |
|---|----------------------------------|------|------|
| Road Type | Distance Between Signs Min. (ft) | | |
| | A | B | C |
| Urban - Low Speed (30 mph or less) | 150 | 150 | 150 |
| Urban - Low Speed (over 30 to 40 mph) | 280 | 280 | 280 |
| Urban - High Speed (over 40 mph to 50 mph) | 360 | 360 | 360 |
| Rural - High Speed (over 50 mph to 65 mph) | 720 | 720 | 720 |
| Urban Expressway and Freeway (55 mph to 60 mph) | 850 | 1350 | 2200 |
| Rural Expressway and Freeway (70 mph to 75 mph) | 1000 | 1500 | 2640 |
| Interstate/4-Lane Divided (Maintenance and Surveying) | 750 | 1000 | 1500 |

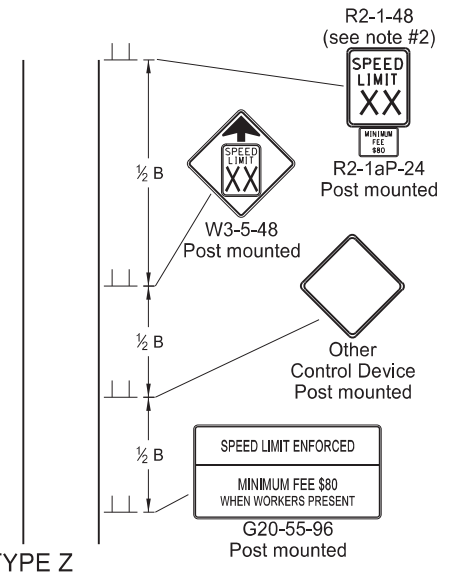
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 9-27-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 08-17-17 | Note update & sign numbers |
| 11-01-19 | Removed signs & revised note |
| 12-08-21 | Switched order of Road Work XXXX and Spd Limit Enforced & added Dollars At Work |
| 11-29-22 | Removed Dollars At Work |

KIRK J. HOFF
 REGISTERED
 PROFESSIONAL
 PE-4683
 ENGINEER
 NORTH DAKOTA
 11/29/22

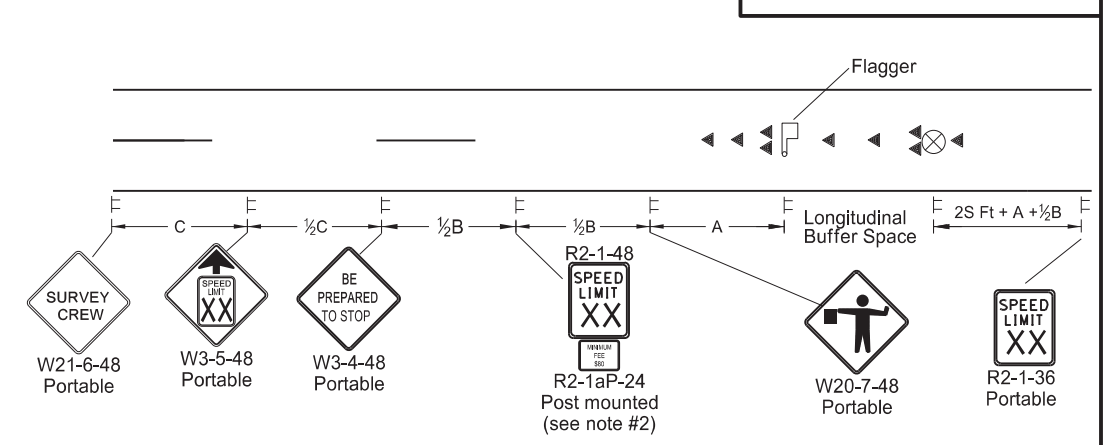
MISCELLANEOUS SIGN LAYOUTS



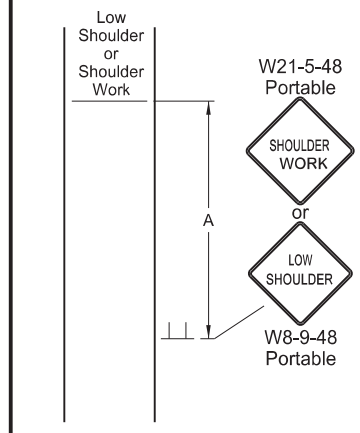
TYPE Y
Where haul road crosses highway outside major work area. Signing shown for one direction only.



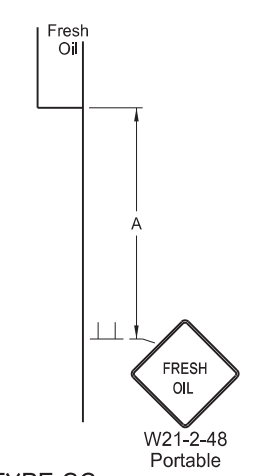
TYPE Z
Where speed zone is needed. Signing shown for one direction only.



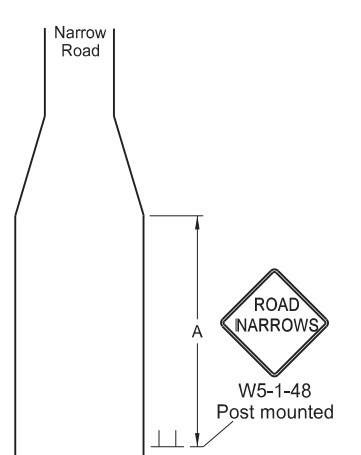
TYPE AA
Where survey crew is used. Signing shown for one direction only.



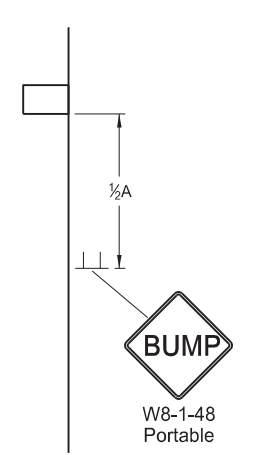
TYPE BB
Within major work area where sign conditions exist



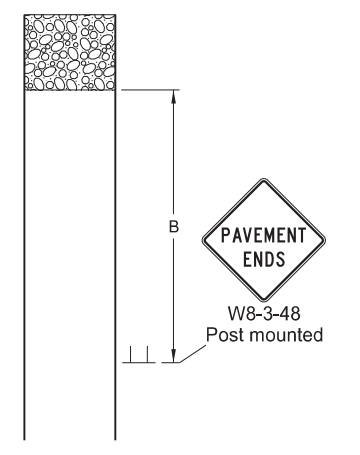
TYPE CC
Where sign conditions exist



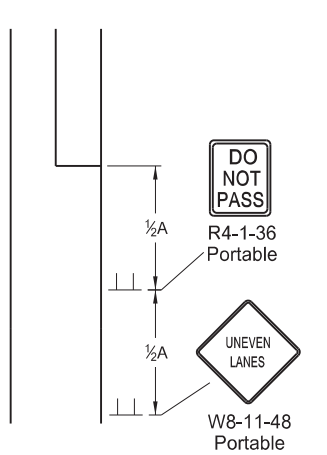
TYPE DD
Where sign conditions exist



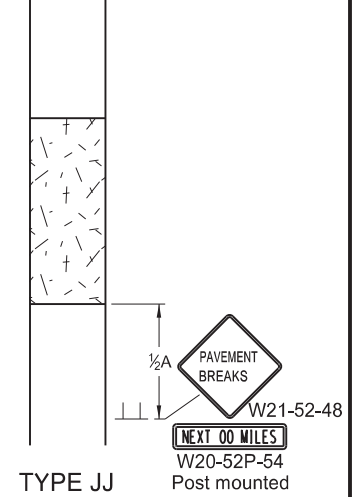
TYPE EE
Where sign conditions exist



TYPE FF
Where sign conditions exist. Signing shown for one direction only.



TYPE GG
Where elevation difference exists between lanes

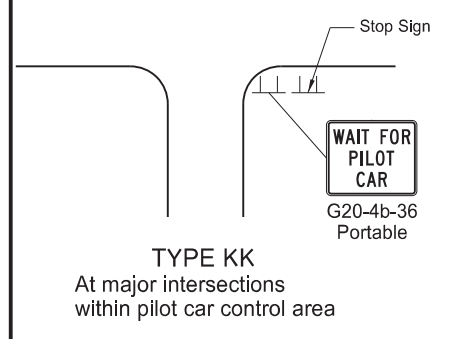


TYPE JJ
For break in pavement. Install signs when conditions exist and remove when not applicable. Signing shown for one direction only.

KEY

- Flagger
- Sign
- Cones
- Survey Equipment

S = Numerical value of speed limit or 85th percentile.



TYPE KK
At major intersections within pilot car control area

- Notes**
- Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
 - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 - Cover existing speed limit signs within reduced speed zones.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
 - When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
 - Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
 - Layouts shown for one direction only.

| ADVANCE WARNING SIGN SPACING | | | |
|---|----------------------------------|------|------|
| Road Type | Distance Between Signs Min. (ft) | | |
| | A | B | C |
| Urban - Low Speed (30 mph or less) | 150 | 150 | 150 |
| Urban - Low Speed (over 30 to 40 mph) | 280 | 280 | 280 |
| Urban - High Speed (over 40 mph to 50 mph) | 360 | 360 | 360 |
| Rural - High Speed (over 50 mph to 65 mph) | 720 | 720 | 720 |
| Urban Expressway and Freeway (55 mph to 60 mph) | 850 | 1350 | 2200 |
| Rural Expressway and Freeway (70 mph to 75 mph) | 1000 | 1500 | 2640 |
| Interstate/4-Lane Divided (Maintenance and Surveying) | 750 | 1000 | 1500 |

| Longitudinal Buffer Space | |
|---------------------------|-------------------|
| *Speed (mph) | Length Min (feet) |
| 20 | 115 |
| 25 | 155 |
| 30 | 200 |
| 35 | 250 |
| 40 | 305 |
| 45 | 360 |
| 50 | 425 |
| 55 | 495 |
| 60 | 570 |
| 65 | 645 |
| 70 | 730 |
| 75 | 820 |

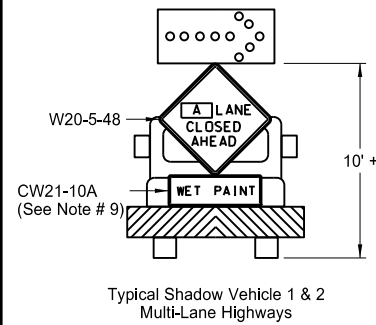
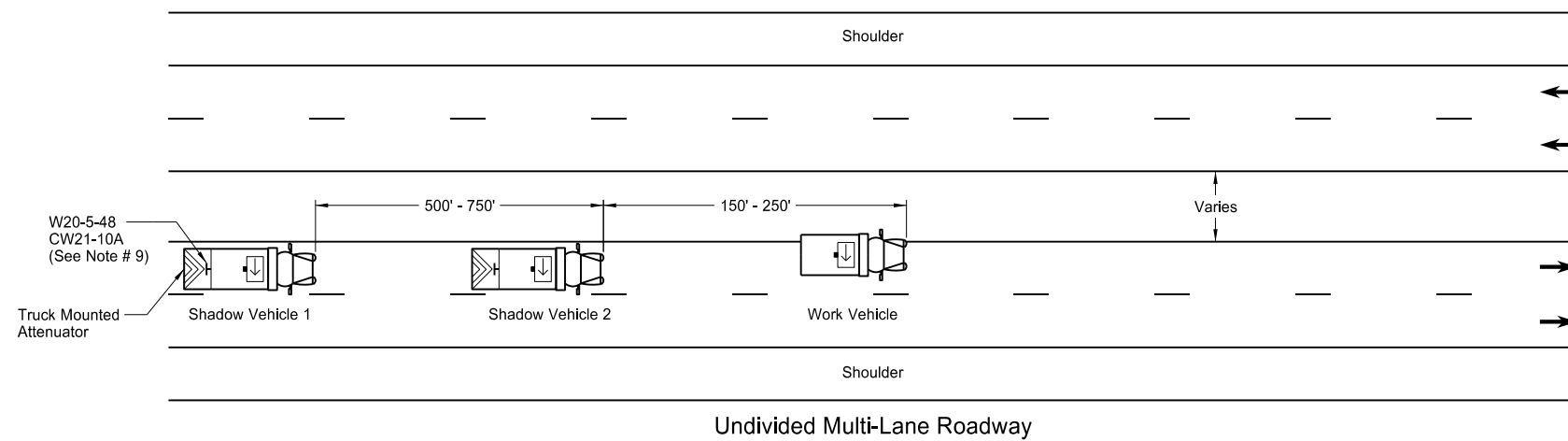
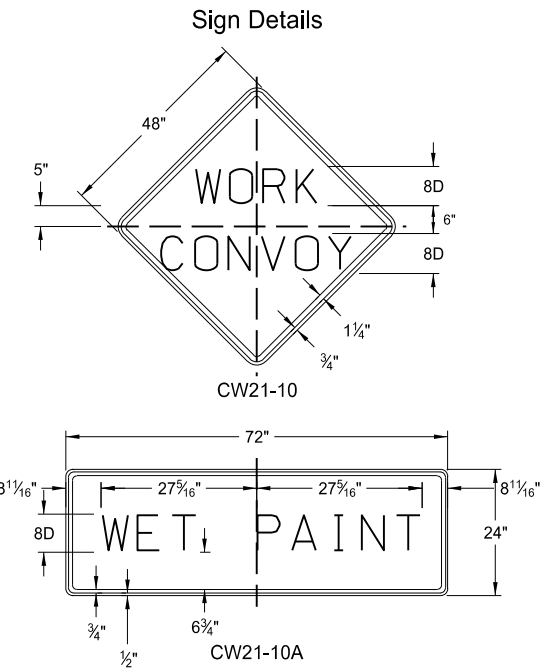
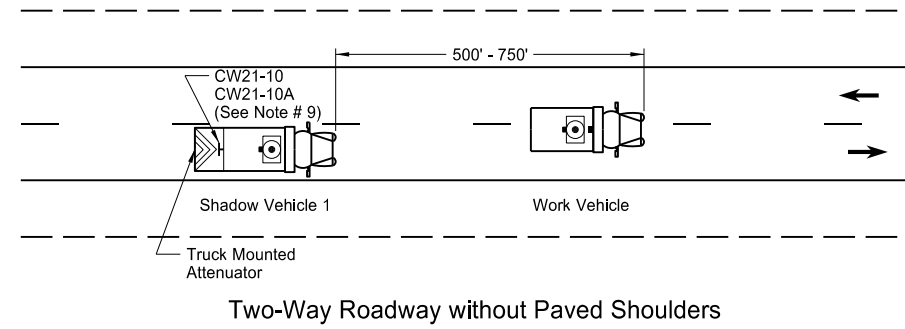
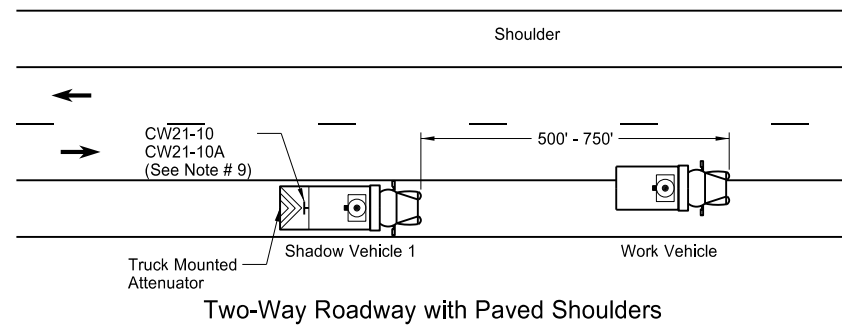
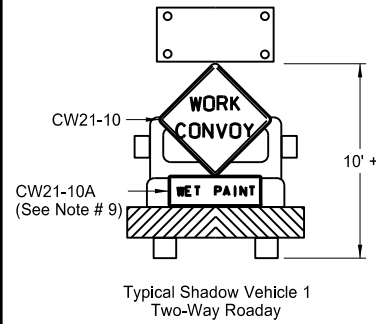
* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|--|
| 9-27-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-17-17 | Added speed limit signs. Updated notes & sign numbers. |
| 11-01-19 | Revised note 5 & sign numbers. |
| 2-23-23 | Revised distance & removed signs. |

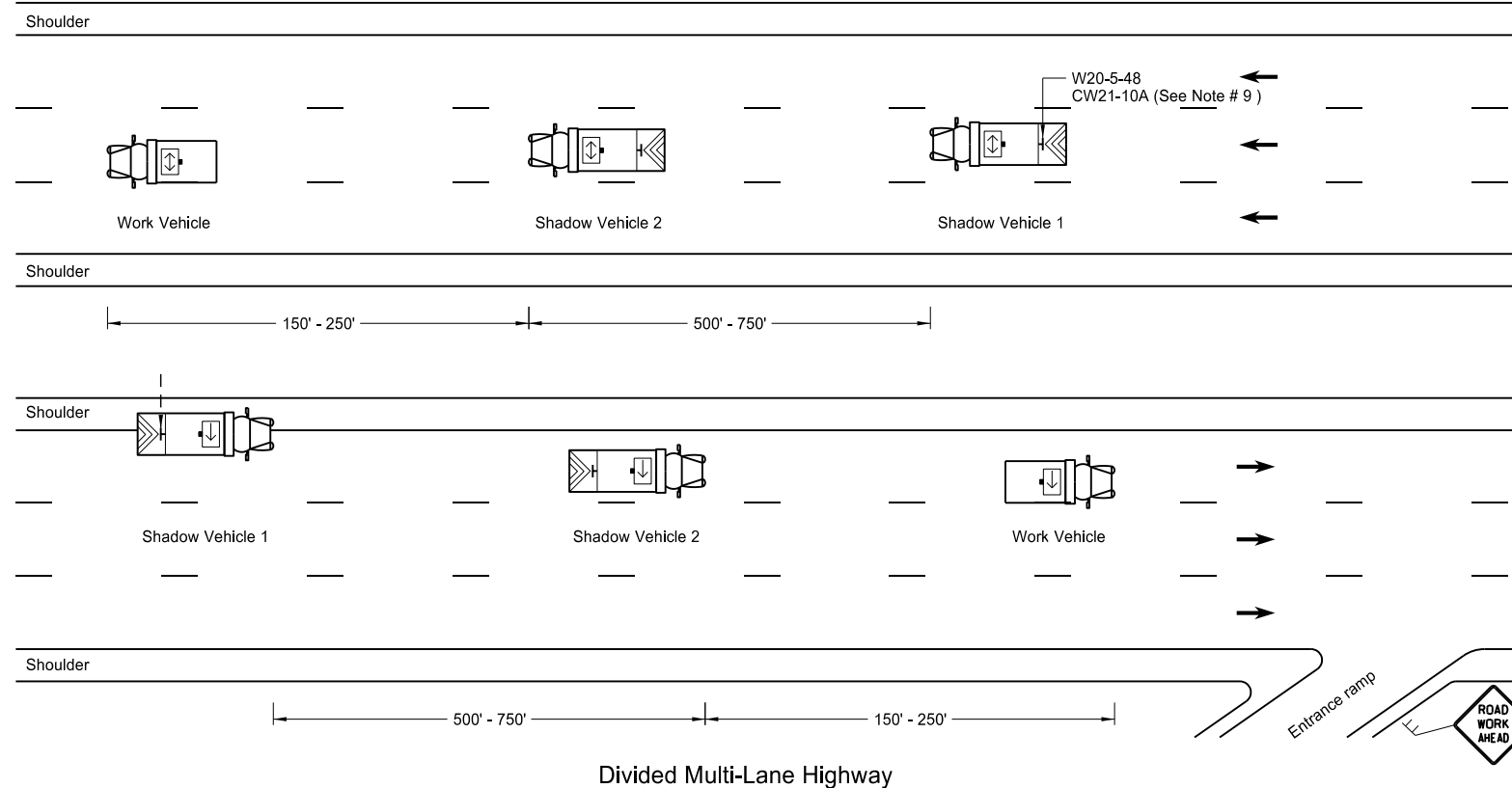


02/23/23

MOBILE OPERATION
(PAVEMENT MARKING)

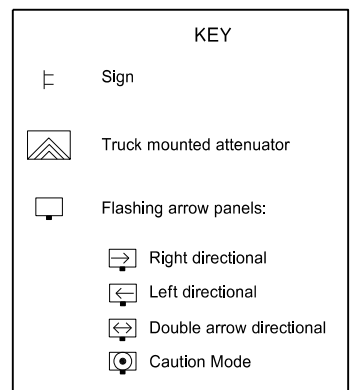


A = Left Right Center



Notes

- Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
- Display yellow rotating beacons or strobe lights on shadow and work vehicles, unless otherwise stated in the plans.
- Use Type B or Type C flashing arrow panels controlled from inside the vehicle.
- Provide each vehicle with two-way electronic communication capability.
- Move shadow vehicle 1 first to shadow other convoy vehicles when convoy changes lane.
- Vary vehicle spacing between shadow vehicle 1 and shadow vehicle 2 based on sight distance restrictions. Motorists approaching the work convoy need to see trail vehicle in time to slow down and/or change lanes as they approach shadow vehicle.
- Sign Colors
Letters = Black
Border = Black
Background = Orange
- As an option, use shadow vehicle 2 the paint tender vehicle.
- Use sign CW21-10A only during painting operation.
- Pull over work and shadow vehicles periodically to allow motor vehicle traffic to pass on two lane - two way roadways.

