| | STATE | PROJECT NO. | PCN | SECTION NO. | SHEET NO. |
|---|---|---|---|---|---|
| | ND | SS-9-999(502) | 23640 | 1 | 1 |

# NORTH DAKOTA
# DEPARTMENT OF TRANSPORTATION

| GOVERNING SPECIFICATIONS | Date Published and Adopted by the North Dakota Department of Transportation |
|---|---|
| Standard Specifications | 1/1/2022 |
| Supplemental Specifications | NONE |

| PROJECT NUMBER \ DESCRIPTION | NET MILES | GROSS MILES |
|---|---|---|
| SS-9-999(502) | Varies | Varies |

Structure #5-179.794
ND Hwy 5, RP 179.794
Section 29 & 32, T-162-N, R-75-W

Structure #5-179.972
ND Hwy 5, RP 179.972
Section 29 & 32, T-162-N, R-75-W

Structure #17-039.840
ND Hwy 17, RP 39.840
Section 21 & 28, T-158-N, R-66-W

Structure #21-095.497
ND Hwy 21, RP 95.497
Section 4 & 9, T-134-N, R-85-W

Structure #21-100.041
ND Hwy 21, RP 100.041
Section 14, T-134-N, R-86-W

Structure #28-052.462
ND Hwy 28, RP 52.462
Section 23 & 24, T-157-N, R-86-W

Structure #28-095.668
ND Hwy 28, RP 95.668
Section 36, T-164-N, R-85-W
Section 31, T-164-N, R-84-W

Structure #40-058.713
ND Hwy 40, RP 58.713
Section 21 & 22, T-163-N, R-95-W

Structure #52-050.507 T
US Hwy 52, RP 50.507
Section 23, T-159-N, R-88-W

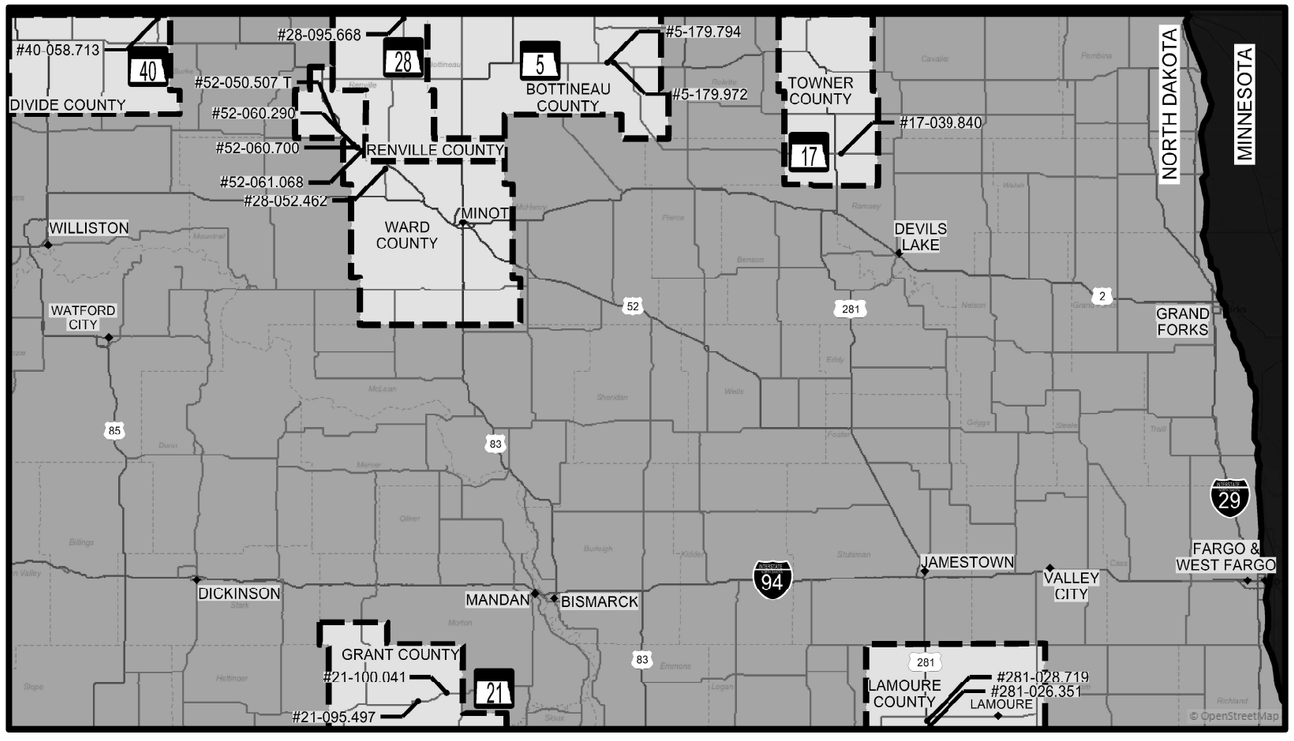
Structure #52-060.290
US Hwy 52, RP 60.290
Section 24, T-158-N, R-87-W

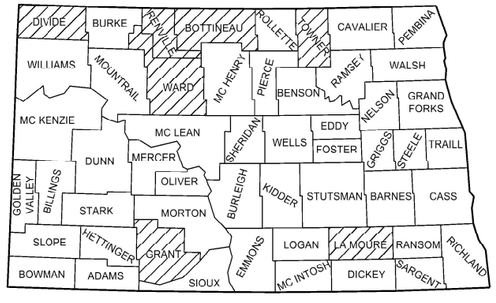
Structure #52-060.700
US Hwy 52, RP 60.700
Section 24, T-158-N, R-87-W

Structure #52-061.068
US Hwy 52, RP 61.068
Section 24, T-158-N, R-87-W

Structure #281-026.351
US Hwy 281, RP 26.351
Section 25, T-133-N, R-64-W

Structure #281-028.719
US Hwy 281, RP 28.719
Section 14, T-133-N, R-64-W




| DESIGNER |
|---|
| Tatyana Fedorenko, PE |
| DESIGNER |
| Mary Boechler, PE |
| DESIGNER |
| Sawyer Kenney, EIT |

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT
Ketterling, Jonathan
06/12/23

Ulteig Engineers, Inc.

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/12/2023
NORTH DAKOTA

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| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
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| | ND | SS-9-999(502) | 2 | 1 |