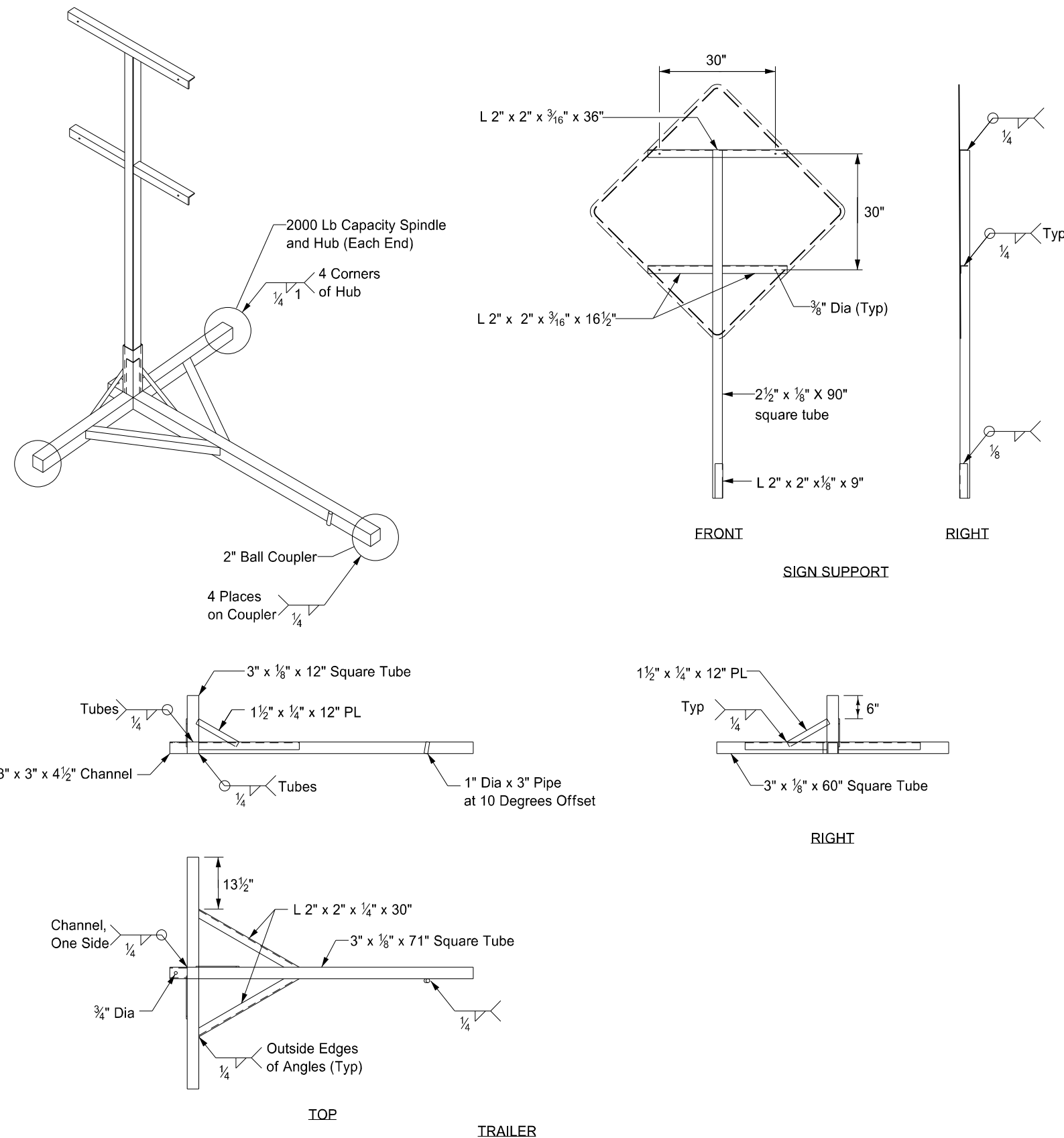


| | |
|--|---|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 9-27-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 6-18-14 | Removed shadow vehicle 2 on two lane roadways |
| 9-27-17 | Updated to active voice |
| 11-08-19 | Changed Standard Heading |

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Kirk J Hoff,
Registration Number
PE- 4683,
on 11/08/19 and the original document is stored at the
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of Transportation

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



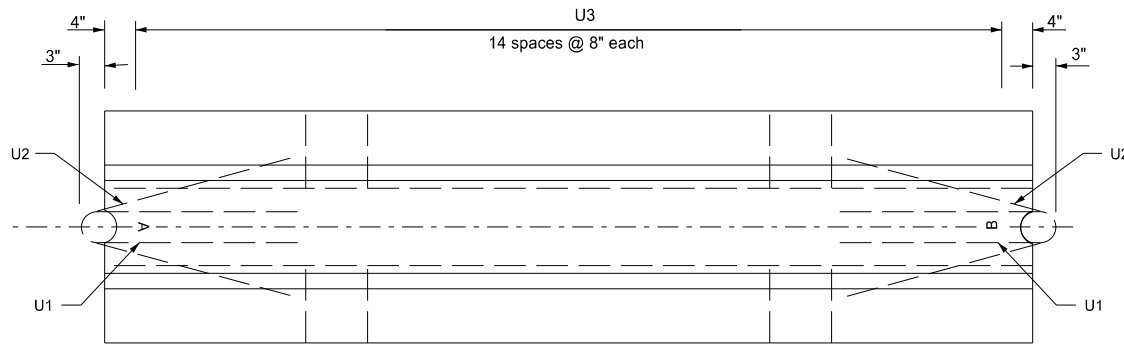
Notes:

- ① Maximum 250 pound weight of assembly.
- ② Use a 14" wheel and tire.
- ③ Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
- ④ Other NCHRP 350 or MASH crash tested assemblies are acceptable.

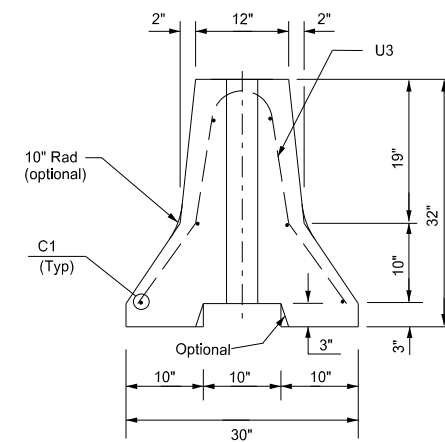
| | |
|--|-------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 11-23-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 12/02/2020 | Updated Note to active voice. |

KIRK J. HOFF
 REGISTERED
 PROFESSIONAL
 PE-4683
 ENGINEER
 NORTH DAKOTA
 12 02 2020

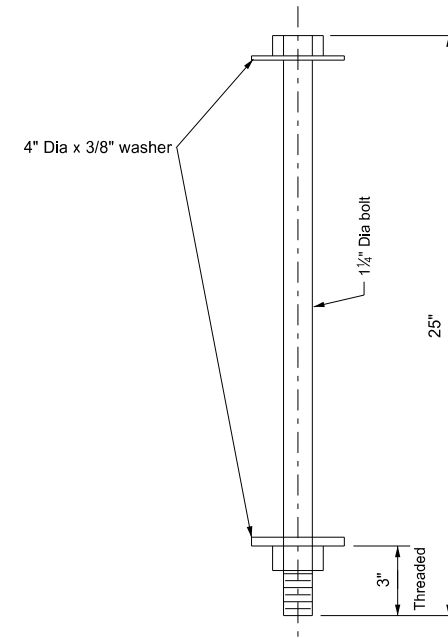
PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)



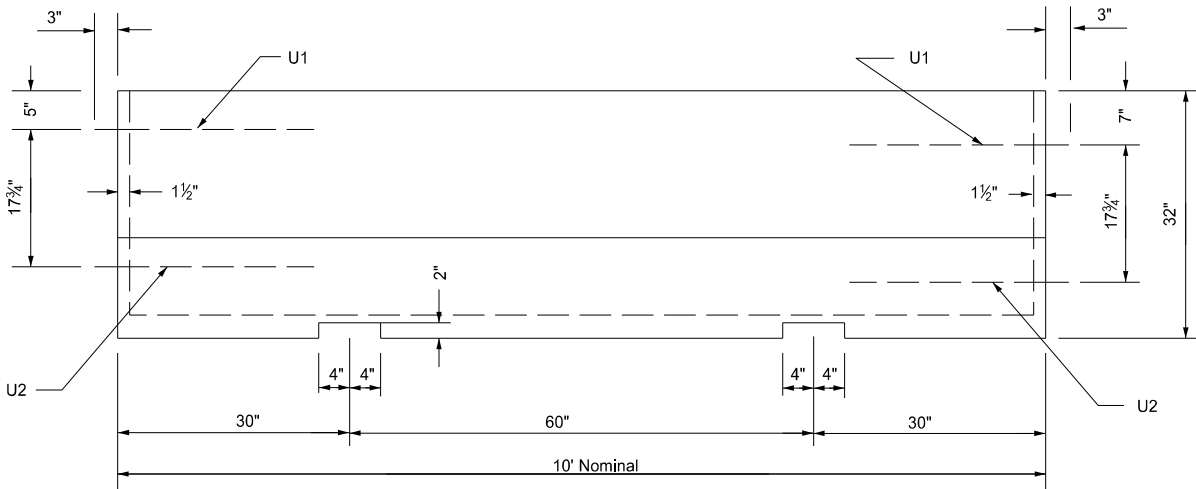
Plan View



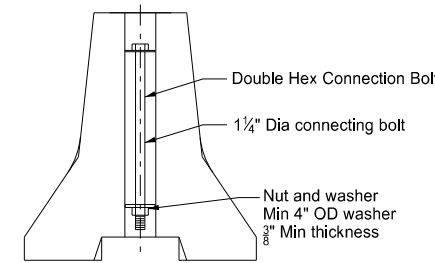
End View



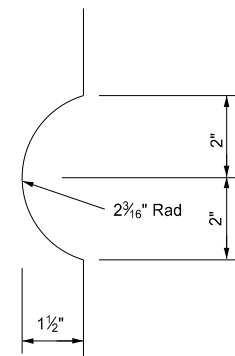
Connecting Bolt Detail
(One per 10 Ft section)



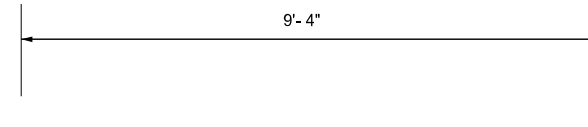
Side View



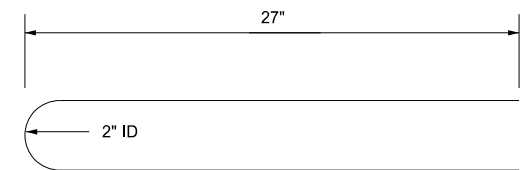
Bolt Connection Detail



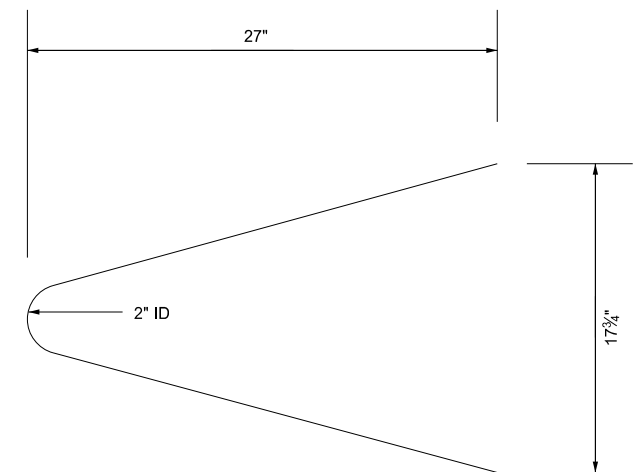
Dap Detail



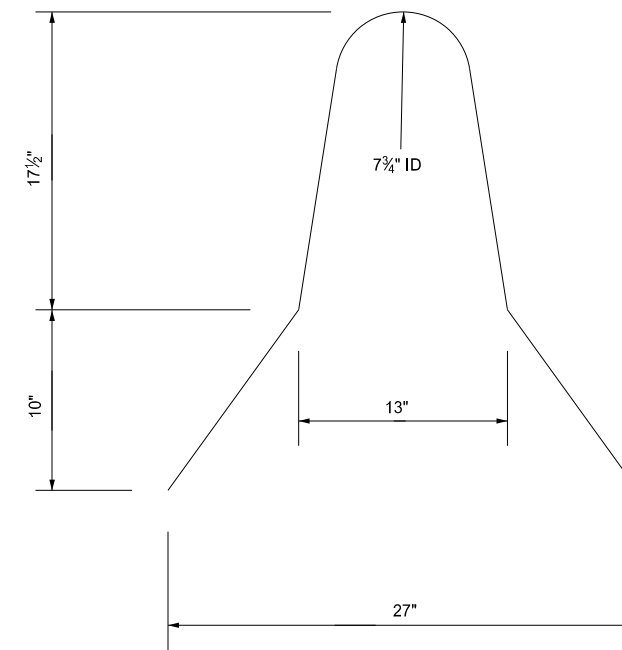
C1 Bar Detail



U1 Bar Detail



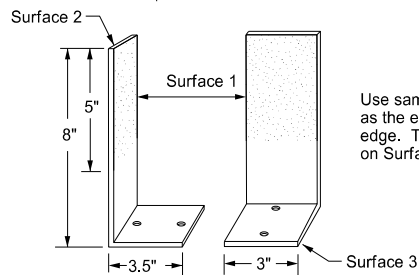
U2 Bar Detail



U3 Bar Detail

Notes:

- Galvanize all exposed hardware as per ASTM A153, except for the loop inserts.
- Use AAE-3 Concrete.
- Provide steel in accordance with Section 612 of NDDOT Standard Specifications.
- Imprint barrier ends A and B as shown with 4 inch letters. Field match A end with B end.
- Place barrier markers at the center of the barrier at 20' centers.
- Connect barrier sections with 1 1/4" Dia A-307 double hex connecting bolt. Maintain bottom nut and washer connection for duration of barrier installation.
- Place barrier to minimize openings between individual sections.



Barrier Marker Detail

Use same color reflective faces as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

Reflective Tape
Use retroreflective, acrylic microprism material with acrylic backing, 3" wide, providing the following minimum optical performance with an observation angle of 0.1° measured in candlepower for the reflector:

| Entrance Angle | Specific Intensity |
|----------------|--------------------|
| Yellow - 4" | 136 |
| White - 4" | 200 |

Adhesive
Use factory applied solid butyl rubber 1/8" thick, 2" wide on 2 1/4" wide release paper on surface 3 to temporarily mount markers to portable concrete barrier.

Marker Body
Use high impact, weatherable engineering thermo-plastic material conforming to the following:

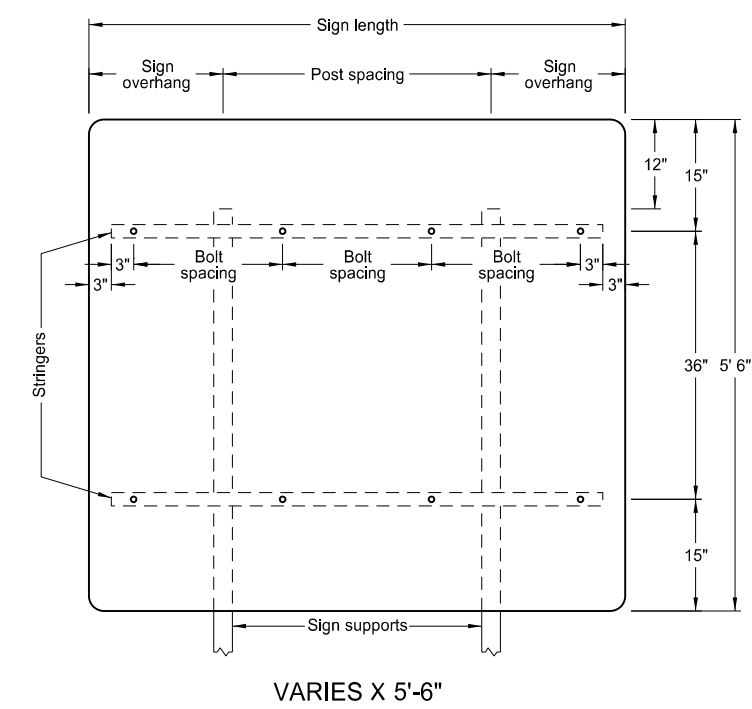
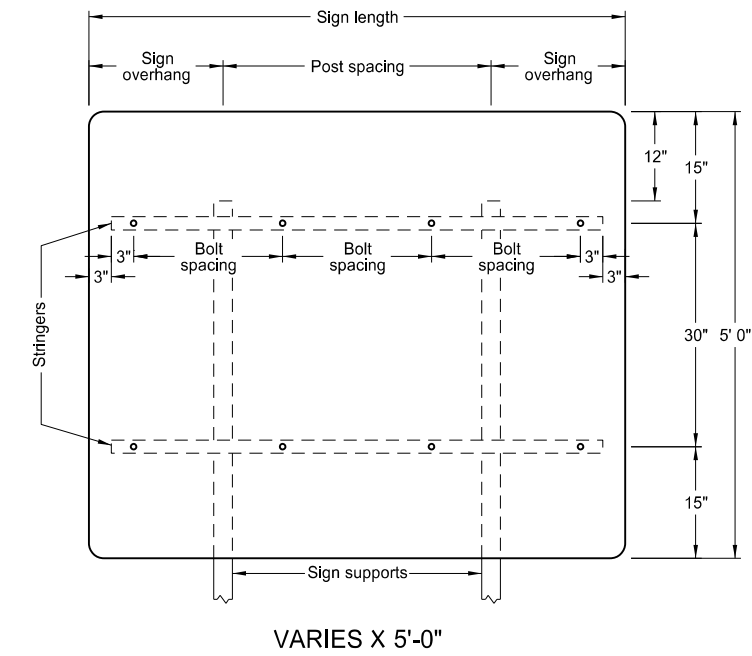
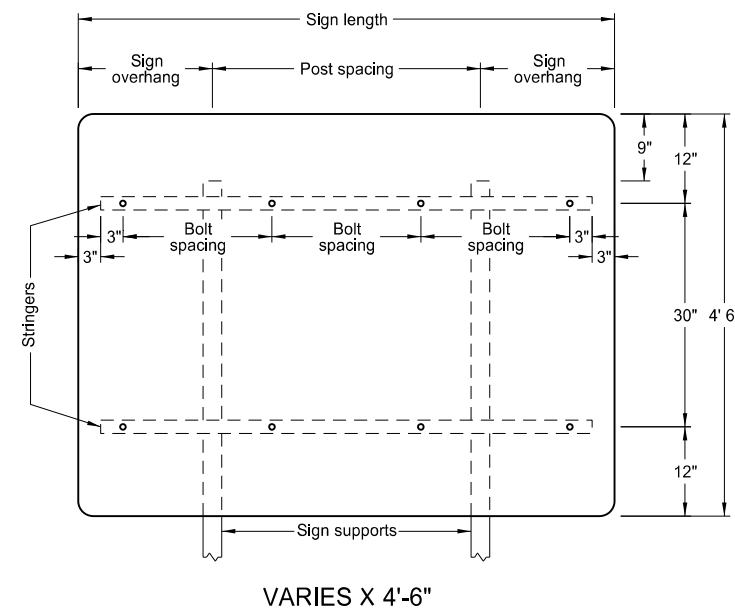
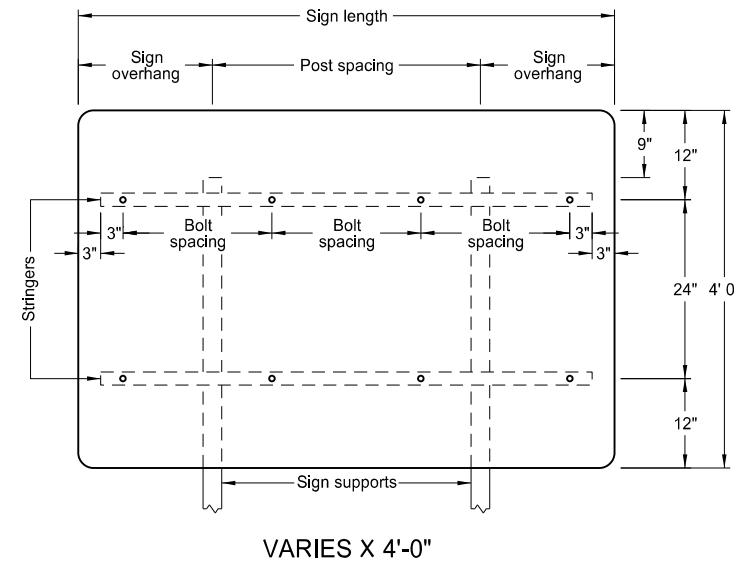
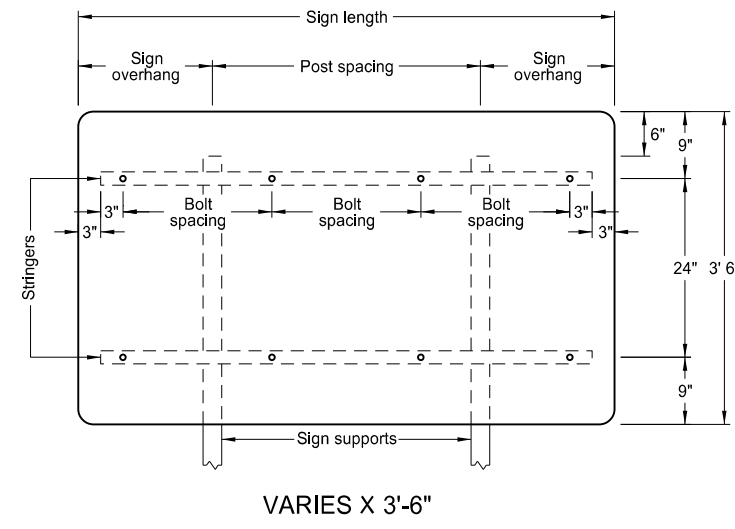
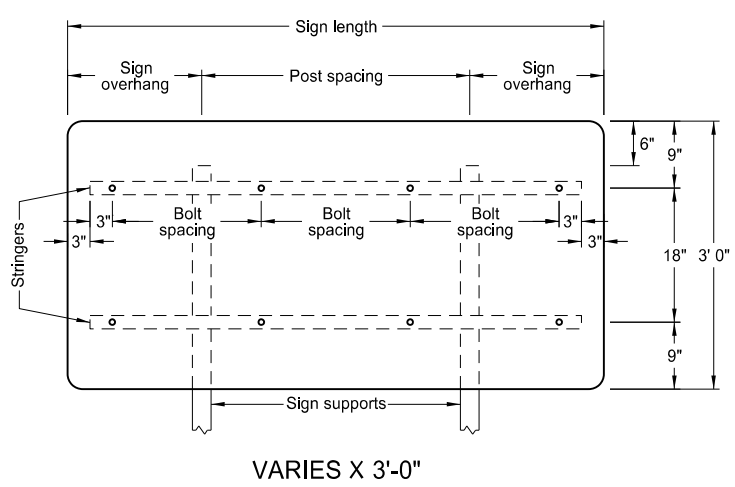
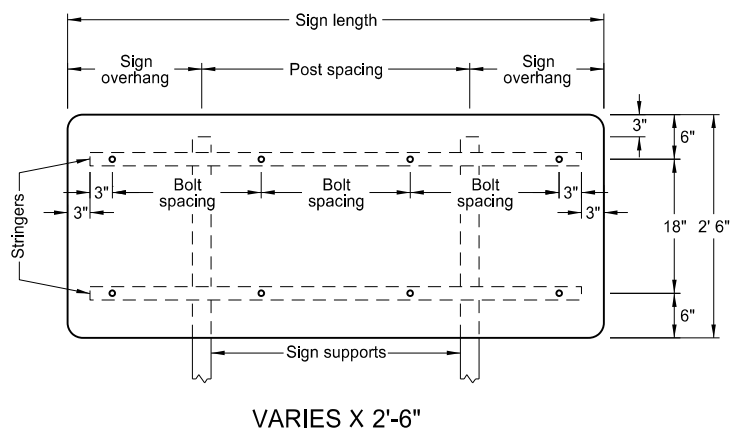
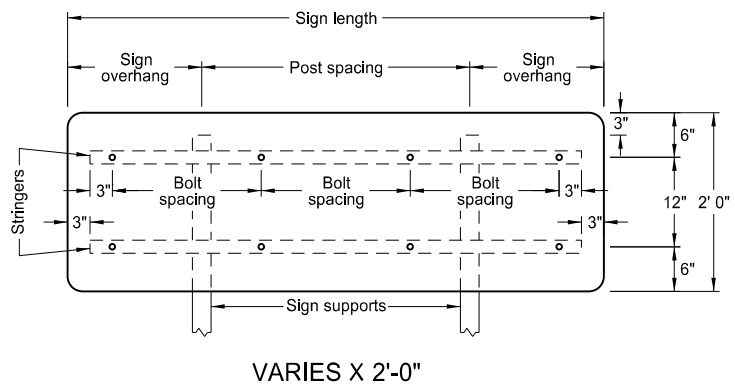
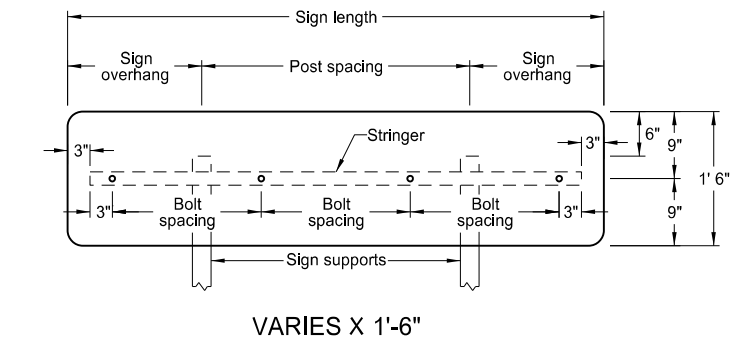
| Property | Result | ASTM Test Method |
|--|---------|------------------|
| Thickness (min) | .090" | — |
| Tensile strength (min psi) @ yield | 5,500 | D638 |
| Impact strength @ -20°F (ft-lbs/in of notch) | 3.2 | D256 Method A |
| Impact strength @ 73°F (ft-lbs/in of notch) | 14.0 | D256 Method A |
| Flexural strength, PSI 1/4" @ 73°F | 8,000 | D790 |
| Flexural modulus, PSI 1/4" @ 73°F | 300,000 | D790 |
| Elongation @ yield | 30% | D638 |