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## PLAN SECTIONS



## LIST OF STANDARD DRAWINGS



## SPECIAL PROVISIONS

| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
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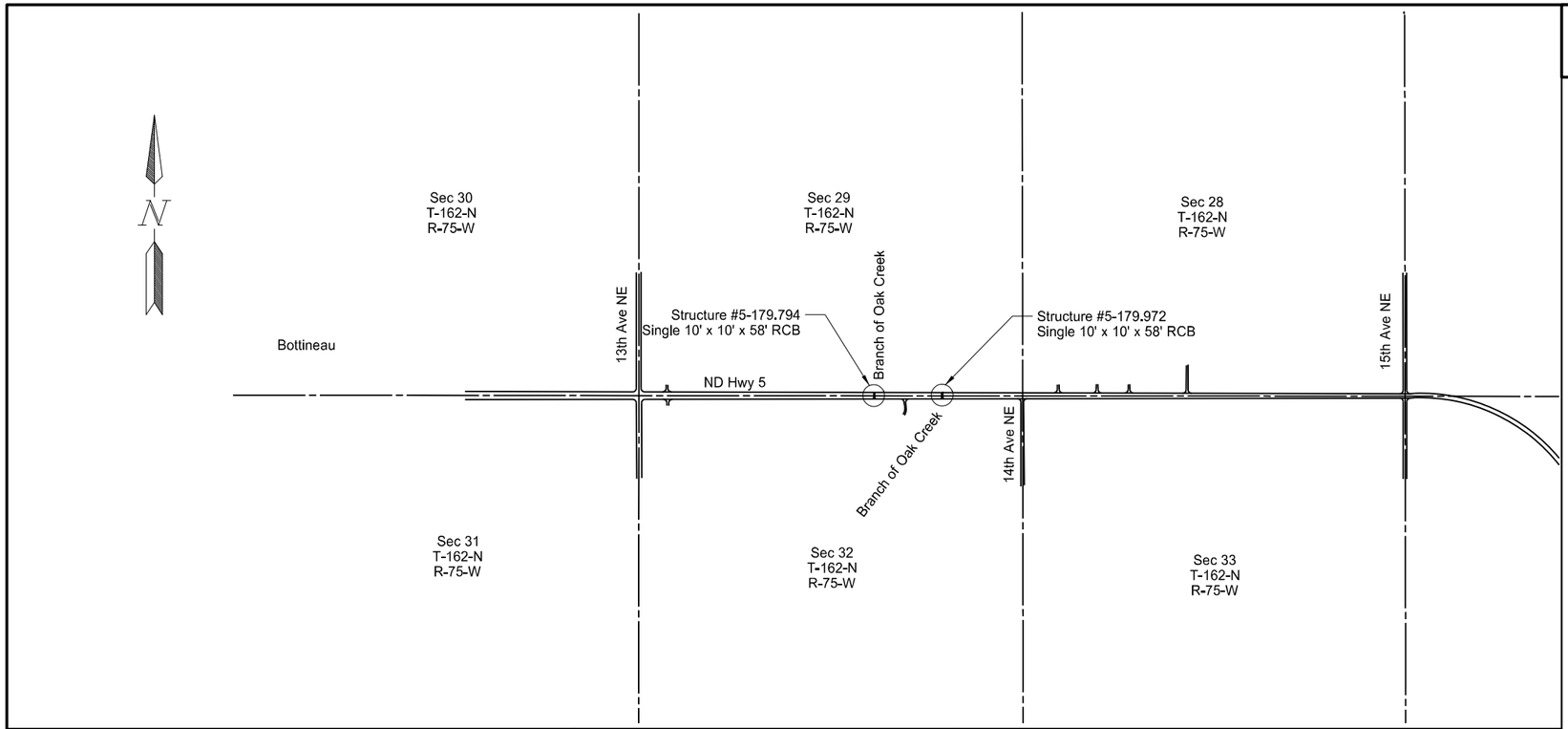
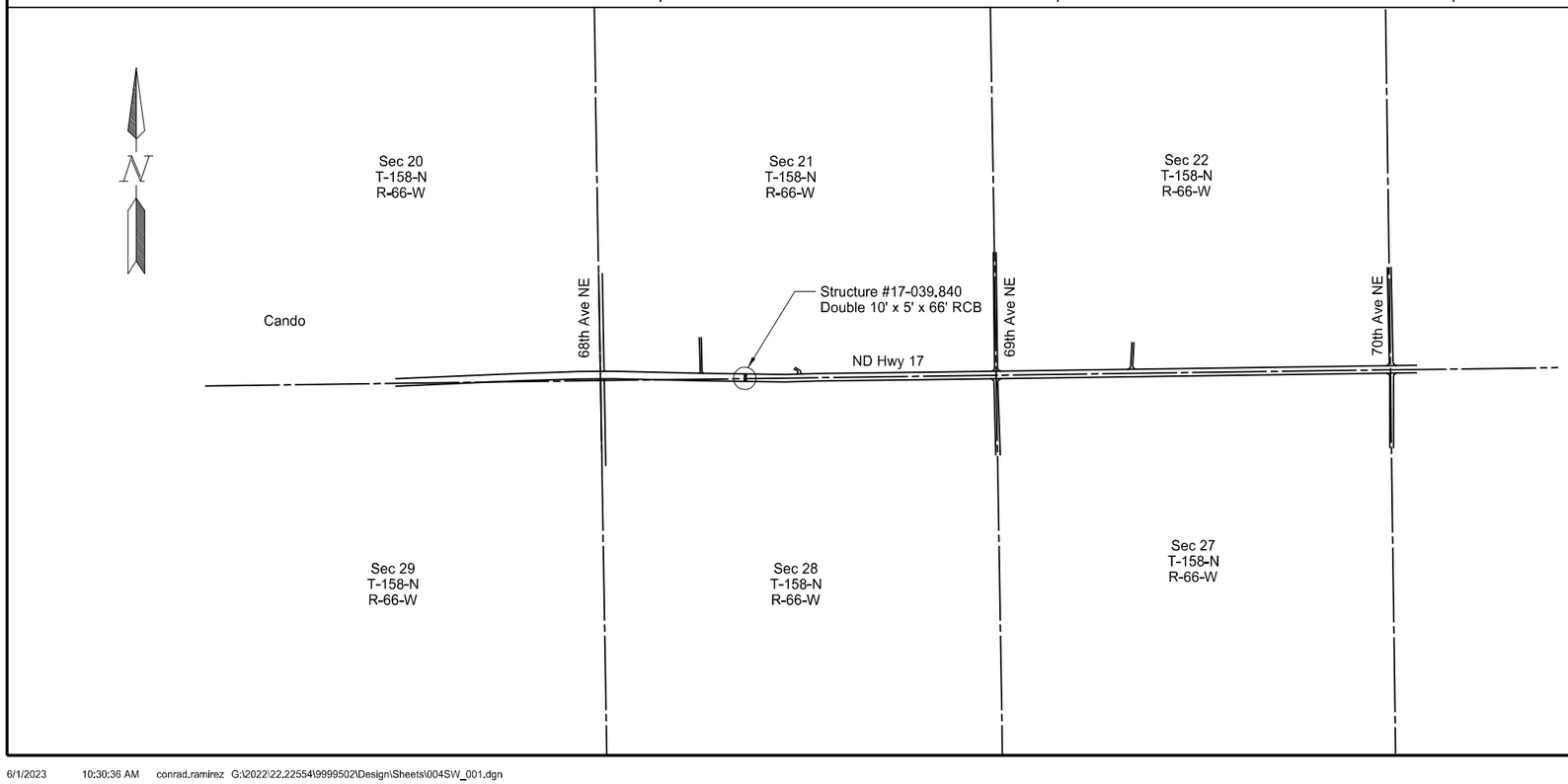
| | ND | SS-9-999(502) | 4 | 1 |




**REPAIR NOTES:**

The general repairs of each structure are as follows:

Structure #5-179.794: Spall Repair, Box Culvert Joint Repair
Structure #5-179.972: Box Culvert Joint Repair
Structure #17-039.840: Spall Repair, Box Culvert Joint Repair