| Bar List | | | | |
|----------|------|-----|-------------|----------|
| Mark | Size | No. | Length | Shape |
| C1 | 4 | 6 | 9'- 4" | Straight |
| U1 | 4 | 2 | 4'- 8" | Bent |
| U2 | 4 | 2 | 4'- 10 1/4" | Bent |
| U3 | 4 | 15 | 5'- 4" | Bent |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|---|
| 07-20-12 | |
| REVISIONS | |
| DATE | CHANGE |
| 9-27-17 11-01-19 | Updated to active voice New Design Engr PE Stamp |

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



| 2 POSTS | | | |
|-------------|---------------|--------------|---------------|
| Sign Length | Sign Overhang | Post Spacing | Bolt Spacing |
| 4'-0" | 1'-0" | 2'-0" | 18" |
| 4'-6" | 1'-3" | 2'-0" | 21" |
| 5'-0" | 1'-0" | 3'-0" | 24" |
| 5'-6" | 1'-3" | 3'-0" | 18" |
| 6'-0" | 1'-6" | 3'-0" | 20" |
| 6'-6" | 1'-3" | 4'-0" | 22" |
| 7'-0" | 1'-6" | 4'-0" | 24" |
| 7'-6" | 1'-9" | 4'-0" | 2-20" & 2-19" |
| 8'-0" | 2'-0" | 4'-0" | 21" |
| 8'-6" | 1'-9" | 5'-0" | 2-22" & 2-23" |
| 9'-0" | 2'-0" | 5'-0" | 24" |
| 9'-6" | 1'-9" | 6'-0" | 4-20" & 1-22" |
| 10'-0" | 2'-0" | 6'-0" | 2-21" & 3-22" |
| 10'-6" | 2'-3" | 6'-0" | 4-23" & 1-22" |
| 11'-0" | 2'-6" | 6'-0" | 24" |
| 11'-6" | 2'-9" | 6'-0" | 21" |
| 12'-0" | 2'-0" | 8'-0" | 22" |
| 12'-6" | 2'-3" | 8'-0" | 23" |
| 13'-0" | 2'-6" | 8'-0" | 24" |
| 13'-6" | 2'-9" | 8'-0" | 3-22" & 4-21" |
| 14'-0" | 3'-0" | 8'-0" | 2-23" & 5-22" |
| 14'-6" | 3'-3" | 8'-0" | 6-23" & 1-24" |
| 15'-0" | 3'-6" | 8'-0" | 24" |
| 15'-6" | 2'-9" | 10'-0" | 6-22" & 2-21" |
| 16'-0" | 3'-0" | 10'-0" | 4-23" & 4-22" |
| 16'-6" | 3'-3" | 10'-0" | 6-23" & 2-24" |
| 17'-0" | 3'-6" | 10'-0" | 24" |
| 17'-6" | 3'-9" | 10'-0" | 22" |
| 18'-0" | 3'-0" | 12'-0" | 6-23" & 3-22" |
| 18'-6" | 3'-3" | 12'-0" | 6-23" & 3-24" |
| 19'-0" | 3'-6" | 12'-0" | 24" |
| 19'-6" | 3'-9" | 12'-0" | 8-22" & 2-23" |
| 20'-0" | 4'-0" | 12'-0" | 8-23" & 2-22" |

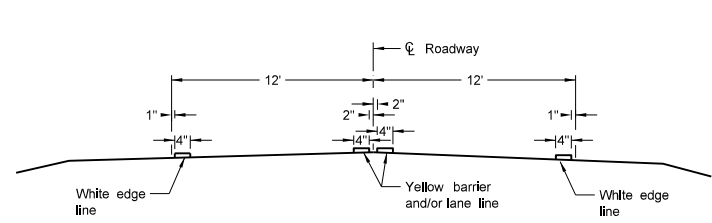
- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1 1/2" x 1 1/2" perforated square tube stringers.
 3. Punch holes round for 3/8" bolt.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|--------------------------------|
| 9-25-12 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-30-18 | Updated notes to active voice. |
| 9-04-19 | New Design Engineer PE Stamp. |

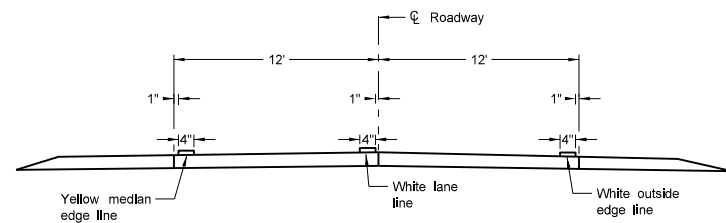
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 Registration Number
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PAVEMENT MARKING

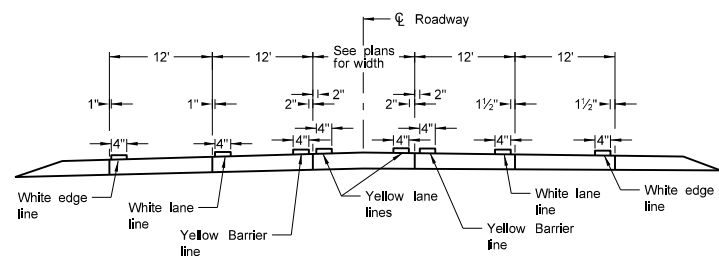
D-762-4



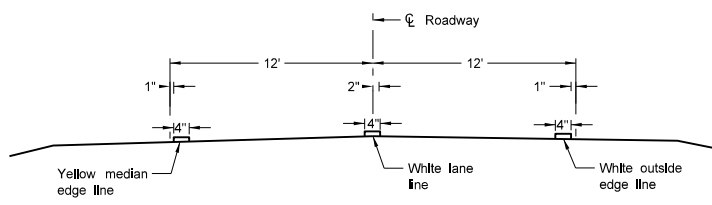
Two Lane Two Way
RURAL ROADWAY



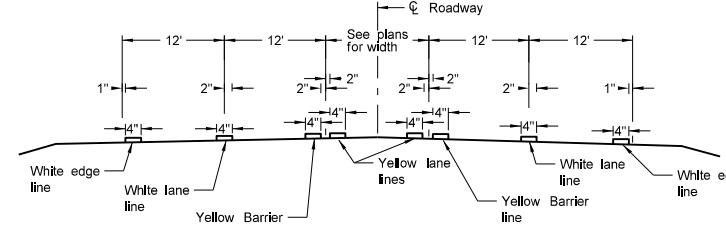
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



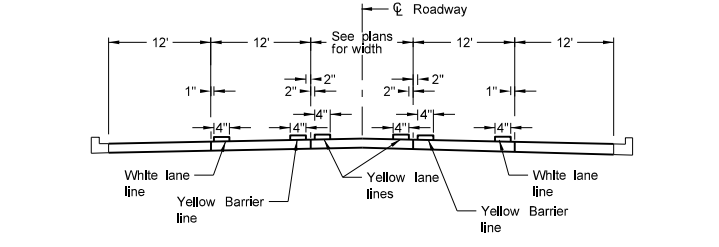
RURAL FIVE LANE ROADWAY
Concrete Section



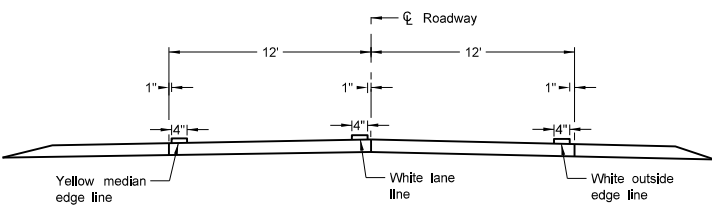
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



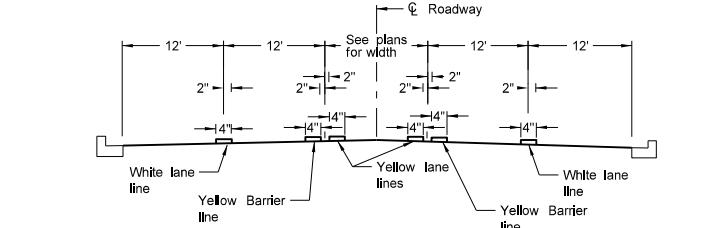
RURAL FIVE LANE ROADWAY
Asphalt Section



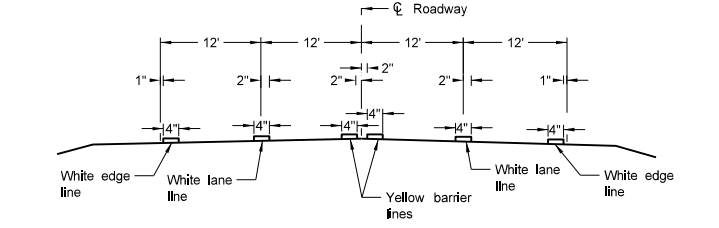
URBAN FIVE LANE SECTION
Concrete Section



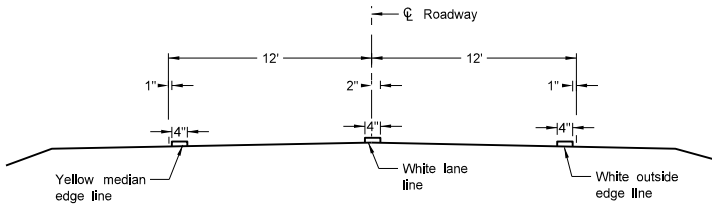
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



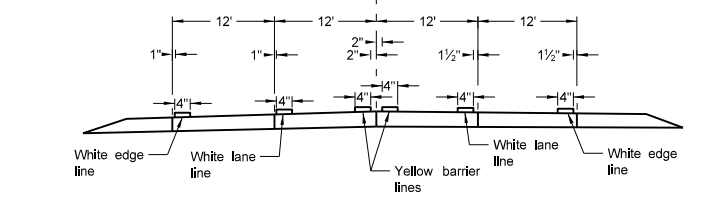
URBAN FIVE LANE SECTION
Asphalt Section



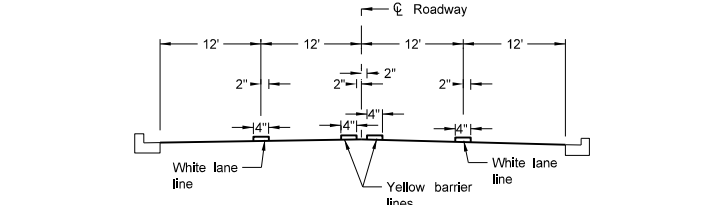
RURAL FOUR LANE ROADWAY
Asphalt Section



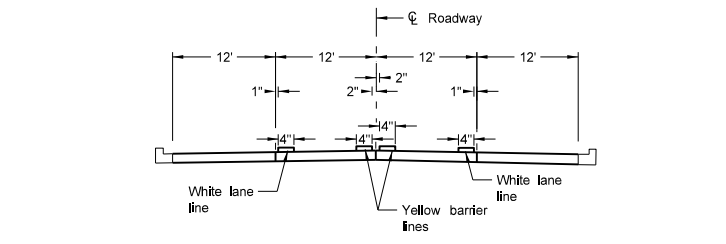
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



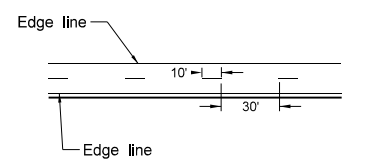
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



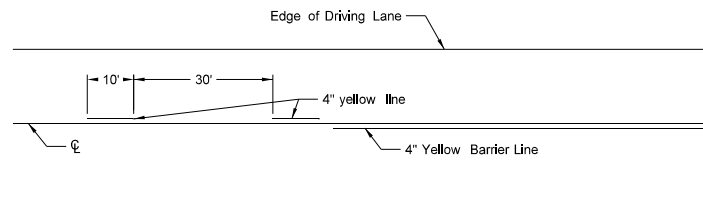
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.

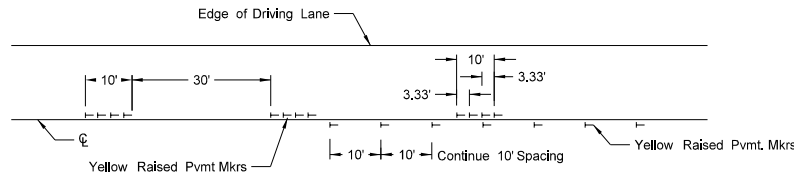
| | |
|--|-------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-17-17 | Updated to active voice. |
| 08-27-19 | New Design Engineer PE Stamp. |

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Registration Number
PE-4683,
on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

SHORT-TERM PAVEMENT MARKING

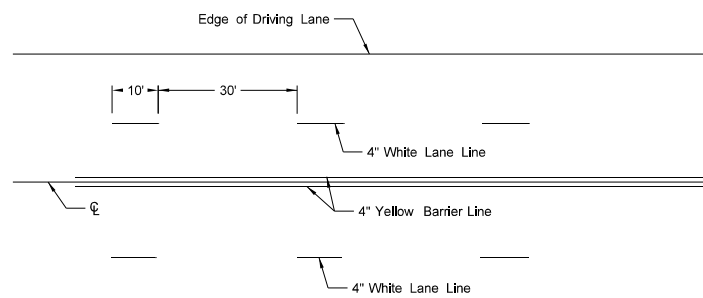


Painted or Tape Lines

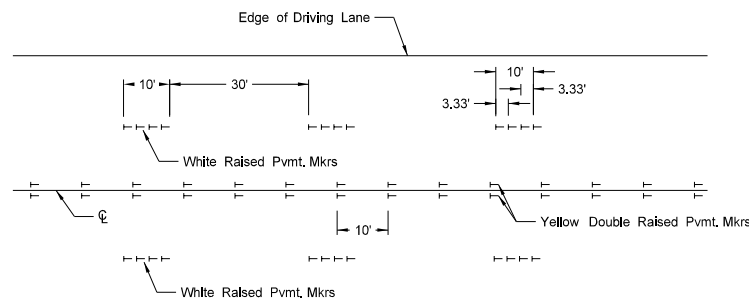


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

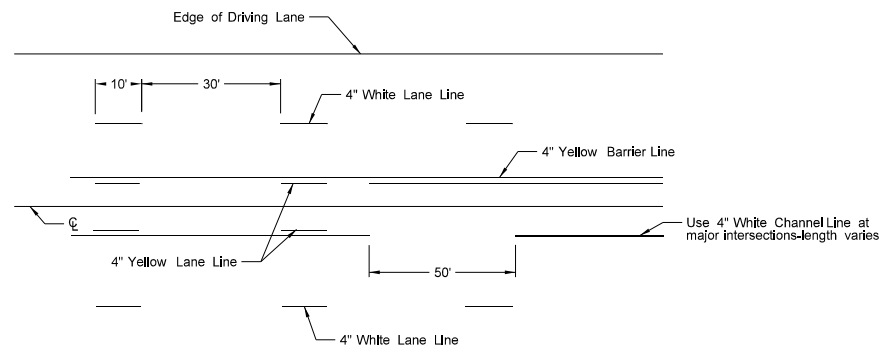


Painted or Tape Lines

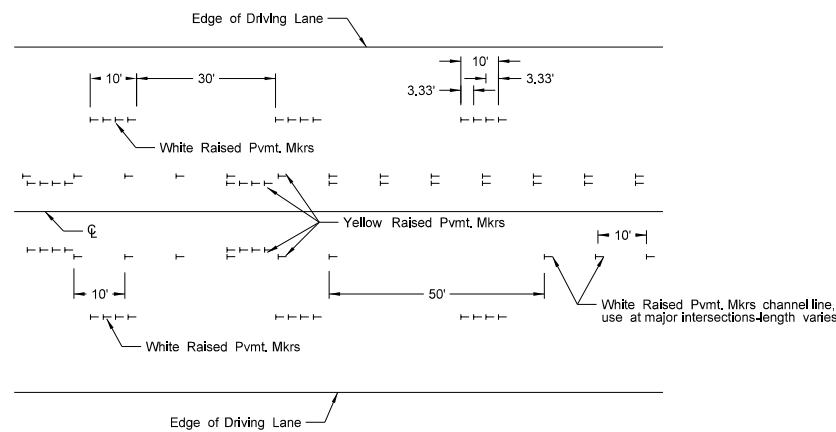


Raised Pavement Markers

FOUR LANE ROADWAY

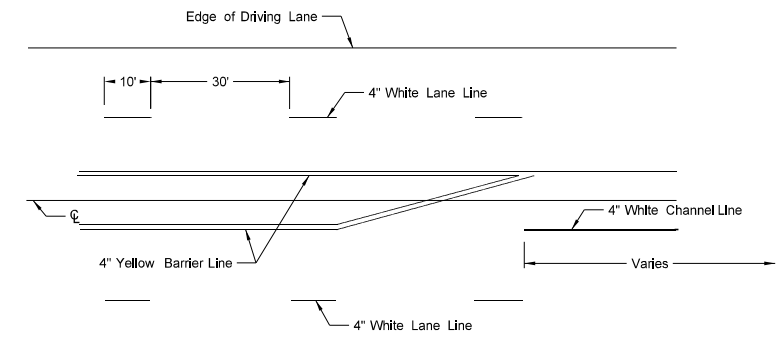


Painted or Tape Lines

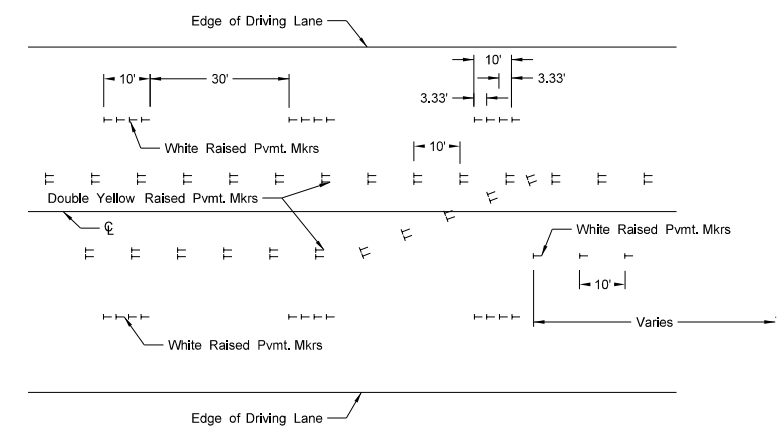


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

1. Place no passing zones on two-lane two-way roadways as shown. In lieu of short term no passing zone pavement markings, place no passing zone signs. Replace no passing zone signs with short term no passing zone pavement marking within three days.
2. Place short term center line stripe (paint) on top lift to match exact placement of permanent stripe.
3. Remove raised markers and tape markings after permanent pavement marking is installed.