Scope of Work

Structure #5-179.794
Structure #5-179.972
Structure #17-039.840

Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

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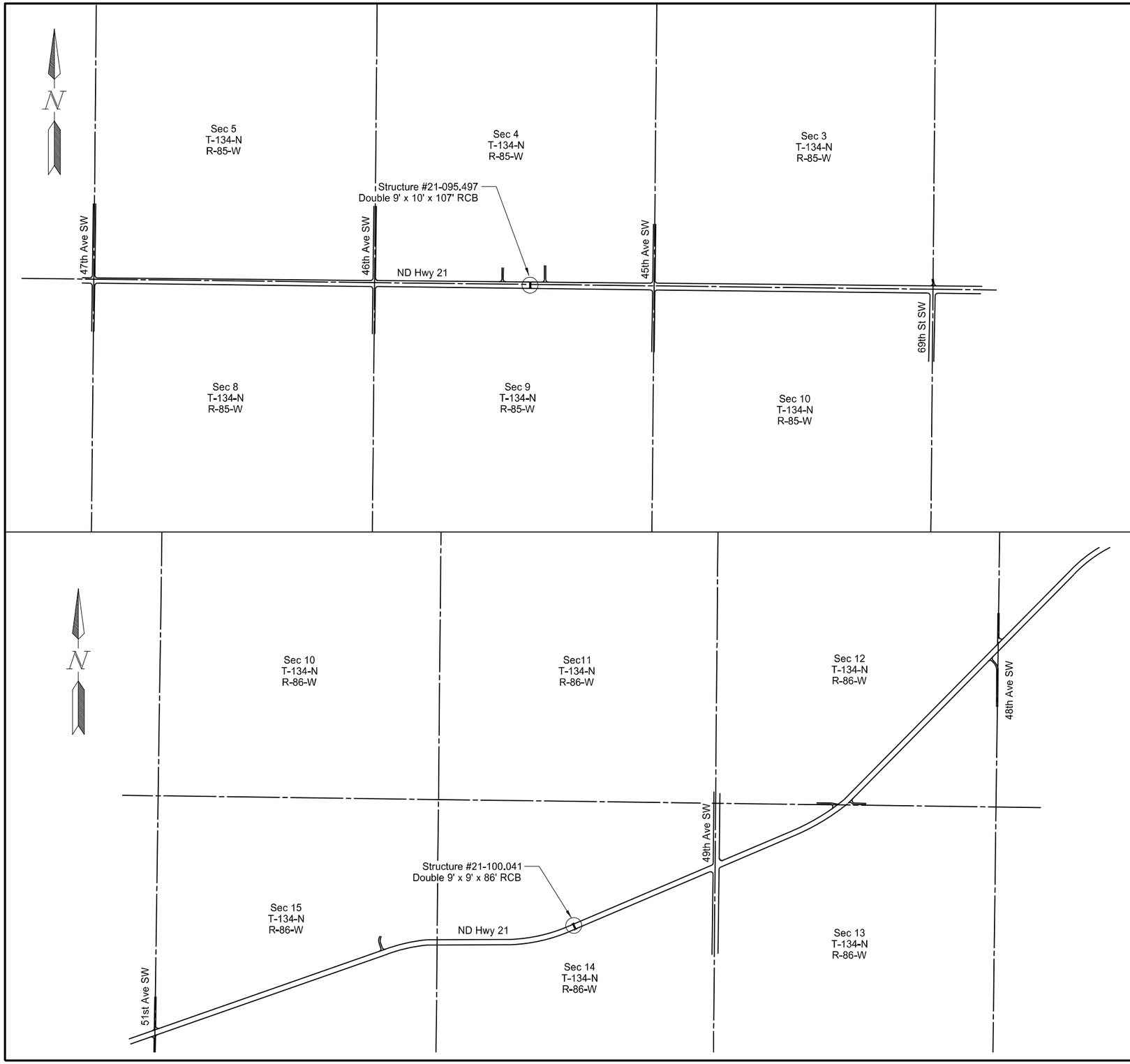
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 4 | 2 |




**REPAIR NOTES:**

The general repairs of each structure are as follows:

Structure #21-095.497: Box Culvert Joint Repair
Structure #21-100.041: Box Culvert Joint Repair

Scope of Work

Structure #21-095.497
Structure #21-100.041

Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
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NORTH DAKOTA

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| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 4 | 3 |

**REPAIR NOTES:**

The general repairs of each structure are as follows:

Structure #28-052.462: Fill Scour Hole, Spall Repair, Box Culvert Joint Repair
Structure #28-095.668: Spall Repair, Box Culvert Joint Repair

Scope of Work

Structure #28-052.462
Structure #28-095.668

Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
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DATE 06/01/2023
NORTH DAKOTA