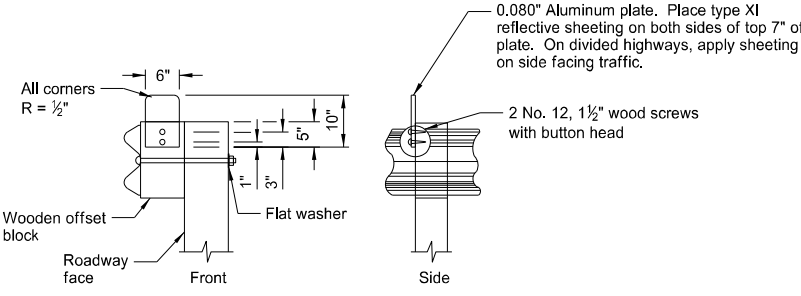
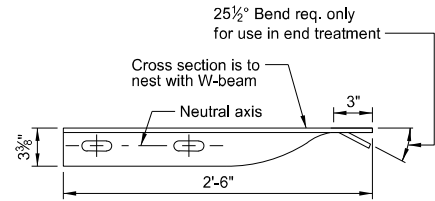
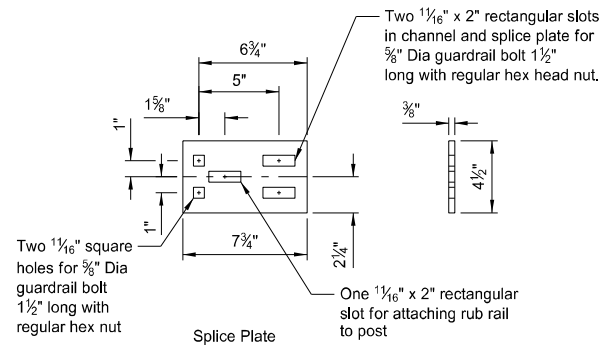
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|---|
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 3-29-16 | Re-numbered to be D-762-11 (previously was D-762-6) |
| 10-17-17 | Updated to active voice. |
| 8-27-19 | New Design Engineer PE Stamp. |

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 Kirk J Hoff,
 Registration Number
 PE-4683,
 on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

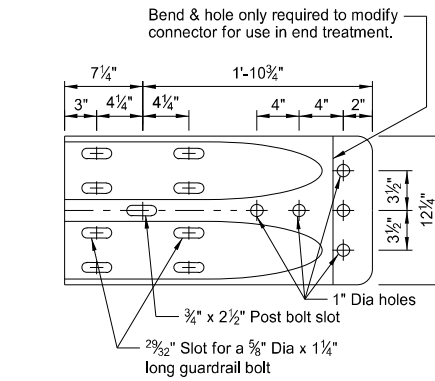
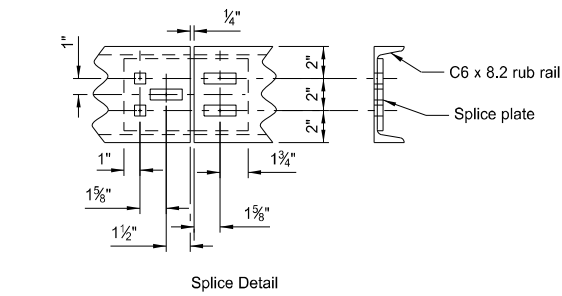
W-BEAM GUARDRAIL GENERAL DETAILS

NOTES:

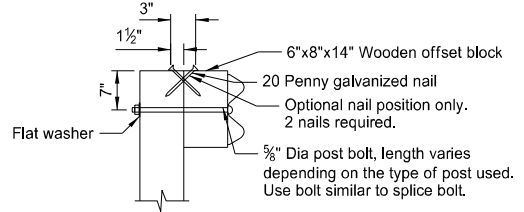
- Place reflector plates at the first post and spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. Use reflector the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
- Dispose of excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material where guardrail is installed after mat is placed. Include cost of excavation and replacing of bituminous material in the price bid for other items.
- Place Object Marker within the vertical edges of the Impact Plate. Use type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply sheeting to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. Attach the Object Marker to the Impact Head Plate with non-rust rivets or some other non-rust attachment device. Slope stripes downward toward the roadway side.
- Guardrail installation height tolerance = $-\frac{1}{4}"$, $+1"$.
- Standard W-Beam rail post bolt slot spacing is 6'-3". Post bolt slot spacing of 3'-1 $\frac{1}{2}"$ is acceptable.



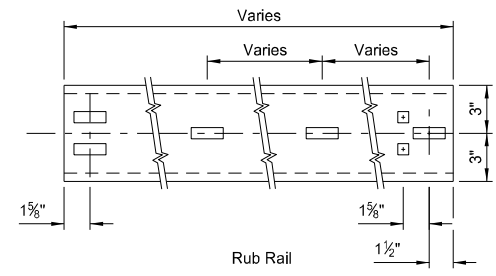
REFLECTORIZED PLATE DETAIL
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



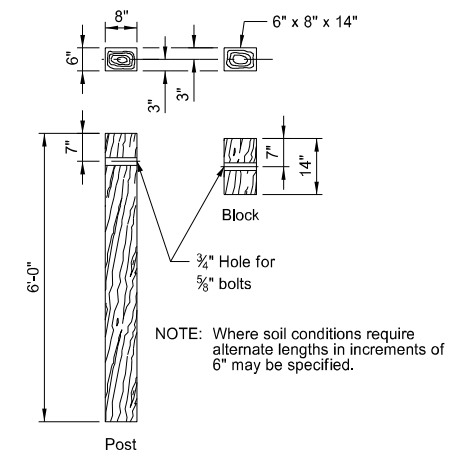
W BEAM TERMINAL CONNECTOR



TYPICAL POST ATTACHMENT DETAIL

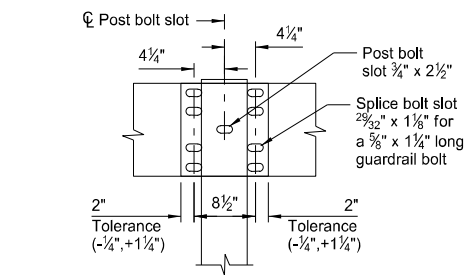


C6x8 RUB RAIL AND SPLICE PLATE

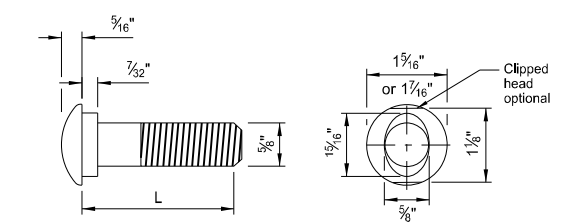


6"x8" TIMBER POST & BLOCK

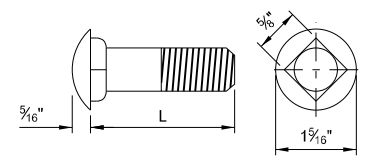
NOTE: Where soil conditions require alternate lengths in increments of 6" may be specified.



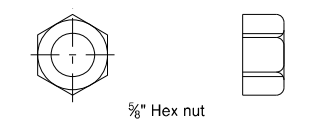
SPLICE DETAIL



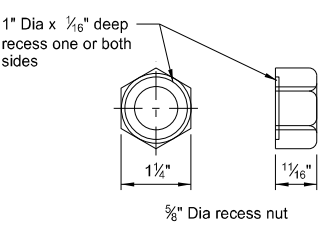
| 5 $\frac{1}{8}"$ Diameter Guardrail Bolt | |
|--|------------------------------------|
| L | Thread Length |
| 1 $\frac{1}{4}"$ | Full length thread |
| 2" | 1 $\frac{1}{4}"$ Min thread length |
| 9 $\frac{1}{2}"$ | 4" Min thread length |
| 18" | 4" Min thread length |
| 20" | 4" Min thread length |
| 22" | 4" Min thread length |
| 25" | 4" Min thread length |



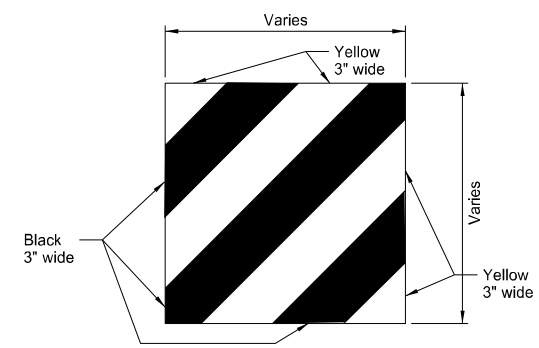
| 5 $\frac{1}{8}"$ Diameter Carriage Bolt | |
|---|------------------------------------|
| L | Thread Length |
| 1 $\frac{1}{2}"$ | Full length thread |
| 3" | 1 $\frac{1}{2}"$ Min thread length |
| 11" | 1 $\frac{3}{4}"$ Min thread length |
| 13" | 1 $\frac{3}{4}"$ Min thread length |



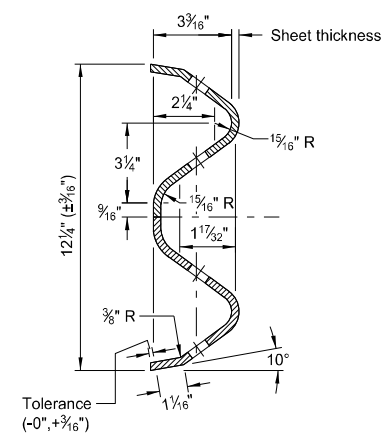
5 $\frac{1}{8}"$ CARRIAGE BOLT & NUT



5 $\frac{1}{8}"$ GUARDRAIL BOLT & RECESS NUT



IMPACT HEAD OBJECT MARKER

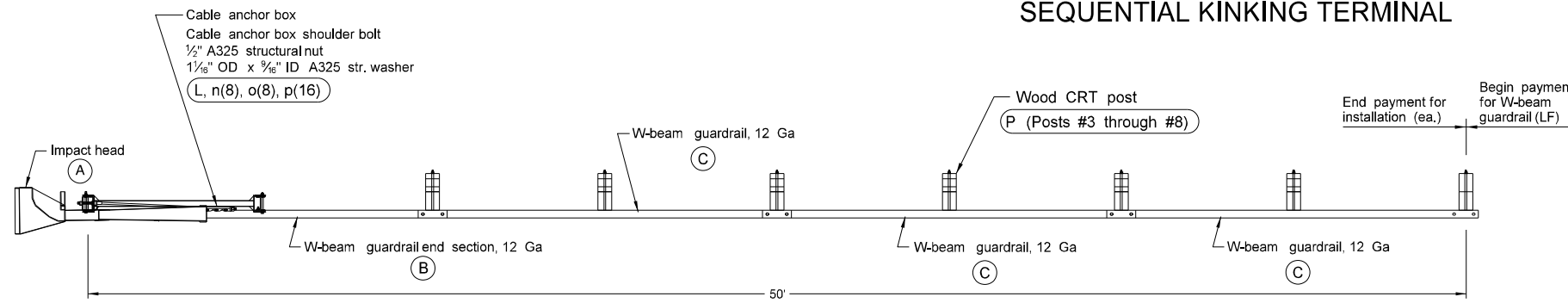


W-BEAM CROSS SECTION

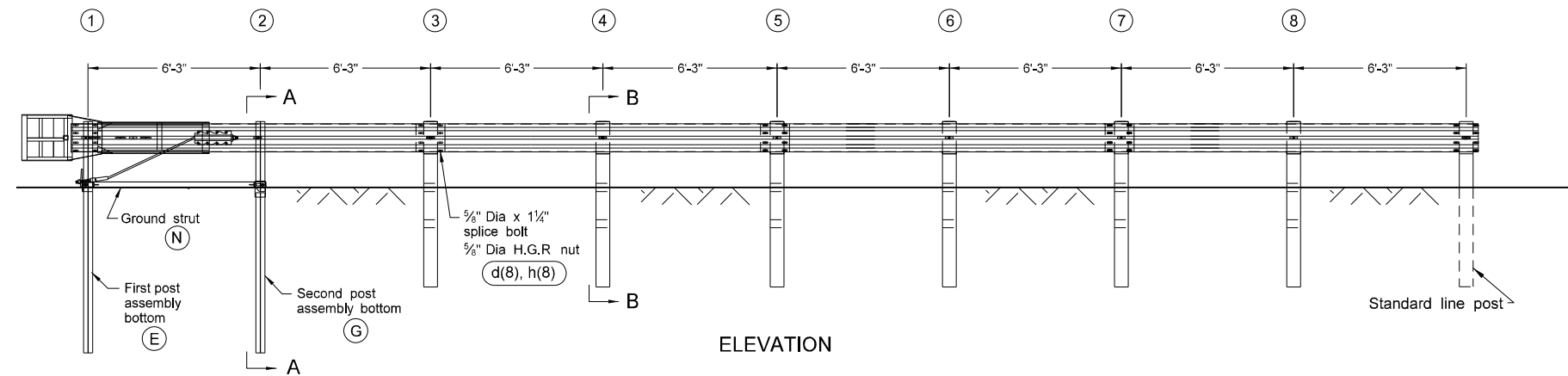
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-11-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-25-19 | Updated notes to active voice and added Note 5. |
| 12-02-20 | Updated clipped head to optional |

KIRK J. HOFF
REGISTERED
PROFESSIONAL
ENGINEER
NORTH DAKOTA
12 02 2020

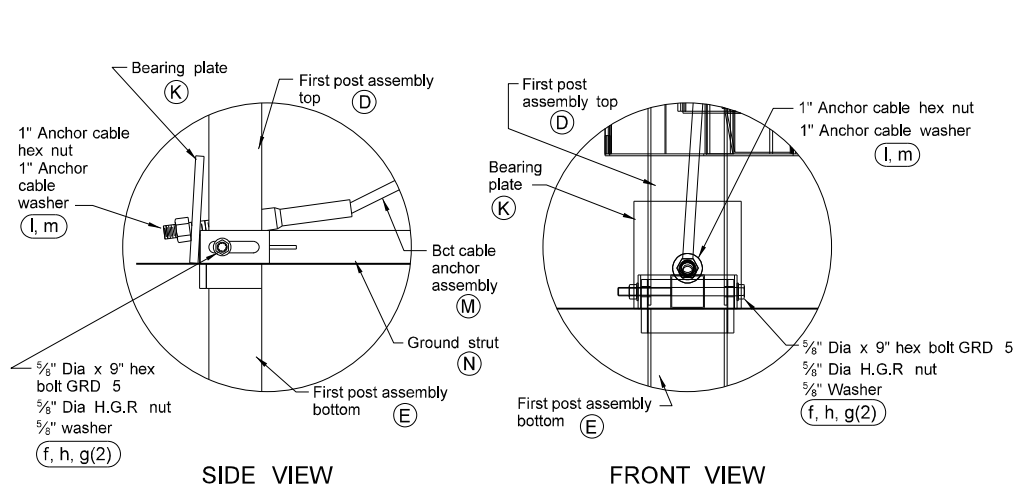
SEQUENTIAL KINKING TERMINAL



PLAN



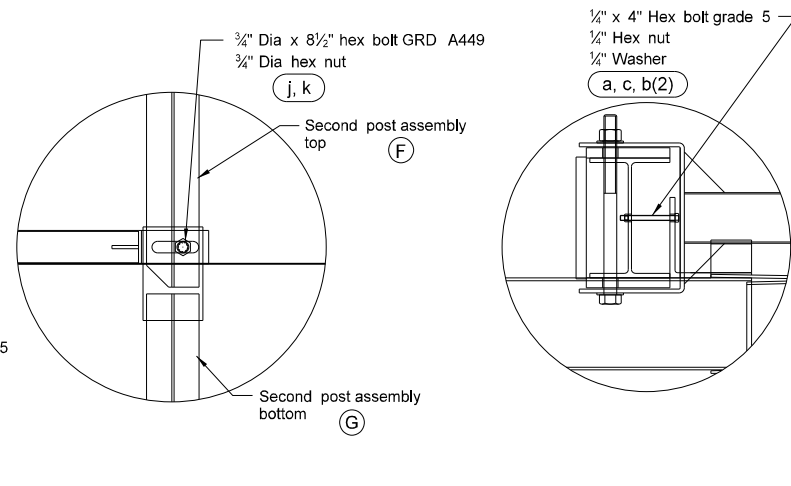
ELEVATION



SIDE VIEW

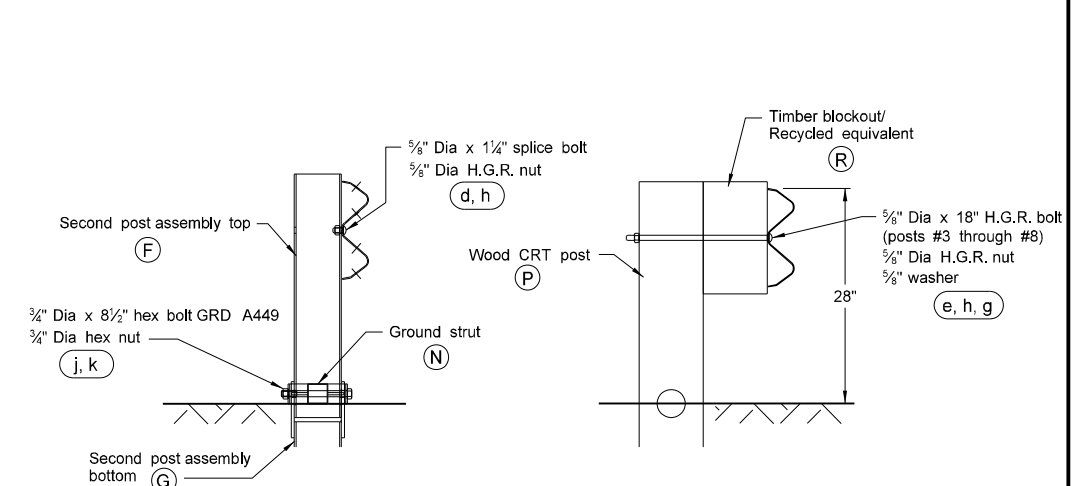
FRONT VIEW

POST #1 CONNECTION DETAILS



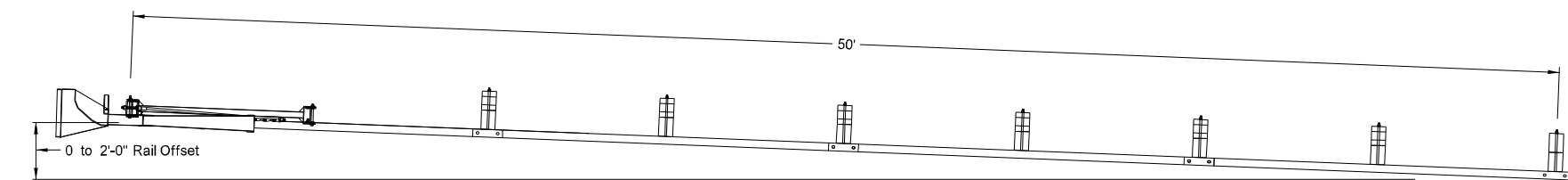
SIDE VIEW DETAIL OF POST #2

IMPACT HEAD CONNECTION DETAIL



SECTION A-A
Post #2

SECTION B-B
Posts #3 through #8



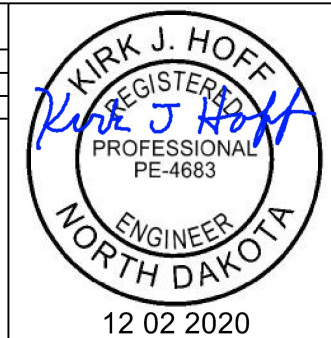
FLARED INSTALLATION
25:1 maximum flare rate

GENERAL NOTES:

1. Use breakaway posts with the SKT.
2. Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the SKT at a rate of up to 25:1 to prevent shoulder encroachment by the impact head.
4. Grade site as needed to prevent lower sections of the posts from protruding more than 4" above ground (measured along a 5' cord).
5. Drive the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material satisfactorily to prevent settlement.
6. When rock is encountered during excavation, use a 10" diameter post hole, 20" into the rock surface, if approved by the engineer. Place granular material in the bottom of the hole, approximately 2 1/2" deep to provide drainage. Field cut posts 1 & 2 to length, place in the hole, and backfill with adequately compacted material excavated from the hole.
7. Place the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
8. "Toe nail" the wood blockouts on post #3 through post #8 with two 20 penny galvanized nails in each rectangular post, to prevent them from turning when the wood shrinks.

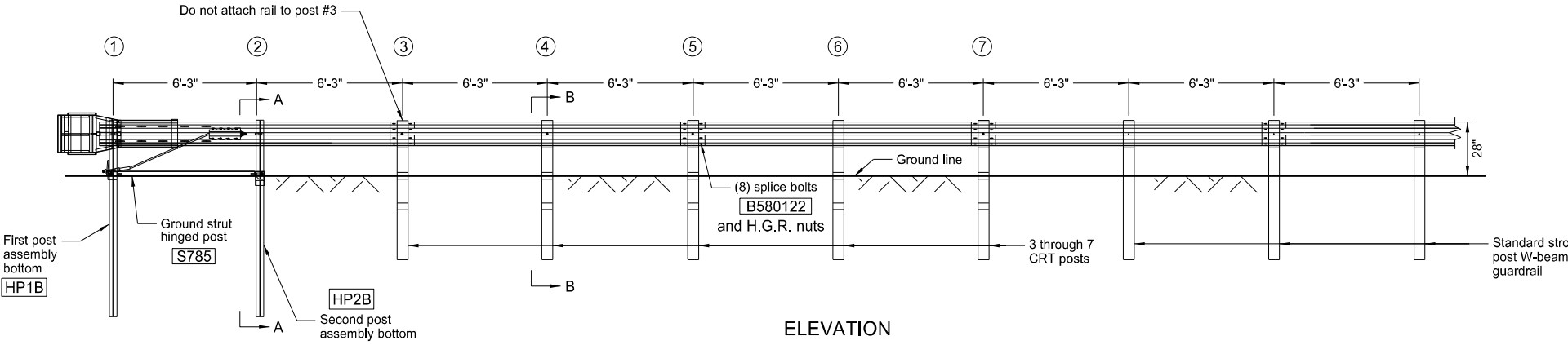
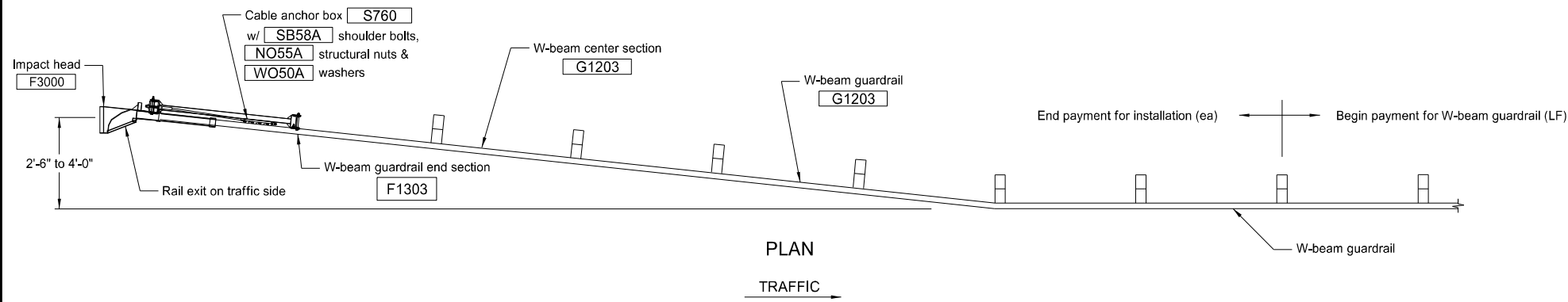
| BILL OF MATERIALS | | |
|-------------------|-----|---|
| ITEM | QTY | |
| A | 1 | IMPACT HEAD |
| B | 1 | W-BEAM GUARDRAIL END SECTION, 12 Ga |
| C | 3 | W-BEAM GUARDRAIL, 12 Ga |
| D | 1 | FIRST POST ASSEMBLY TOP |
| E | 1 | FIRST POST ASSEMBLY BOTTOM |
| F | 1 | SECOND POST ASSEMBLY TOP |
| G | 1 | SECOND POST ASSEMBLY BOTTOM |
| K | 1 | BEARING PLATE |
| L | 1 | CABLE ANCHOR BOX |
| M | 1 | BCT CABLE ANCHOR ASSEMBLY |
| N | 1 | GROUND STRUT HINGED POST |
| P | 6 | WOOD CRT POST |
| R | 6 | TIMBER BLOCKOUT/RCY EQUIVALENT |
| HARDWARE | | |
| a | 2 | 1/4 " x 4" HEX BOLT Grade 5 |
| b | 4 | 1/4" WASHER |
| c | 2 | 1/4" HEX NUT |
| d | 25 | 5/8" Dia X 1 1/4" SPLICE BOLT, POST #2 |
| e | 6 | 5/8" Dia X 18" H.G.R. BOLT (POSTS 3 THRU 8) |
| f | 1 | 5/8" Dia X 9" HEX BOLT GRD 5 |
| g | 8 | 5/8" WASHER |
| h | 32 | 5/8" Dia H.G.R. NUT |
| j | 1 | 3/4" Dia X 8 1/2" HEX BOLT GRD A449 |
| k | 1 | 3/4" Dia HEX NUT |
| l | 2 | 1" ANCHOR CABLE HEX NUT |
| m | 2 | 1" ANCHOR CABLE WASHER |
| n | 8 | GROUND STRUT HINGED POST |
| o | 8 | 1/2" A325 STRUCTURAL NUT |
| p | 16 | 1 1/8" OD X 5/8" ID A325 STR. WASHER |

| | |
|--|--------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-11-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-02-20 | Updated notes to active voice. |



FLARED ENERGY ABSORBING TERMINAL

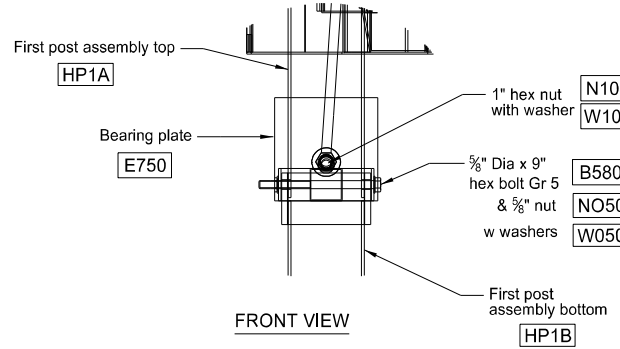
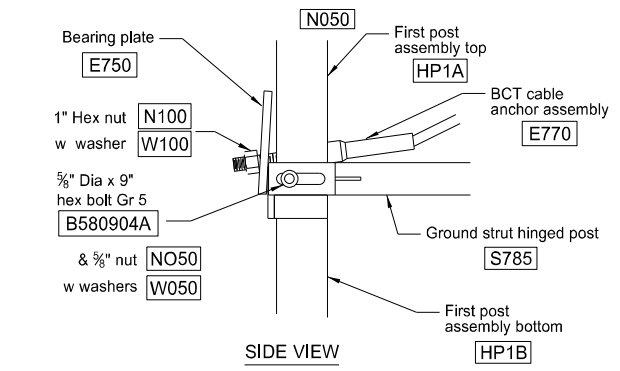
D-764-6



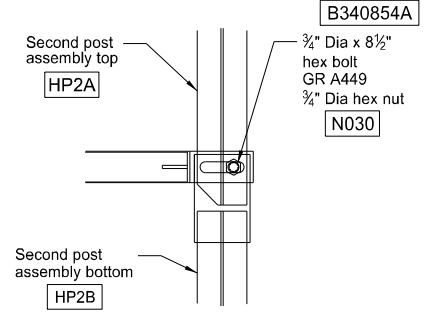
| ITEM # | QTY | BILL OF MATERIALS |
|----------|-----|---|
| F3000 | 1 | IMPACT HEAD |
| F1303 | 1 | W-BEAM GUARDRAIL END SECTION, 12 GA |
| G1203 | 2 | W-BEAM GUARDRAIL, 12 GA |
| HP1A | 1 | FIRST POST ASSEMBLY TOP |
| HP1B | 1 | FIRST POST ASSEMBLY BOTTOM |
| HP2A | 1 | SECOND POST ASSEMBLY TOP |
| HP2B | 1 | SECOND POST ASSEMBLY BOTTOM |
| P671 | 5 | WOOD CRT POST |
| P675 | 5 | TIMBER BLOCKOUT OR RECYCLED EQUIVALENT |
| E750 | 1 | BEARING PLATE |
| S760 | 1 | CABLE ANCHOR BOX |
| E770 | 1 | BCT CABLE ANCHOR ASSEMBLY |
| S785 | 1 | GROUND STRUT HINGED POST |
| HARDWARE | | |
| B140404 | 2 | 1/4" Dia x 4" HEX BOLT |
| WO14 | 4 | 1/4" WASHER |
| N014 | 2 | 1/4" HEX NUT |
| B580122 | 17 | 5/8" Dia x 1 1/4" SPLICE BOLT |
| B581802 | 4 | 5/8" Dia x 10" H.G.R. BOLT (POSTS 3 THRU 6) |
| B580904A | 1 | 5/8" Dia x 9" HEX BOLT GR 5 |
| WO50 | 5 | 5/8" WASHER |
| N050 | 22 | 5/8" Dia H.G.R. NUT |
| B340854A | 1 | 3/4" Dia x 8 1/2" HEX BOLT GR A449 |
| NO30 | 1 | 3/4" Dia HEX NUT |
| N100 | 2 | 1" ANCHOR CABLE HEX NUT |
| W100 | 2 | 1" ANCHOR CABLE WASHER |
| SB58A | 8 | CABLE ANCHOR BOX SHOULDER BOLT |
| NO55A | 8 | 1/2" A325 STRUCTURAL NUT |
| WO50A | 16 | 1 1/16" OD x 3/16" ID A325 STR. WASHER |

GENERAL NOTES

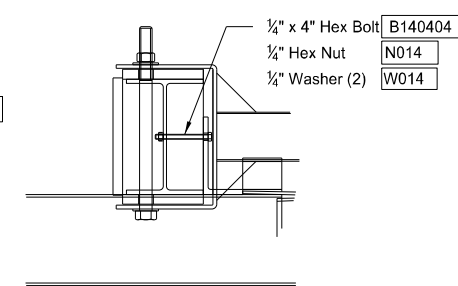
- Use wood posts with the Flared Energy Absorbing Terminal except posts #1 and #2.
- Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Grade site as needed to prevent lower sections of the posts from protruding more than 4 inches above the ground (measured along a 60 inch cord).
- Drive the lower section without the upper post attached. If the post is placed in a drilled hole, compact the backfill material satisfactorily to prevent settlement.
- When rock is encountered during excavation, use a 12" diameter post hole 20" into the rock surface, if approved by the Engineer. Place granular material in the bottom of hole approximately 2 1/2" deep to provide drainage. Field cut soil tubes to length, place in hole, and back fill with adequately compacted material excavated from hole.
- Place the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts with two 20 penny galvanized nails in each post to prevent them from turning when the wood shrinks.
- Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, flare the Flared Energy Absorbing Terminal at the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, turn the Flared Energy Absorbing Terminal parallel to the roadway.



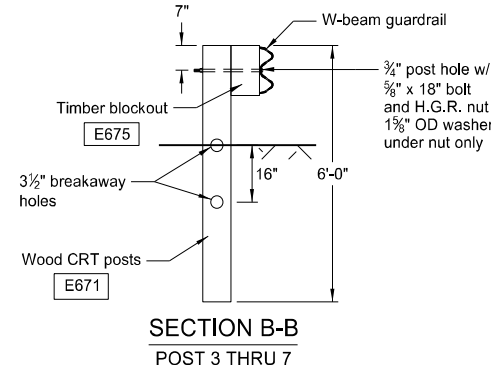
POST #1 CONNECTION DETAILS



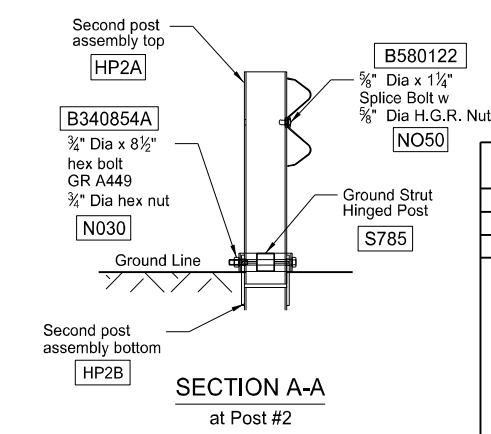
SIDE VIEW DETAIL OF POST #2



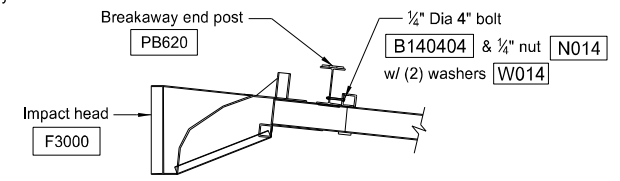
IMPACT HEAD CONNECTION DETAIL



SECTION B-B
POST 3 THRU 7



SECTION A-A
at Post #2



IMPACT HEAD CONNECTING DETAIL

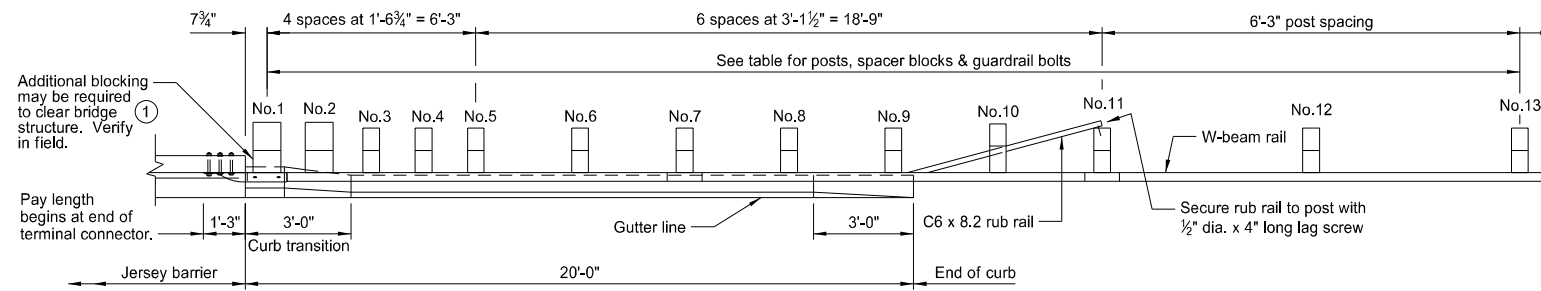
| | |
|--|-------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-11-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-02-20 | Update notes to active voice. |



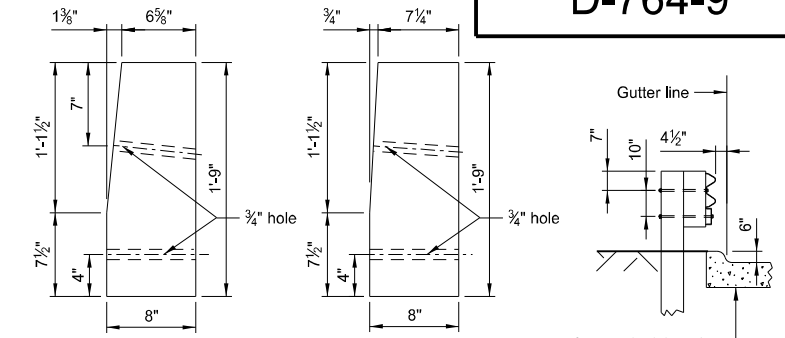
12 02 2020

W-BEAM TRANSITION TO CONCRETE JERSEY BARRIER WITH APPROACH CURB

D-764-9

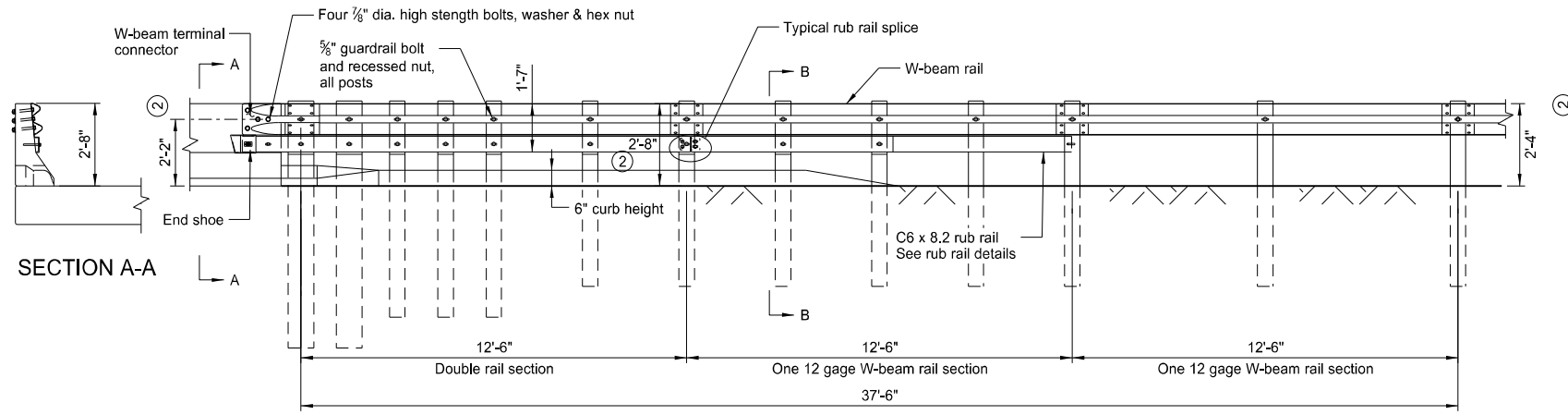


PLAN

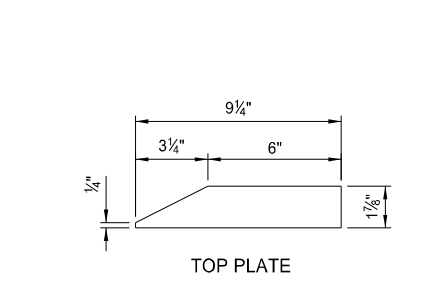


TAPERED TIMBER BLOCK DETAILS

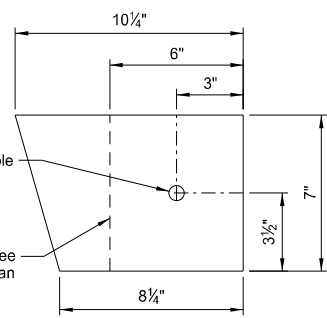
| POST, TIMBER BLOCK & BOLT TABLE | | |
|---------------------------------|---------------------------|------------------------------|
| DESCRIPTION | POST NO. | SIZE |
| Post | 1 & 2 | 10" X 10" X 8'-0" min long |
| | 3-5 | 6" X 8" X 7'-0" min long |
| | 6-13 | 6" X 8" X 6'-0" min long |
| Spacer block | 1-2 | 10" X 8" X 21" tapered block |
| | 3-9 | 6" X 8" X 21" |
| | 10 | 6" X 9 3/4" X 14" |
| | 11-13 | 6" X 8" X 14" |
| Guardrail bolt & recessed nut | 1 & 2 & 10 | 5/8" Dia X 20" - guardrail |
| | 3-9, 11-13 | 5/8" Dia X 18" - guardrail |
| | 1-2 | 5/8" Dia X 22" - rub rail |
| 3-9 | 5/8" Dia X 20" - rub rail | |



GENERAL ASSEMBLY DETAILS



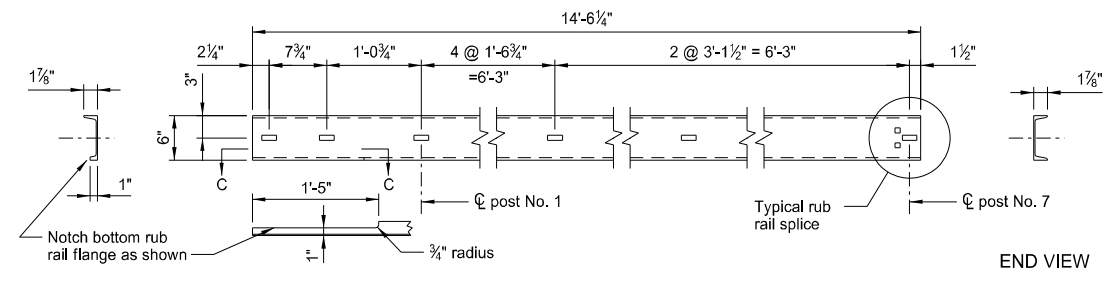
TOP PLATE



FRONT PLATE

BOTTOM PLATE

END SHOE PLATE DETAILS
(1/4" plate)

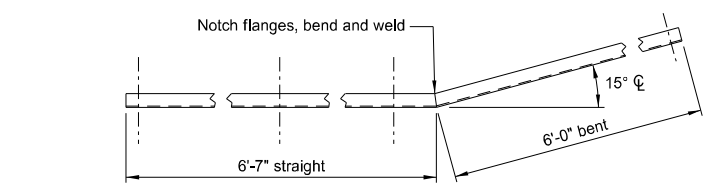


END VIEW

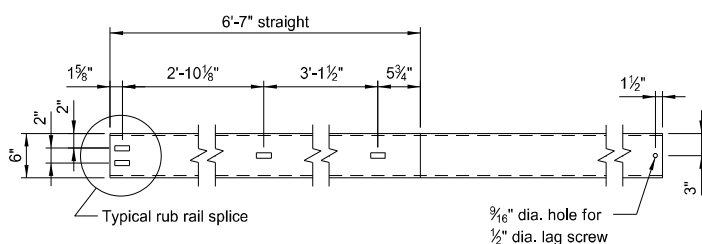
SECTION C-C

ELEVATION

RUB RAIL STRAIGHT SECTION

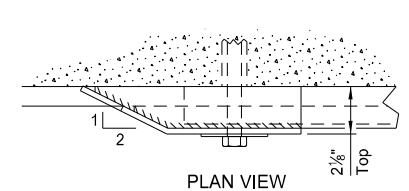


PLAN VIEW

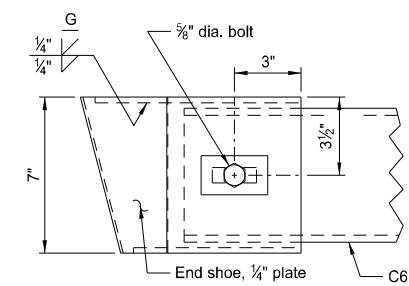


ELEVATION

RUB RAIL BENT SECTION

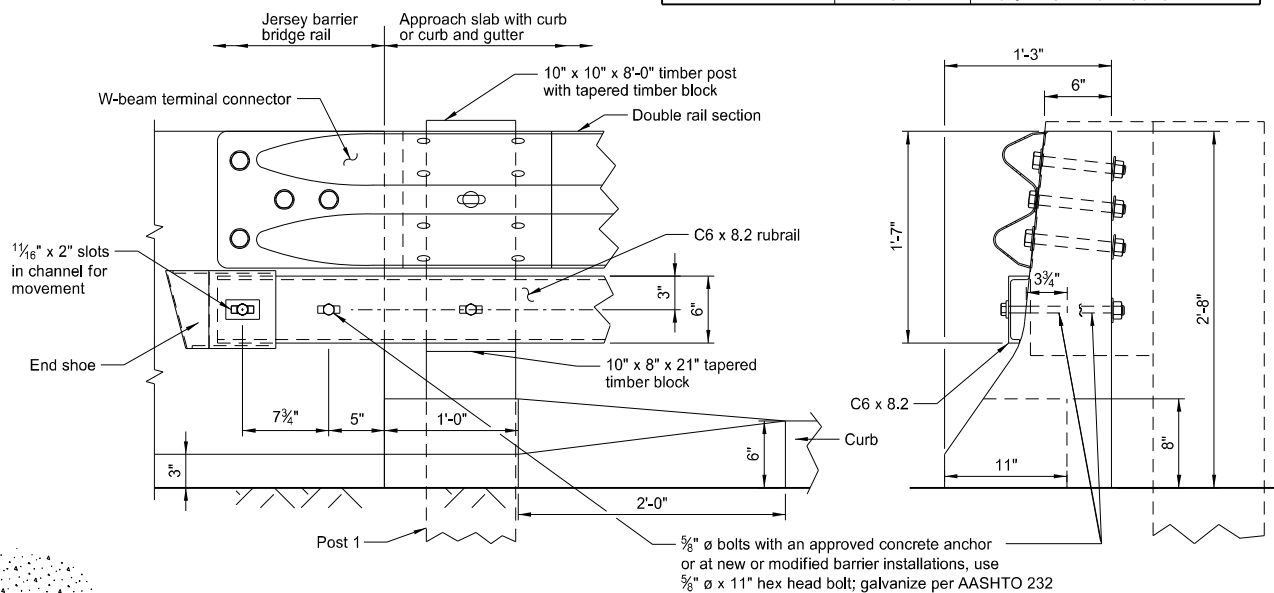


PLAN VIEW



ELEVATION

RUB RAIL END SHOE ASSEMBLY



TRAFFIC SIDE ELEVATION

RAIL ATTACHMENT AND CURB DETAIL

END VIEW

- ① Additional blocking may be required at post No.1.
- ② Height is 2'-8" from 0' to 12'-6" from bridge. Height tapers from 2'-8" to 2'-4" between 12'-6" to 37'-6" from bridge.