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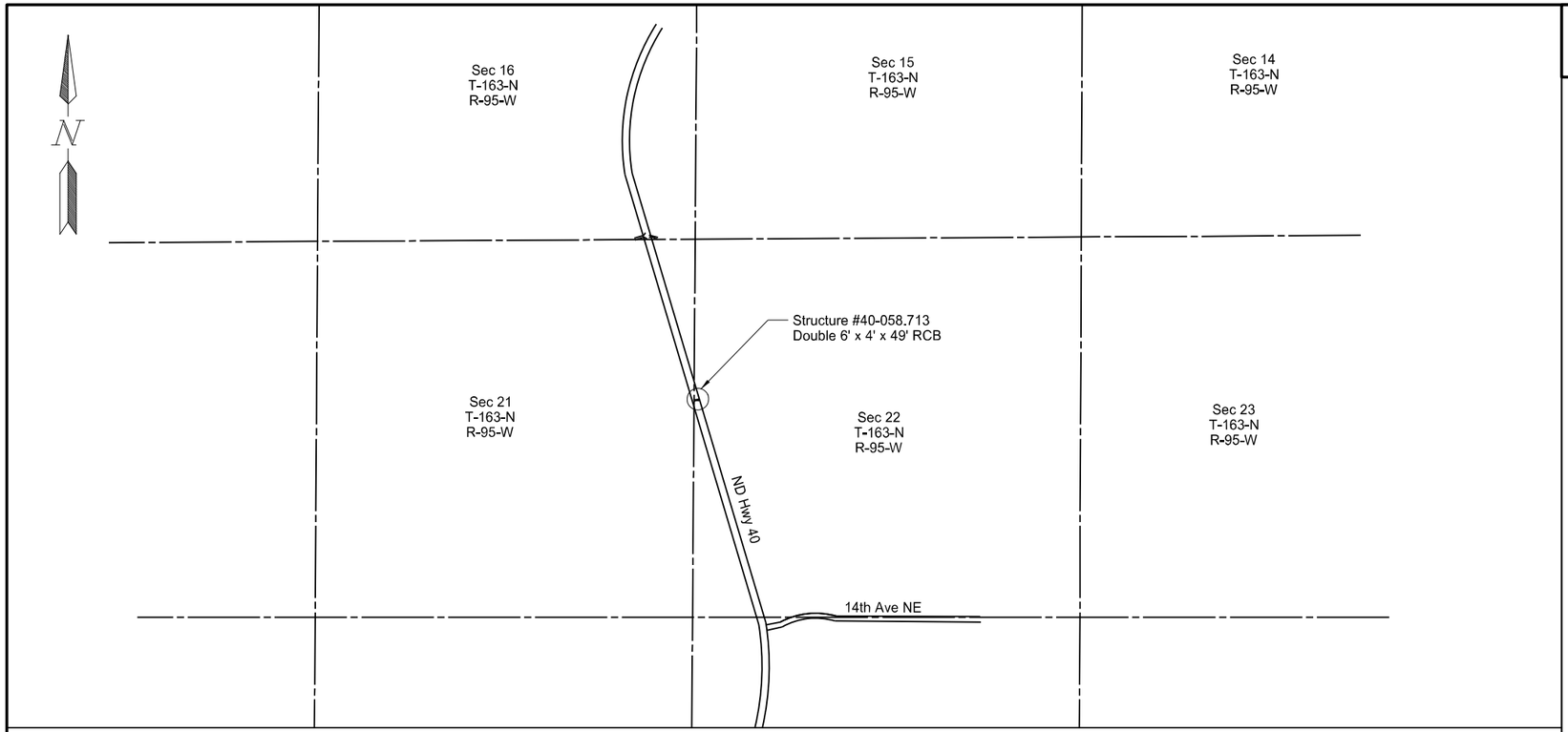