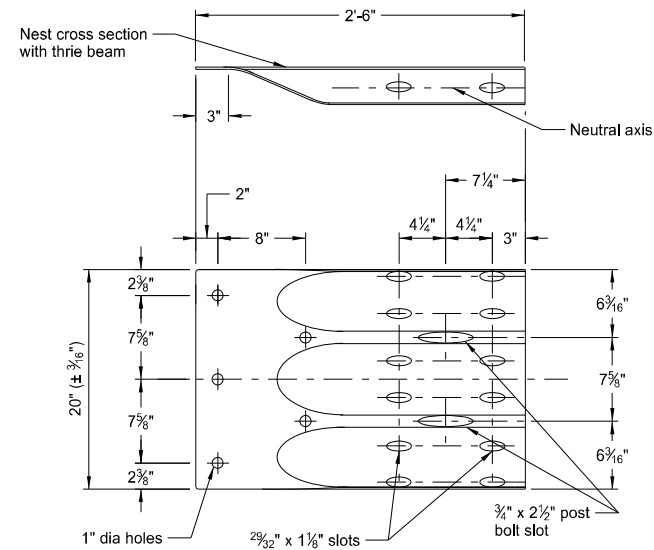
NOTES:
 Galvanize all hardware in accordance with AASHTO M232.
 Use AASHTO 270M Grade 250 C6 x 8.2 rub rail and structural steel galvanized after fabrication in accordance with AASHTO M111.
 All rub rail slotted holes are 1 1/16" x 2".
 All rub rail square holes are 1 1/16".
 Use timber posts and blocks for the W-beam guardrail.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|--------------------------------|
| 10-11-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-02-20 | Updated notes to active voice. |

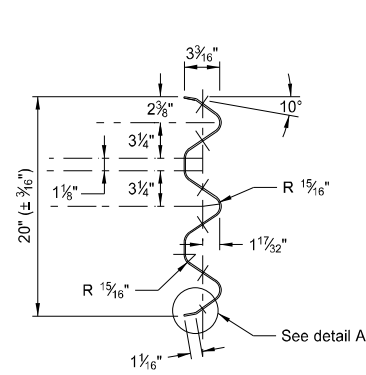
12 02 2020

THRIE BEAM TRANSITION TO DOUBLE BOX BEAM RETROFIT

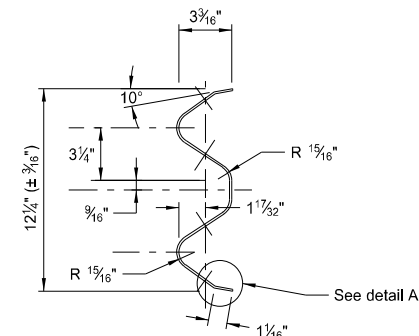
D-764-10



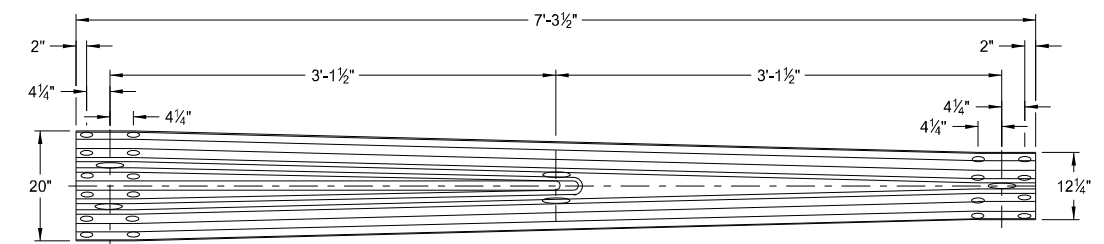
THRIE BEAM TERMINAL CONNECTOR



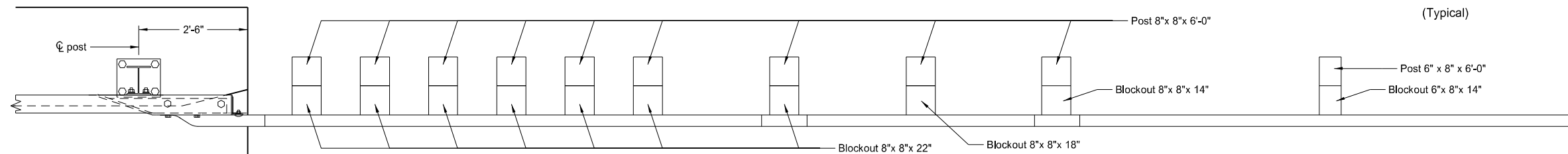
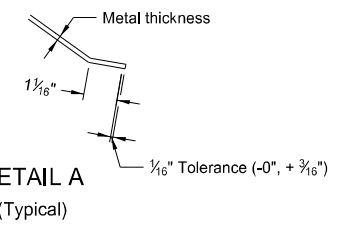
THRIE BEAM END VIEW



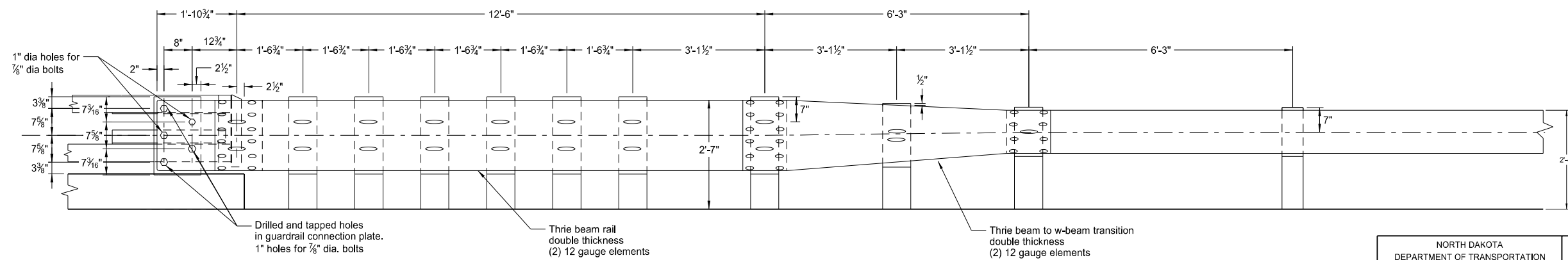
W-BEAM END VIEW



THRIE BEAM TO W-BEAM TRANSITION SECTION



PLAN



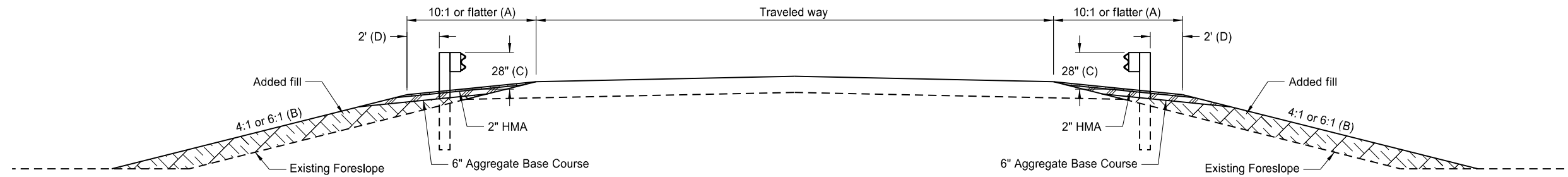
ELEVATION

| | |
|--|-------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-11-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 12/02/20 | Updated text to active voice. |

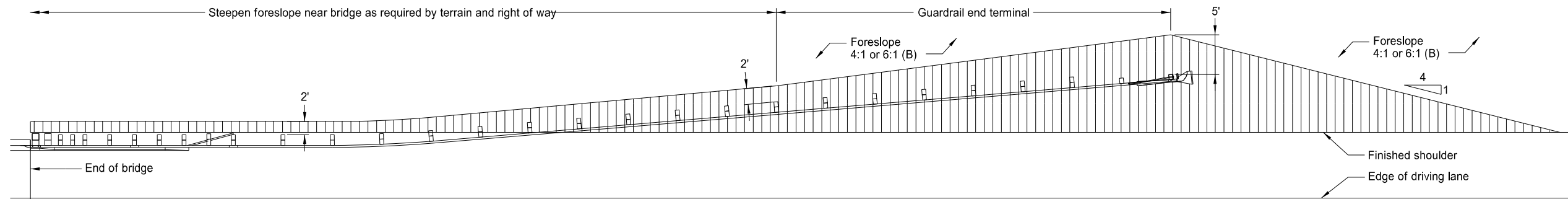


TYPICAL GRADING AT BRIDGE ENDS
WITH W-BEAM GUARDRAIL

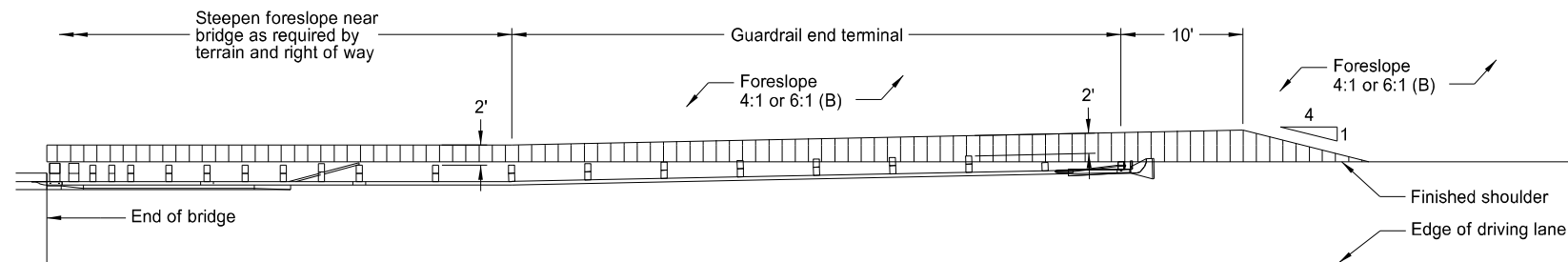
D-764-22



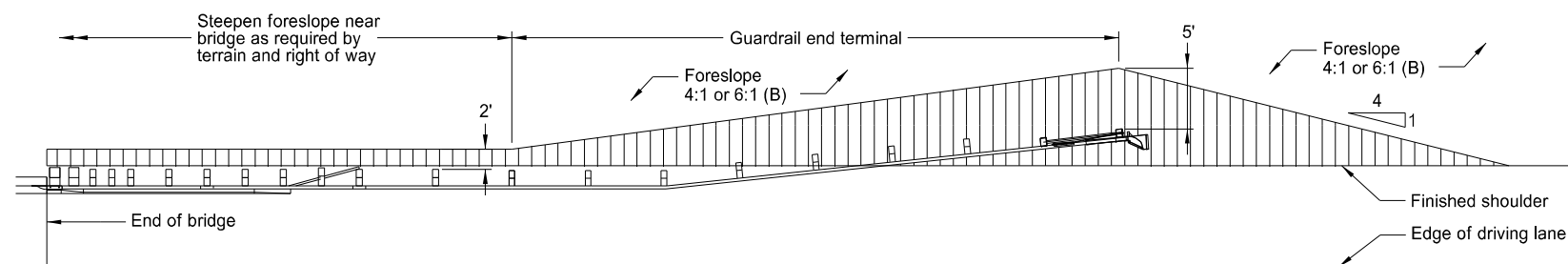
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Use slope flatter than 10:1 when necessary to provide proper guardrail height.
- (B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.
- (C) Measure from top of guardrail to top of surfacing at front face of guardrail.
- (D) Dimension at end terminals vary per Plan Layouts shown on this sheet.

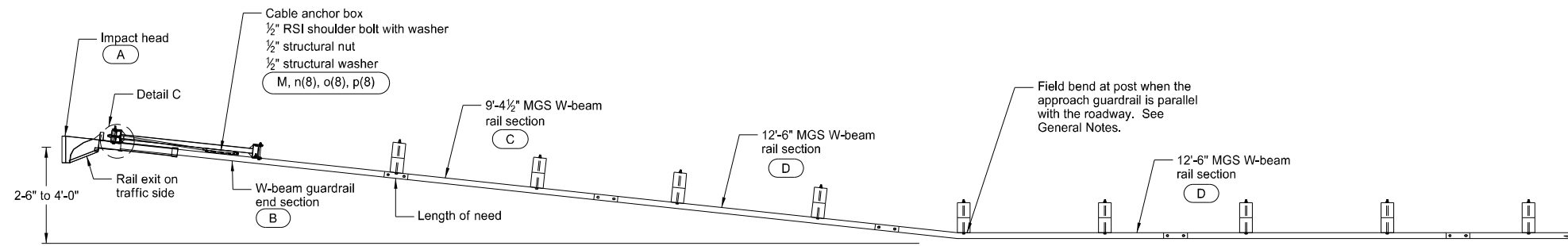
| | |
|--|--------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-02-20 | Updated notes to active voice. |



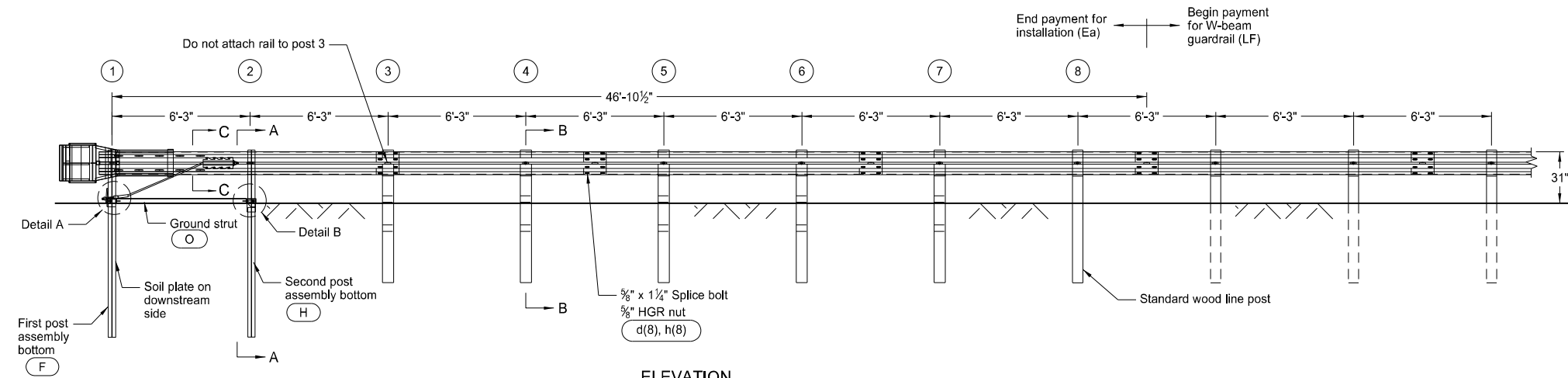
12 02 2020

MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

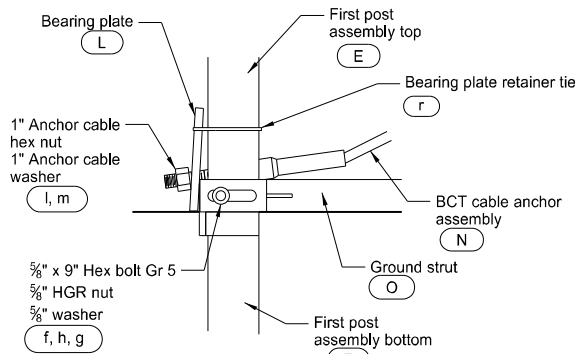
D-764-38



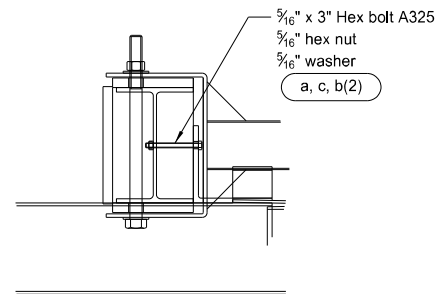
PLAN



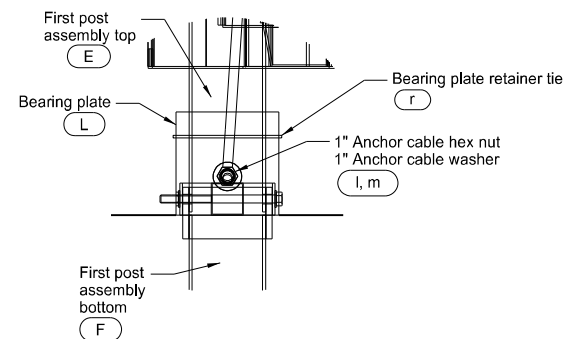
ELEVATION



SIDE VIEW

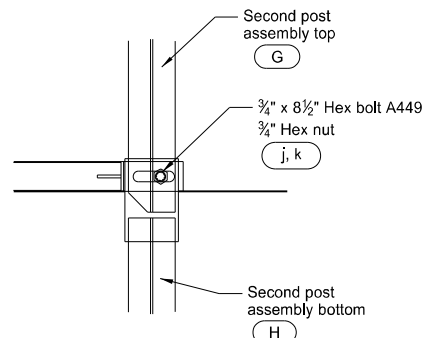


DETAIL C
Post 1 (Impact Head connection)

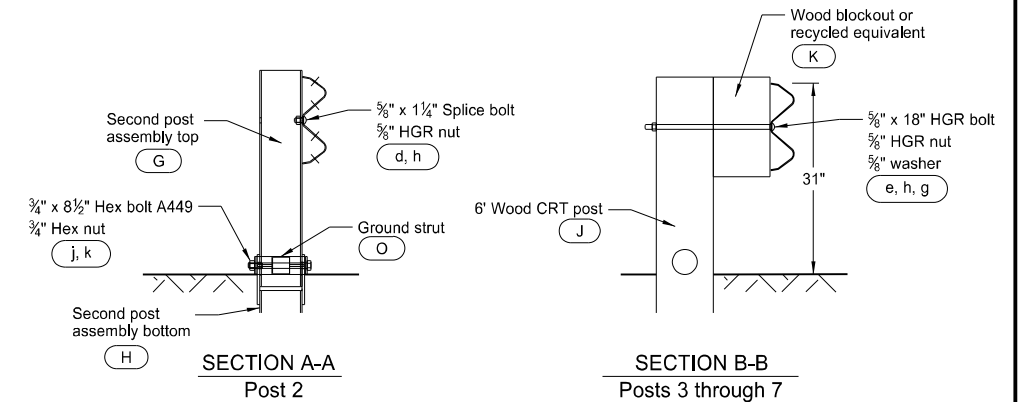


FRONT VIEW

DETAIL A
Post 1

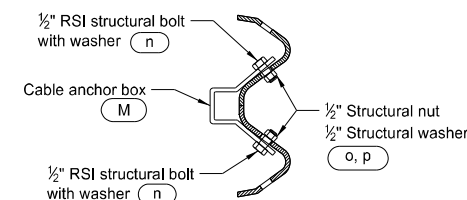


DETAIL B
Post 2



SECTION A-A
Post 2

SECTION B-B
Posts 3 through 7



SECTION C-C

GENERAL NOTES:

- Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, ensure the Flared Energy Absorbing Terminal has only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, ensure the Flared Energy Absorbing Terminal is turned parallel to the roadway.
- Site grade as necessary to ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord).
- Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material to prevent settlement.
- Install the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts with two 20 penny galvanized nails to prevent them from turning when the wood shrinks.

| ITEM | ITEM NO. | BILL OF MATERIALS | QTY |
|----------|-----------|--|-----|
| A | F3000 | IMPACT HEAD | 1 |
| B | SF1303 | W-BEAM GUARDRAIL END SECTION, 12 Ga | 1 |
| C | G12025 | 9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga | 1 |
| D | G1203A | 12'-6" MGS W-BEAM RAIL SECTION, 12 Ga | 2 |
| E | UHP1A | FIRST POST ASSEMBLY TOP | 1 |
| F | HP1B | FIRST POST ASSEMBLY BOTTOM | 1 |
| G | UHP2A | SECOND POST ASSEMBLY TOP | 1 |
| H | HP2B | SECOND POST ASSEMBLY BOTTOM | 1 |
| J | UP671 | WOOD CRT POST | 5 |
| K | P675 | WOOD BLOCKOUT OR RECYCLE EQUIVALENT | 5 |
| L | E750 | BEARING PLATE | 1 |
| M | S760 | CABLE ANCHOR BOX | 1 |
| N | E770 | BCT CABLE ANCHOR ASSEMBLY | 1 |
| O | S785 | GROUND STRUT HINGED POST | 1 |
| HARDWARE | | | |
| a | B5160304A | 5/16" x 3" HEX BOLT A325 | 2 |
| b | W0516 | 5/16" WASHER | 4 |
| c | N0516 | 5/16" HEX NUT | 2 |
| d | B580122 | 5/8" Dia x 1 1/4" SPLICE BOLT | 33 |
| e | B581802 | 5/8" Dia X 18" HGR BOLT | 5 |
| f | B580904A | 5/8" Dia x 9" HEX BOLT GRD 5 | 1 |
| g | W050 | 5/8" WASHER | 7 |
| h | N050 | 5/8" Dia HGR NUT | 39 |
| j | B340854A | 3/4" Dia x 8 1/2" HEX BOLT GRD A449 | 1 |
| k | N030 | 3/4" Dia HEX NUT | 1 |
| l | N100 | 1" ANCHOR CABLE HEX NUT | 2 |
| m | W100 | 1" ANCHOR CABLE WASHER | 2 |
| n | SB12A | 1/2" RSI SHOULDER BOLT WITH WASHER | 8 |
| o | N012A | 1/2" STRUCTURAL NUT | 8 |
| p | W012A | 1/2" STRUCTURAL WASHER | 8 |
| r | CT-100ST | BEARING PLATE RETAINER TIE | 1 |

NOTE: Standard wood line post, block, and associated hardware not included in Bill of Materials Table.

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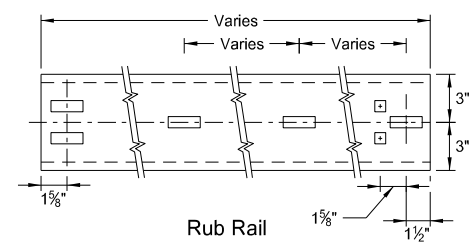
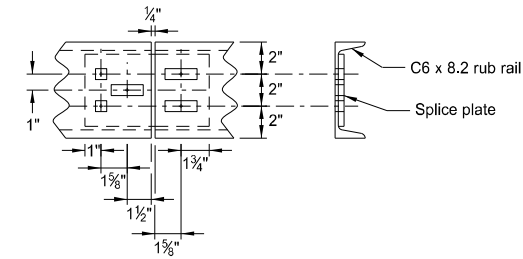
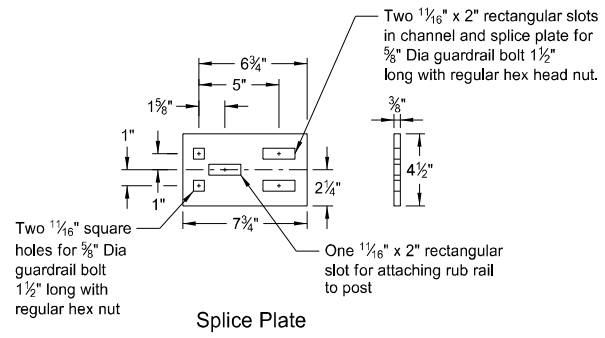
REVISIONS
DATE CHANGE
12-02-20 Updated notes to active voice.



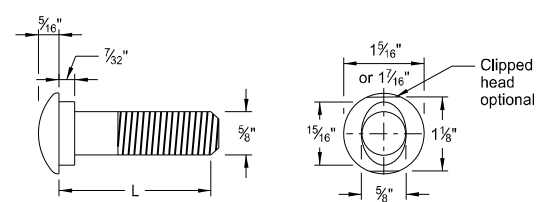
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MGS W-BEAM GUARDRAIL GENERAL DETAILS

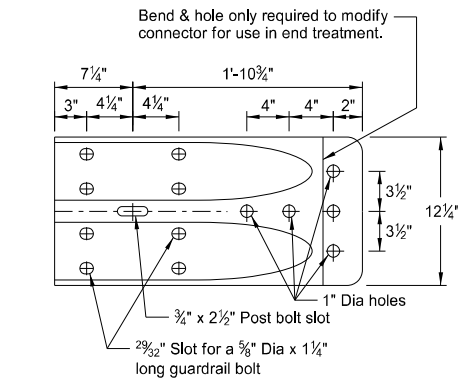
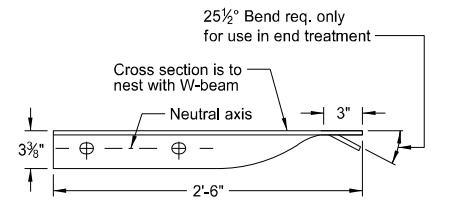
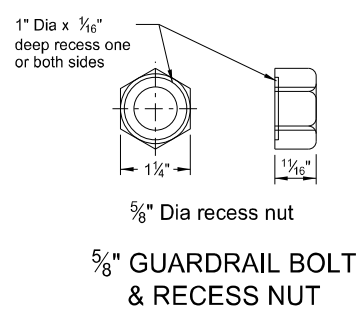
D-764-40



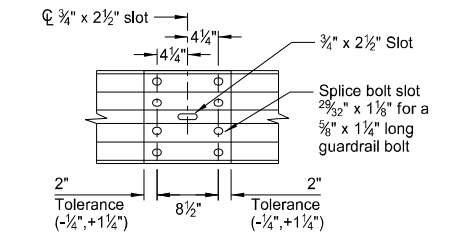
C6x8.2 RUB RAIL AND SPLICE PLATE



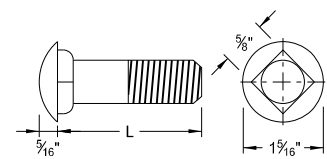
| 5/8" Diameter Guardrail Bolt | |
|------------------------------|--------------------------|
| L | Thread Length |
| 1 1/4" | Full length thread |
| 2" | 1 3/4" Min thread length |
| 9 1/2" | 4" Min thread length |
| 18" | 4" Min thread length |
| 20" | 4" Min thread length |
| 22" | 4" Min thread length |
| 25" | 4" Min thread length |



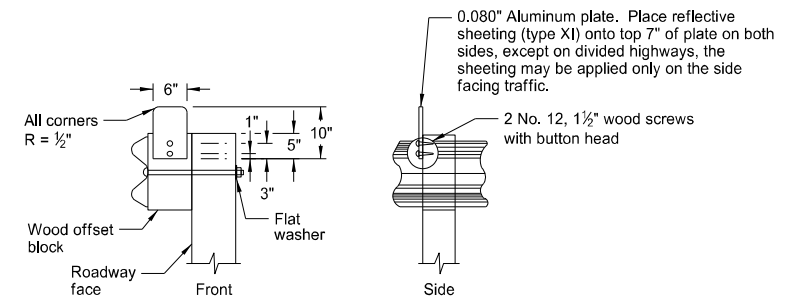
W BEAM TERMINAL CONNECTOR



NOTE: Do not install center bolt in the 3/4" x 2 1/2" slot at mid span splices.

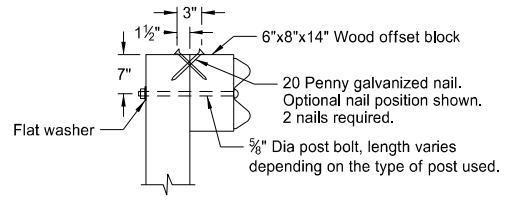


| 5/8" Diameter Carriage Bolt | |
|-----------------------------|--------------------------|
| L | Thread Length |
| 1 1/2" | Full length thread |
| 3" | 1 1/2" Min thread length |
| 11" | 1 3/4" Min thread length |
| 13" | 1 3/4" Min thread length |

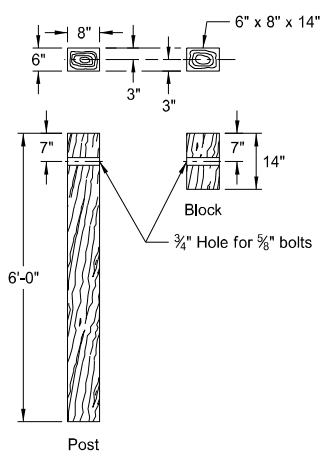


REFLECTORIZED PLATE DETAIL

NOTE: Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.

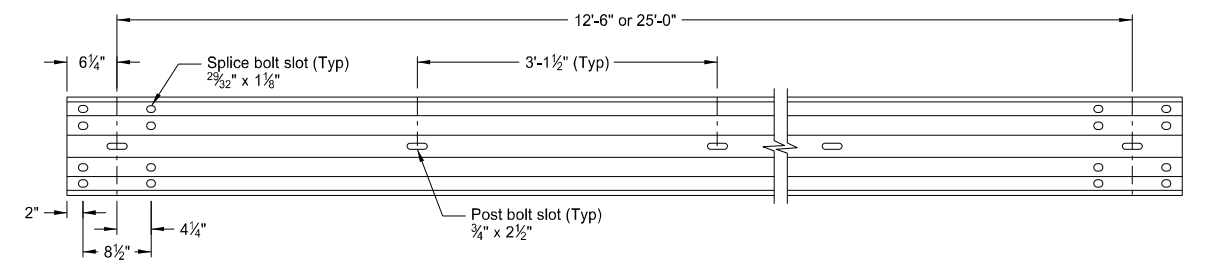
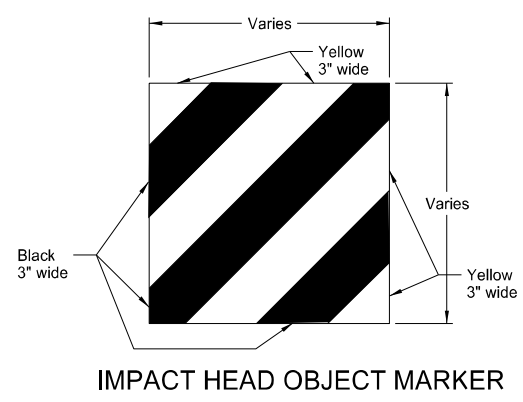


TYPICAL WOOD POST ATTACHMENT DETAIL

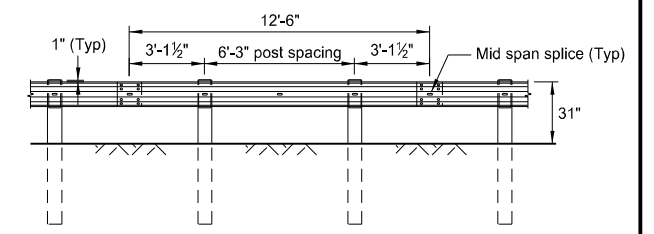


6" x 8" WOOD POST & BLOCK

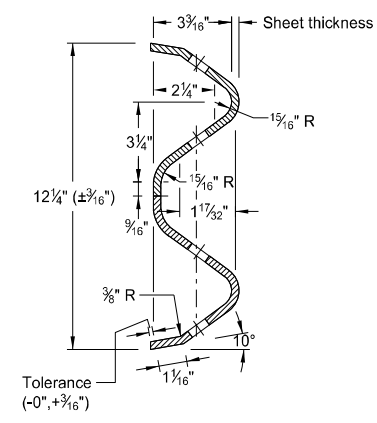
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM



W-BEAM CROSS SECTION

NOTES:

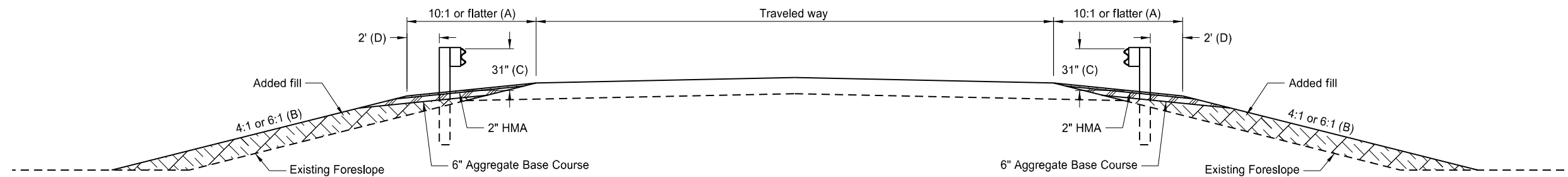
1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material at guardrail post: Dispose all excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. Fit the Object Marker within the vertical edges of the Impact Plate. Provide type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply the sheeting to 0.100 Aluminum sheeting meeting the requirements of Section 894.01.A. Attach the Object Marker to the Impact Head Plate with rivets or other attachment device. Ensure the rivets or attachment device are non-rust. Slope the stripes downward toward the roadway side.
4. Guardrail installation height tolerance = ±1".

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| 12-02-20 | Updated clipped head to optional |

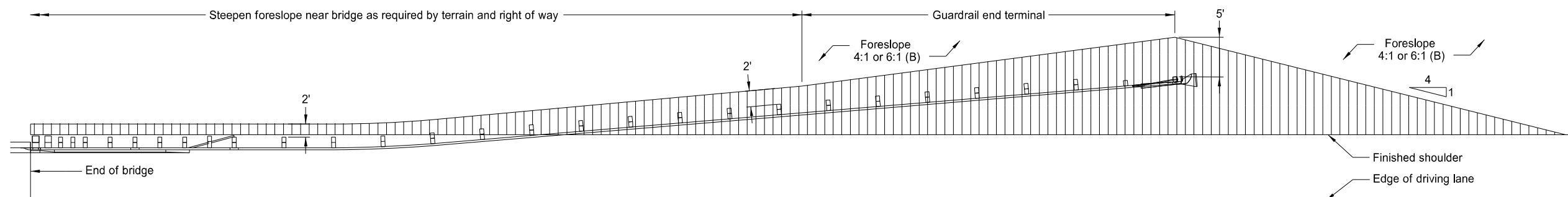
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12 02 2020

TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

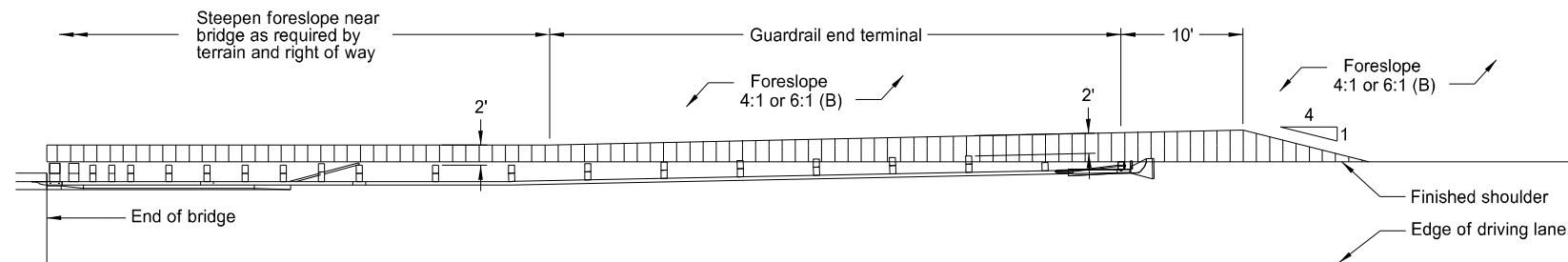
D-764-48



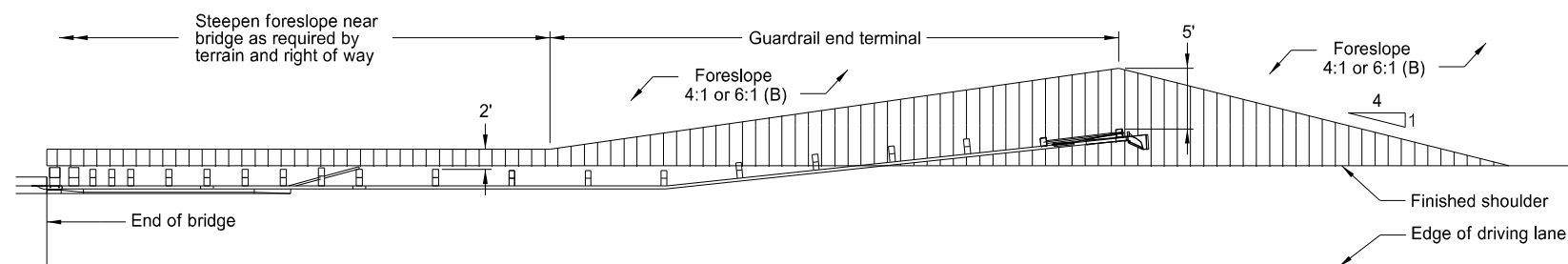
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL

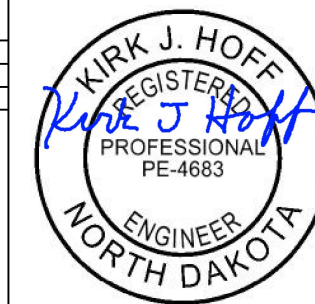


PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Use slope flatter than 10:1 when required to provide proper guardrail height.
- (B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.
- (C) Measure from top of guardrail to top of surfacing at front face of guardrail.
- (D) Vary dimension at end terminals per Plan Layouts shown on this sheet.

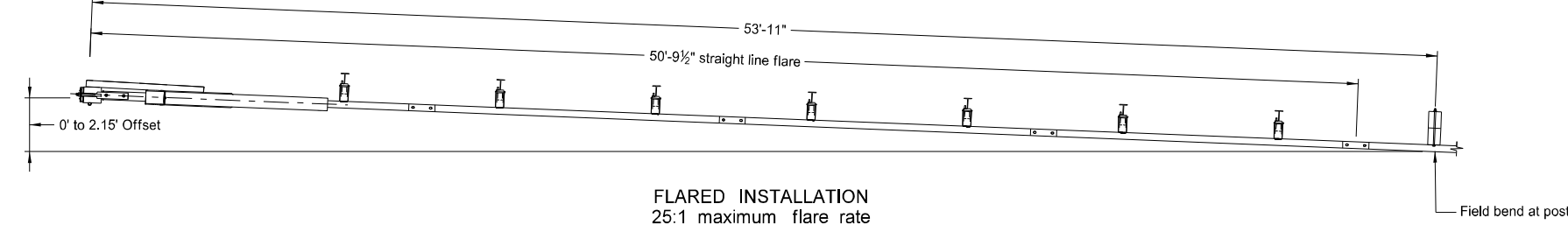
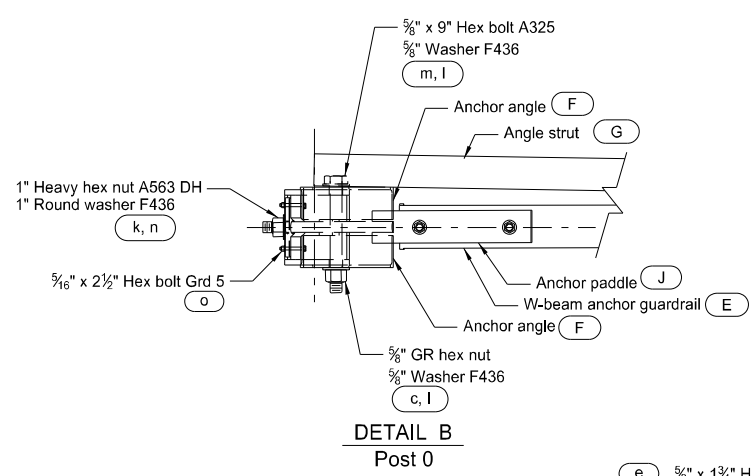
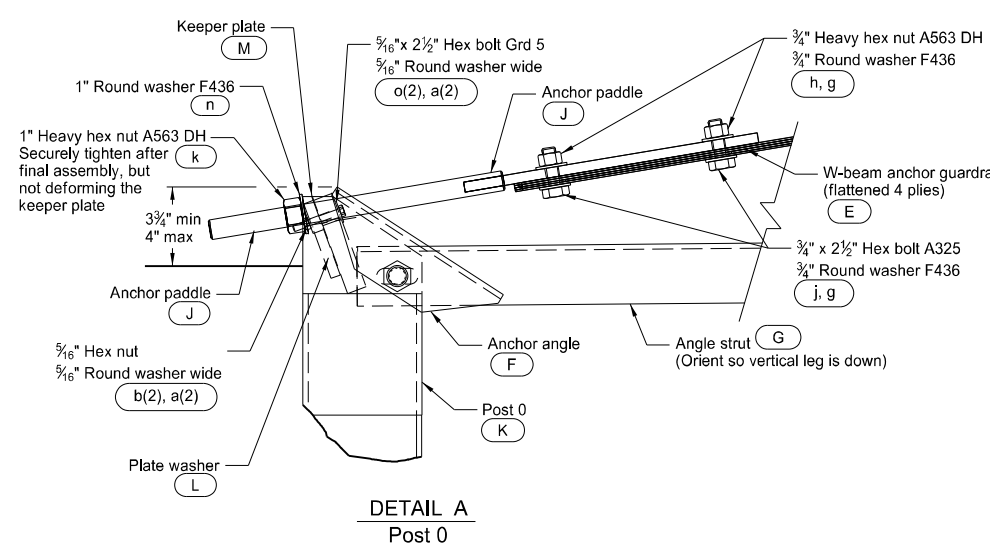
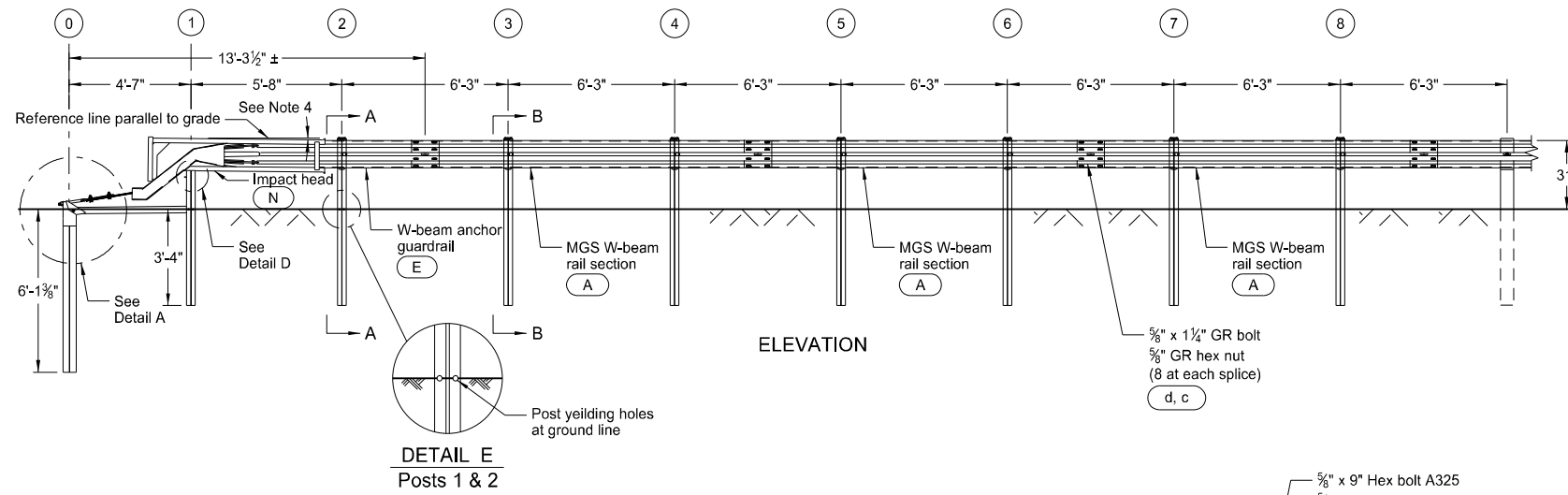
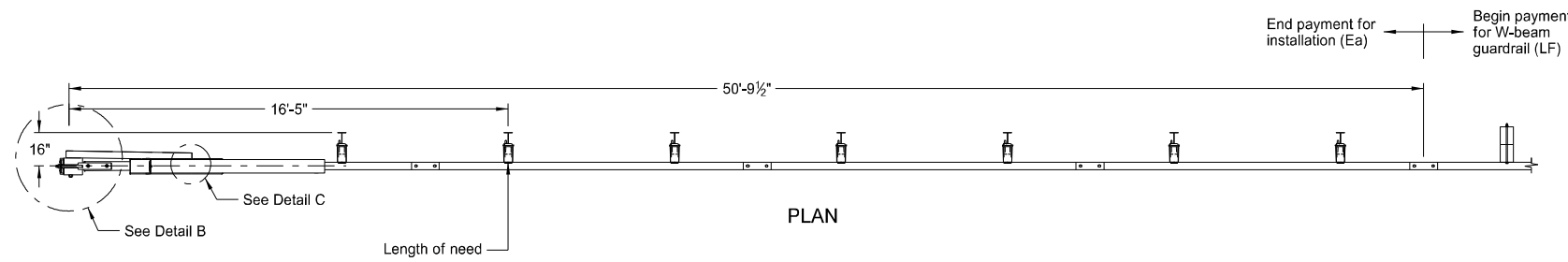
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| DATE | CHANGE |
| 12/02/20 | Updated notes to active voice. |