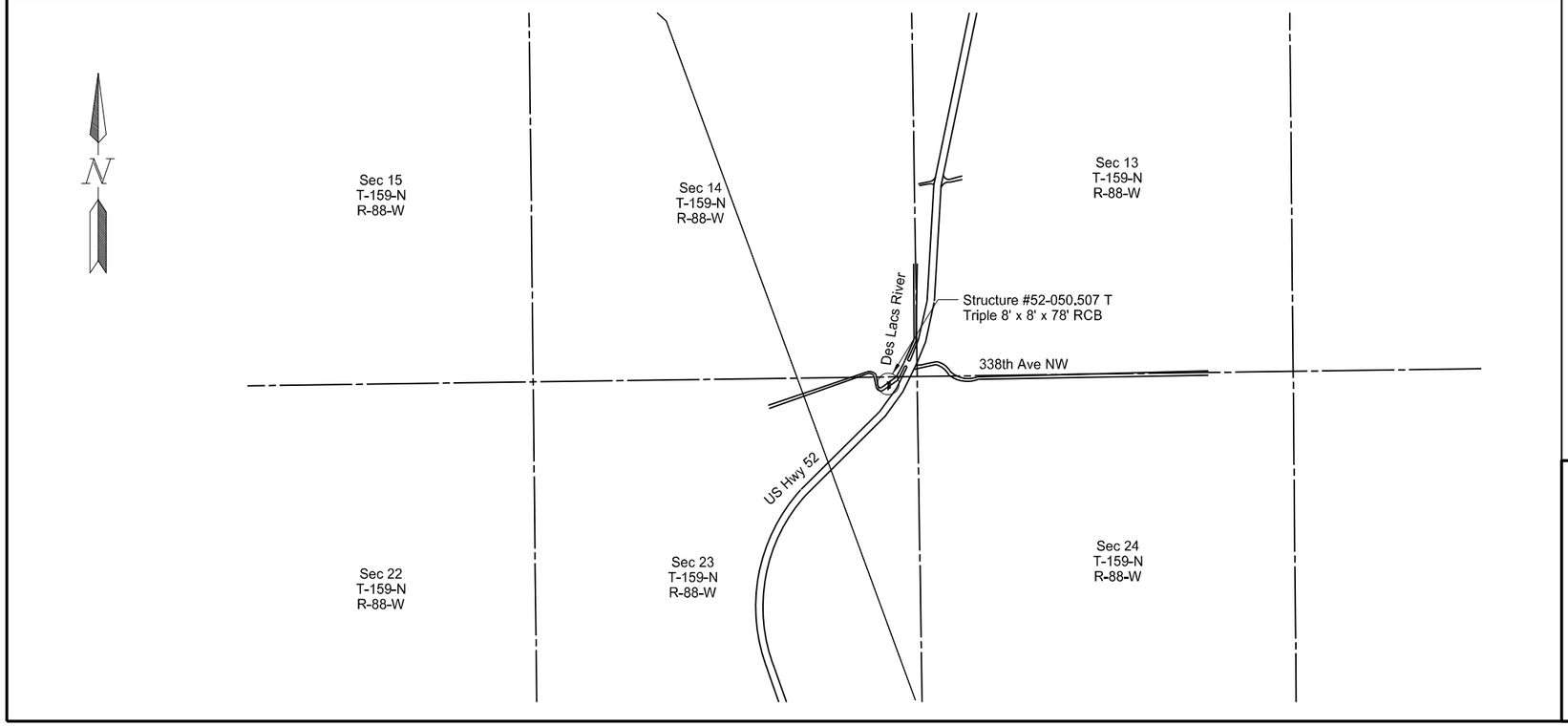


| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 4 | 4 |

**REPAIR NOTES:**

The general repairs of each structure are as follows:

Structure #40-058.713: Spall Repair, Box Culvert Joint Repair, Joint Treatment
Structure #52-050.507 T: Fill Scour Hole, Spall Repair, Box Culvert Joint Repair, Wingwall Replacement

Scope of Work

Structure #40-058.713
Structure #52-050.507 T

Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
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DATE 06/01/2023
NORTH DAKOTA

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| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 4 | 5 |

**REPAIR NOTES:**

The general repairs of each structure are as follows:

Structure #52-060.290: Spall Repair, Box Culvert Joint Repair
Structure #52-060.700: Spall Repair, Box Culvert Joint Repair
Structure #52-061.068: Spall Repair, Box Culvert Joint Repair
Structure #281-026.351: Box Culvert Joint Repair

Scope of Work

Structure #52-060.290
Structure #52-060.700
Structure #52-061.068
Structure #281-026.351

Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
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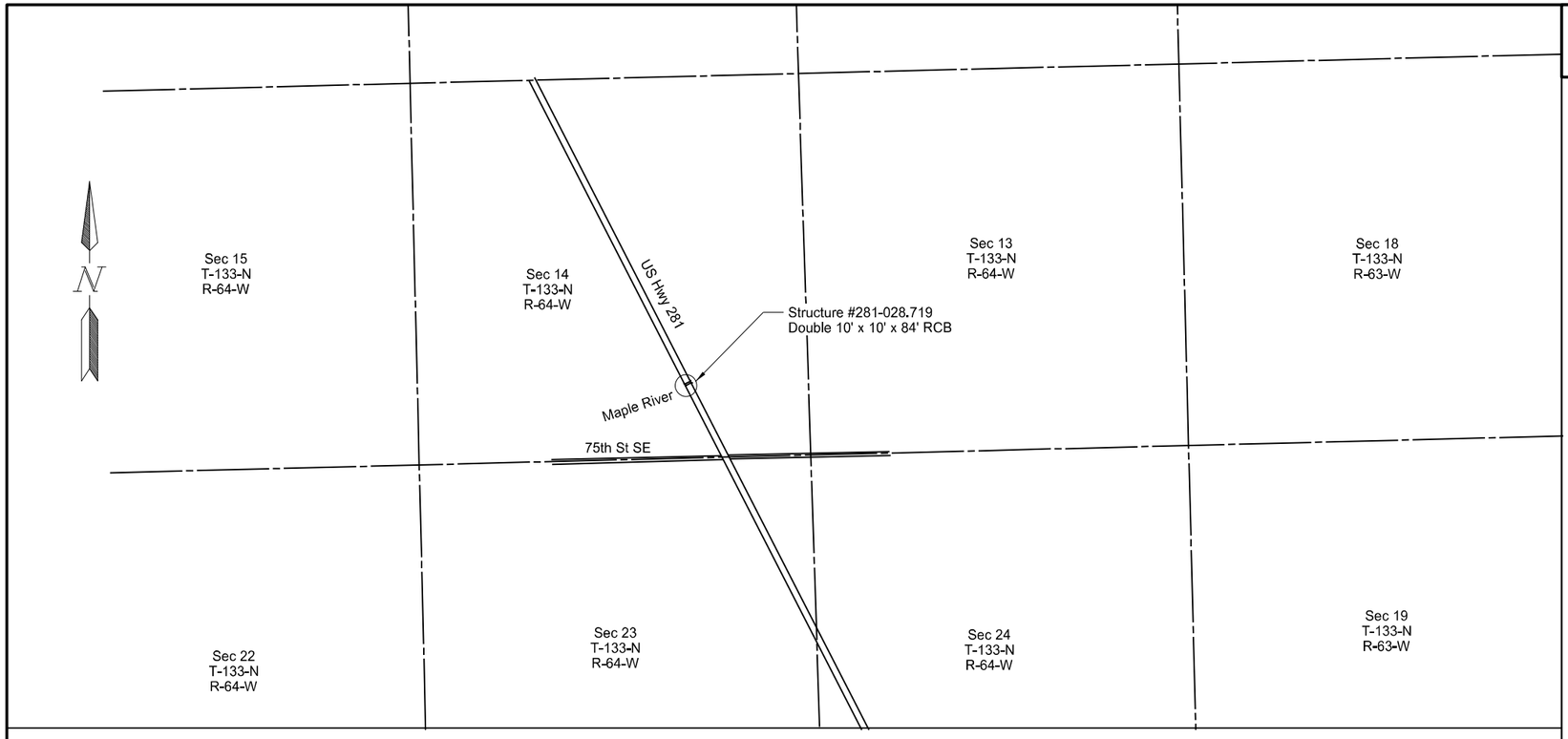
DATE 06/01/2023
NORTH DAKOTA