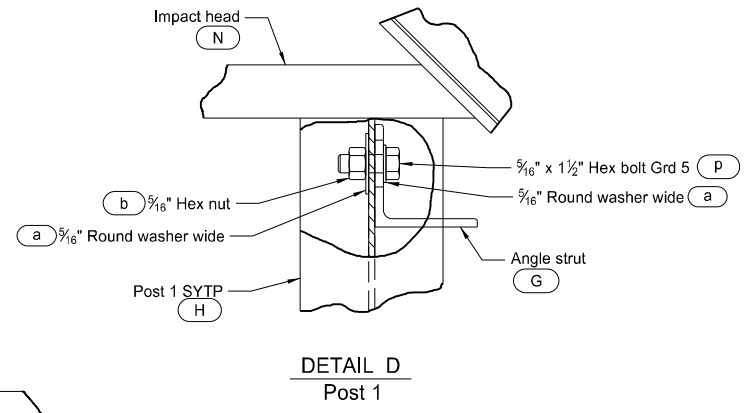
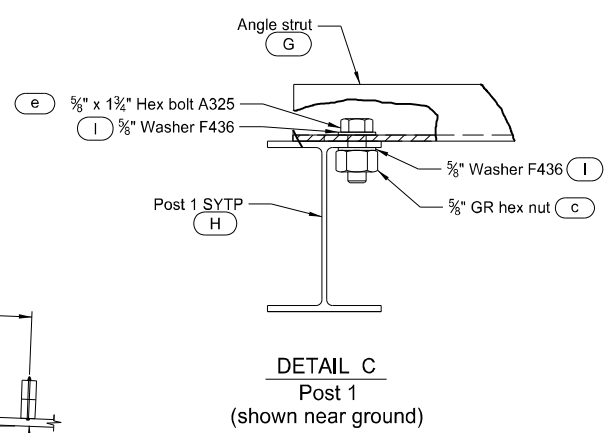
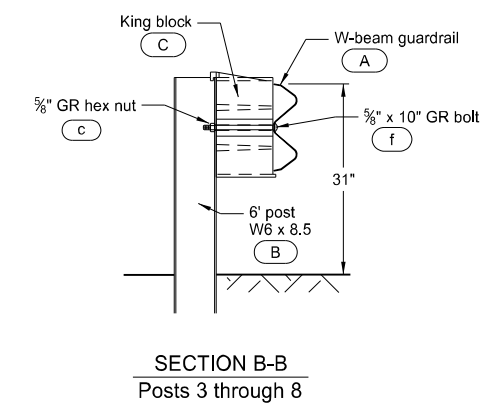
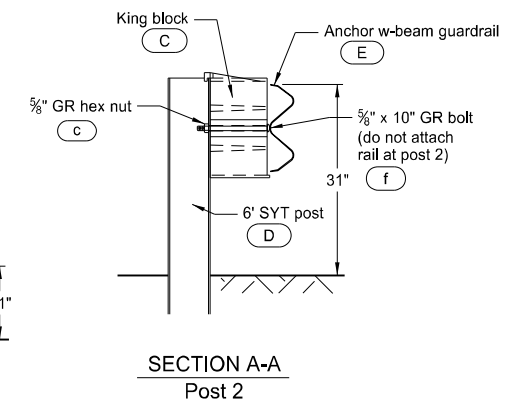
12 02 2020

MASH SOFTSTOP END TERMINAL - STEEL POST

D-764-50



- GENERAL NOTES:
- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
 - Flare the SoftStop at a rate of 25:1 or flatter.
 - Do not curve the guardrail within the SoftStop under any circumstances.
 - If necessary, install the SoftStop impact head parallel to the grade line or with an upward tilt. See softstop assembly manual for specific details.



| ITEM | ITEM NO. | BILL OF MATERIALS | QTY |
|------|----------|---|-----|
| A | 000011 | 12 / 12'-6" / 3'-1 1/2" / S MGS W-BEAM RAIL SECTION | 3 |
| B | 000533 | 6'-0" STEEL POST W6 x 8.5 | 6 |
| C | 006777 | KING BLOCK 4" X 7 1/2" X 1'-2" | 7 |
| D | 015000 | 6'-0" SYT POST / 8.5 / 31" GR HT | 1 |
| E | 015200 | SFST - ANCHOR GUARDRAIL 12'-6" | 1 |
| F | 015201 | SFST - ANCHOR ANGLE | 2 |
| G | 015202 | SFST - ANGLE STRUT | 1 |
| H | 015203 | SFST - POST #1 SYTP | 1 |
| J | 015204 | SFST - ANCHOR PADDLE | 1 |
| K | 015205 | SFST - POST #0 | 1 |
| L | 015206 | SFST - PLATE WASHER | 1 |
| M | 015207 | SFST - KEEPER PLATE | 1 |
| N | 015208 | SFST - IMPACT HEAD | 1 |

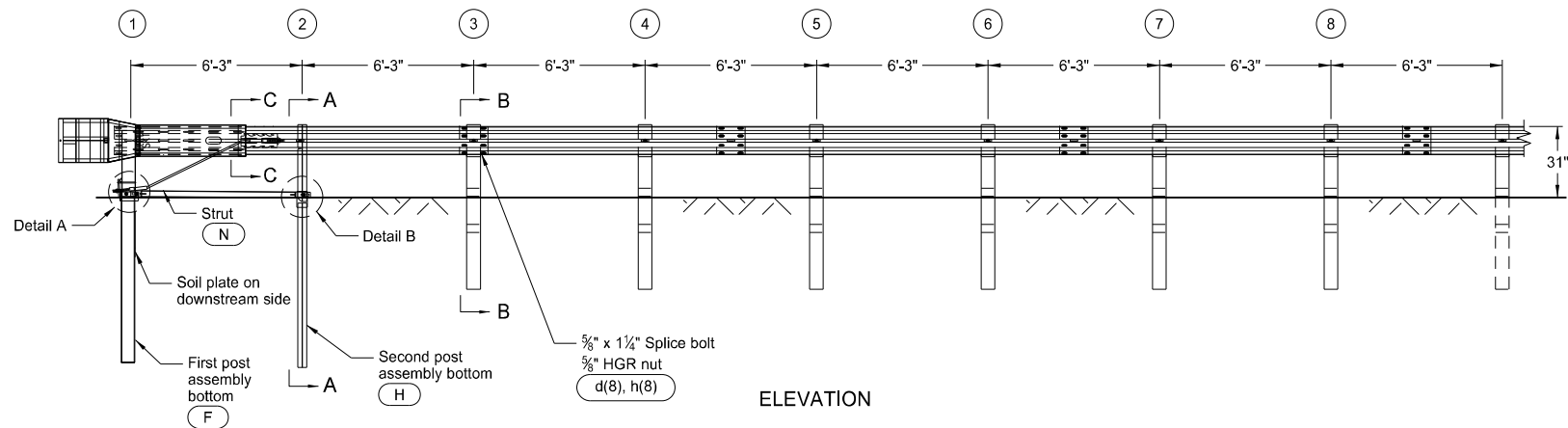
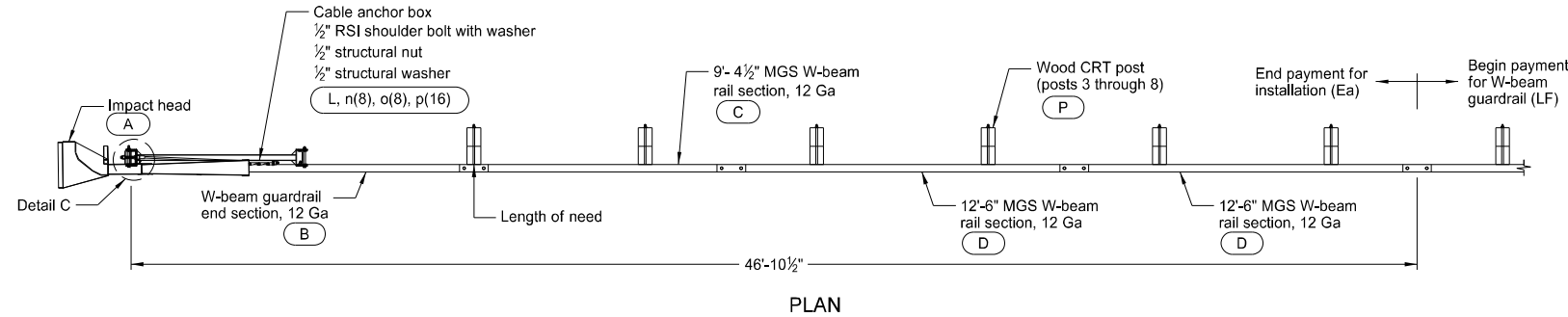
| HARDWARE | | | |
|----------|--------|-------------------------------|----|
| a | 003240 | 5/16" ROUND WASHER WIDE | 6 |
| b | 003245 | 5/16" HEX NUT | 3 |
| c | 003340 | 5/8" GR HEX NUT | 41 |
| d | 003360 | 5/8" x 1 1/2" GR BOLT | 32 |
| e | 003391 | 5/8" x 1 3/4" HEX BOLT A325 | 1 |
| f | 003500 | 5/8" x 10" GR BOLT A307 | 7 |
| g | 003701 | 3/4" ROUND WASHER F436 | 4 |
| h | 003704 | 3/4" HVY HEX NUT A563 DH | 2 |
| j | 003717 | 3/4" x 2 1/2" HEX BOLT A325 | 2 |
| k | 003908 | 1" HVY HEX NUT A563 DH | 1 |
| l | 004372 | 5/8" WASHER F436 | 4 |
| m | 004489 | 5/8" x 9" HEX BOLT A325 | 1 |
| n | 004902 | 1" ROUND WASHER F436 | 1 |
| o | 105285 | 5/16" x 2 1/2" HEX BOLT GRD 5 | 2 |
| p | 105286 | 5/16" x 1 1/2" HEX BOLT GRD 5 | 1 |

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| 12-02-20 | Updated notes to active voice. |

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MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

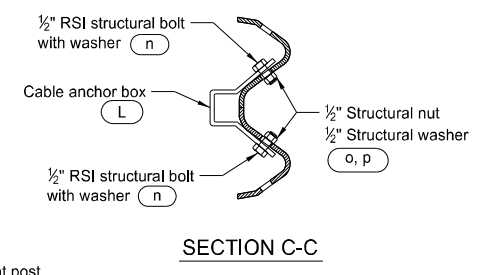
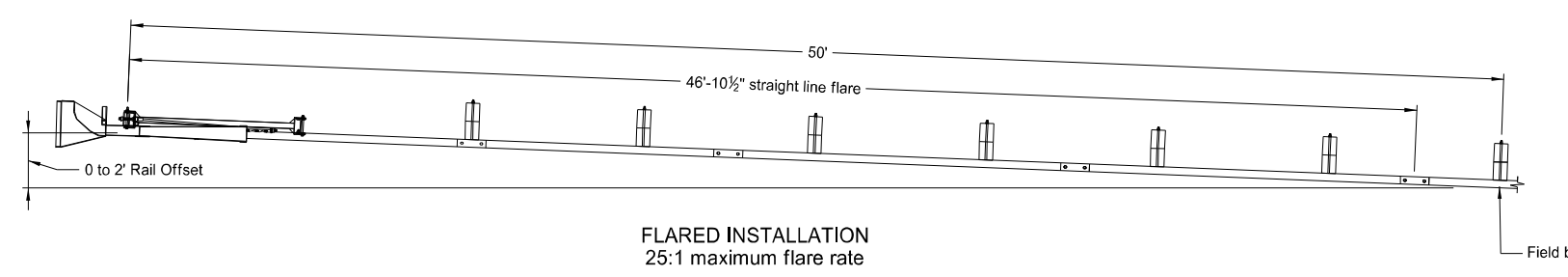
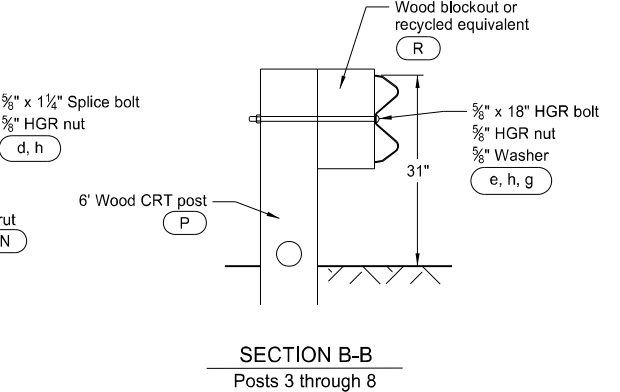
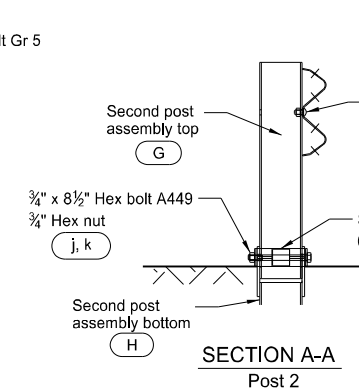
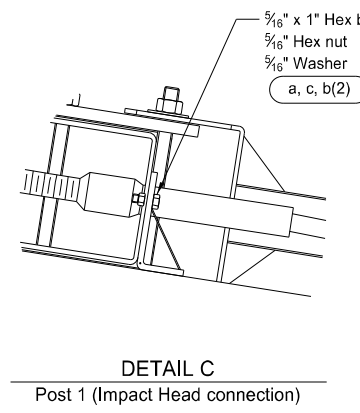
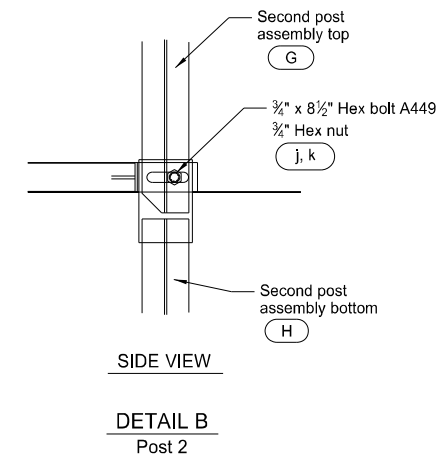
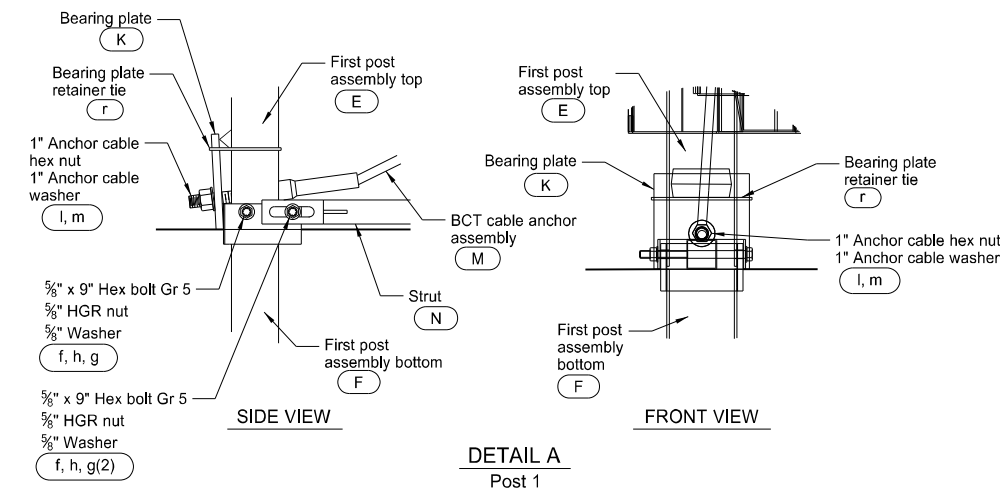
D-764-51



GENERAL NOTES:

- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Flare the MSKT at a rate of up to 25:1, as needed to prevent the impact head from encroaching on the shoulder.
- Site grade as necessary to ensure the lower sections of posts do not protrude more than 4" above the ground (measured along a 5' cord).
- Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material to prevent settlement.
- Install breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts at post 3 through post 8 with two 20 penny galvanized nails to prevent them from turning when the wood warps.

| ITEM | ITEM NO. | BILL OF MATERIALS | QTY |
|----------|-----------|---|-----|
| A | MS3000 | IMPACT HEAD | 1 |
| B | SF1303 | W-BEAM GUARDRAIL END SECTION, 12 Ga | 1 |
| C | G12025 | 9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga | 1 |
| D | G1203A | 12'-6" MGS W-BEAM RAIL SECTION, 12 Ga | 2 |
| E | MTPHP1A | FIRST POST ASSEMBLY TOP (6" X 6" X 1/2" Tube) | 1 |
| F | MTPHP1B | FIRST POST ASSEMBLY BOTTOM (6" W6X15) | 1 |
| G | UHP2A | SECOND POST ASSEMBLY TOP | 1 |
| H | HP2B | SECOND POST ASSEMBLY BOTTOM | 1 |
| K | E750 | BEARING PLATE | 1 |
| L | S760 | CABLE ANCHOR BOX | 1 |
| M | E770 | BCT CABLE ANCHOR ASSEMBLY | 1 |
| N | MS785 | STRUT | 1 |
| P | UP671 | 6" WOOD CRT POST | 6 |
| R | P675 | WOOD BLOCKOUT OR RECYCLED EQUIVALENT | 6 |
| HARDWARE | | | |
| a | B5160104A | 5/16" x 1" HEX BOLT GR 5 | 2 |
| b | W0516 | 5/16" WASHER | 4 |
| c | N0516 | 5/16" HEX NUT | 2 |
| d | B580122 | 5/8" Dia x 1 1/4" SPLICE BOLT | 33 |
| e | B581802 | 5/8" Dia x 18" HGR BOLT (POSTS 3 THRU 8) | 6 |
| f | B580904A | 5/8" x 9" HEX BOLT GR 5 | 2 |
| g | W050 | 5/8" WASHER | 9 |
| h | N050 | 5/8" Dia HGR NUT | 35 |
| j | B340854A | 3/4" Dia x 8 1/2" HEX BOLT GRD A449 | 1 |
| k | N030 | 3/4" Dia HEX NUT | 1 |
| l | N100 | 1" ANCHOR CABLE HEX NUT | 2 |
| m | W100 | 1" ANCHOR CABLE WASHER | 2 |
| n | SB12A | 1/2" RSI SHOULDER BOLT WITH WASHER | 8 |
| o | N012A | 1/2" STRUCTURAL NUT | 8 |
| p | W012A | 1/2" STRUCTURAL WASHER | 8 |
| r | CT-100ST | BEARING PLATE RETAINER TIE | 1 |



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