6/1/2023 10:36:35 AM conrad.ramirez G:\2022\22.22554\9999502\Design\Sheets\004SW_005.dgn




| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 4 | 6 |

**REPAIR NOTES:**

The general repairs of each structure are as follows:

Structure #281-028.719: Box Culvert Joint Repair

Scope of Work

Structure #281-028.719

Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 6 | 1 |

# NOTES

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

Upcoming project on US 281 at N TWP LINE N ELLENDALE TO EDGELEY.

Upcoming project on ND 28 from E JCT 5-MOHALL N TO STATE LINE.

Project 23342 is located on ND 17 at 5 EAST OF CANDO.

704-500 PORTABLE RUMBLE STRIPS (PRS): Use PRS made of rubber or engineered polymers. Install PRS as part of the temporary traffic control when the following signs are also part of the required of the required traffic control set up:

“Be Prepared to Stop” (W3-4)
“Flagger” symbol (W20-7)

Install PRS that meet the following criteria:

Have no adhesive or fasteners required for placement;
Have a manufacturer’s speed rating that meets or exceeds the posted speed limit; and each strip in the array must weigh a minimum of 100 pounds.

Use individual PRS constructed in one of the following manners:

A single piece;
Interlocking segments; or
Two pieces hinged at the midpoint.

An installed array of PRS consists of a minimum of 3 individual strips.

Move rumble strips with the flagging operation. Do not place rumble strips on horizontal curves.

The Engineer will count and measure each array as one unit. Include the cost of providing, installing, maintaining, and relocating PRS in the unit price bid for “Portable Rumble Strips”.

704-P01 TRAFFIC CONTROL FOR BOX CULVERTS: Provide traffic control consisting of a lane closure and flagging for thirteen box culvert locations, and a detour and roadway diversion at 0052-050.507T.

Traffic control device quantities for thirteen box culvert locations are based on 2 simultaneous lane closures. The Department will pay for additional devices if more locations are repaired concurrently.

Standard D-704-19 Type F – for thirteen box culverts identified in the plans. Use delineator drums in lieu of attenuation devices and barriers.

See Work Zone Traffic Control Plan for 0052-050.507T detour and roadway diversion.

910-P01 CONTROLLED DENSITY BACKFILL: Controlled density backfill consists of cement, water, fly ash, and aggregate at the ratio specified below. Place controlled density backfill as shown in the plans. Mix the material continuously during pumping or placement to keep the solution from separating. This item will be paid incidental to Item 930 Joint Repair.

Mix Design:
Material Weight (LBS)

Cement = 70 LBS/CY
FLY ASH = 125 LBS/CY
FINE AGGREGATE = 2600 LBS/CY
WATER = 416.5 LBS/CY

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 6 | 2 |

# ENVIRONMENTAL NOTES

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation and the Federal Highway Administration have 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 Oak Creek, Cut Bank Creek, Des Lacs River, and Maple River 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 THREATENED AND ENDANGERED SPECIES: The project is located near/within suitable habitat for the species listed in the following table.

| SPECIES | HABITAT | PRESENCE |
|---|---|---|
| **Northern Long-Eared Bat** | Forested/Wooded Areas/Bridges/Box Culverts/Caves/Mines | Active Season: April 1 - October 31* Inactive Season: November 1 - March 31* |

*Time frames can differ slightly, depending on the year

If any of the above threatened and endangered species are identified within 1 mile of the project, the Contractor will notify the Engineer immediately and cease construction activities in the vicinity until an avoidance area is established. The Engineer will establish an avoidance area that is at least a 0.5 mile and immediately coordinate with the USFWS (701-355-8513), FHWA (701-221-9464), and NDDOT Environmental and Transportation Services (701-328-2592). The Contractor will not resume work within the avoidance area until the Engineer has confirmed with the agencies that work may proceed (either the species have left the area, or approved avoidance/minimization measures have been implemented).

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
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Fedorenko
DATE 06/01/2023
NORTH DAKOTA

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 8 | 1 |

## Estimated Quantities

| SPEC | CODE | ITEM DESCRIPTION | UNIT | Mainline: Funding A | TOTAL |
|---|---|---|---|---|---|
| 103 | 0100 | CONTRACT BOND | L SUM | 1 | 1 |
| 202 | 0101 | REMOVAL OF CONCRETE | EA | 1 | 1 |
| 203 | 0195 | EMBANKMENT SPECIAL | L SUM | 1 | 1 |
| 210 | 0210 | FOUNDATION FILL | CY | 97 | 97 |
| 255 | 0101 | ECB TYPE 1 | SY | 44 | 44 |
| 256 | 0200 | RIPRAP GRADE II | CY | 1 | 1 |
| 602 | 1131 | CLASS AE-3 CONCRETE-BOX CULVERT | CY | 9.1 | 9.1 |
| 612 | 0114 | REINFORCING STEEL-GRADE 60-BOX CULVERT | LBS | 555 | 555 |
| 702 | 0100 | MOBILIZATION | L SUM | 1 | 1 |
| 704 | 0100 | FLAGGING | MHR | 390 | 390 |
| 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | 1514 | 1514 |
| 704 | 1048 | PORTABLE RUMBLE STRIPS | EA | 12 | 12 |
| 704 | 1052 | TYPE III BARRICADE | EA | 6 | 6 |
| 704 | 1060 | DELINEATOR DRUMS | EA | 24 | 24 |
| 930 | 8230 | SHORING | EA | 1 | 1 |
| 930 | 9612 | SPALL REPAIR | SF | 148 | 148 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 96 | 96 |
| 950 | 9712 | JOINT TREATMENT | LF | 8 | 8 |

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 100 | 1 |

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|---|---|---|---|---|---|
| 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** | **4** | **26** | **104** |
| G20-4-36 | 36"x18" | PILOT CAR FOLLOW ME (Mounted to back of pilot car) | | 18 | |
| G20-10-108 | 108"x48" | CONTRACTOR SIGN | | 70 | |
| 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 | | 36 | |
| G20-55-96 | 96"x48" | SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT | | 59 | |
| I2-5-96 | 96"x48" | YOUR HIGHWAY DOLLARS AT WORK | | 59 | |
| M1-1-36 | 36"x36" | INTERSTATE ROUTE MARKER (Post and installation only) | | 10 | |
| 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)** | **2** | **7** | **14** |
| 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 __** | **8** | **39** | **312** |
| **R2-1aP-24** | **24"x18"** | **MINIMUM FEE $80 (Mounted on Speed Limit post)** | **4** | **10** | **40** |
| 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 | | 16 | |
| **R11-2-48** | **48"x30"** | **ROAD CLOSED (Mounted on barricade)** | **2** | **12** | **24** |
| R11-2a-48 | 48"x30" | STREET CLOSED (Mounted on barricade) | | 12 | |
| 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) | | 15 | |
| W1-3-48 | 48"x48" | REVERSE TURN RIGHT or LEFT | | 35 | |
| W1-4-48 | 48"x48" | REVERSE CURVE RIGHT or LEFT | | 35 | |
| 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 | | 35 | |
| **W3-4-48** | **48"x48"** | **BE PREPARED TO STOP** | **4** | **35** | **140** |
| **W3-5-48** | **48"x48"** | **SPEED REDUCTION AHEAD** | **4** | **35** | **140** |
| 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)** | **4** | **10** | **40** |
| **W20-1-48** | **48"x48"** | **ROAD WORK AHEAD or _FT or _ MILE** | **4** | **35** | **140** |
| 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** | **4** | **35** | **140** |
| **W20-4-48** | **48"x48"** | **ONE LANE ROAD AHEAD or __ FT or _ MILE** | **4** | **35** | **140** |
| W20-5-48 | 48"x48" | RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE | | 35 | |
| **W20-7-48** | **48"x48"** | **FLAGGER** | **4** | **35** | **140** |
| W20-8-18 | 18"x18" | STOP - SLOW PADDLE Back to Back | | 5 | |
| 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 | |
| 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** | **4** | **35** | **140** |
| W22-8-48 | 48"x48" | FRESH OIL LOOSE ROCK | | 35 | |

**SPECIAL SIGNS**

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|---|---|---|---|---|---|

**SPEC & CODE**

| SPEC & CODE | DESCRIPTION | TOTAL UNITS | |
|---|---|---|---|
| 704-1000 | TRAFFIC CONTROL SIGNS | | 1514 |

| SPEC & CODE | DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|
| **704-0100** | **FLAGGING** | **MHR** | **390** |
| 704-1018 | LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL | EACH | |
| 704-1043 | ATTENUATION DEVICE-TYPE B-65 | EACH | |
| **704-1048** | **PORTABLE RUMBLE STRIPS** | **EACH** | **12** |
| 704-1050 | TYPE I BARRICADES | EACH | |
| **704-1052** | **TYPE III BARRICADES** | **EACH** | **6** |
| **704-1060** | **DELINEATOR DRUMS** | **EACH** | **24** |
| 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 | |
| 704-3501 | PORTABLE PRECAST CONCRETE MED BARRIER | LF | |
| 704-3510 | PRECAST CONCRETE MED BARRIER - STATE FURNISHED | EACH | |
| 762-0200 | RAISED PAVEMENT MARKERS | EACH | |
| 762-0420 | SHORT TERM 4IN LINE - TYPE R | LF | |
| 762-0426 | SHORT TERM 24IN LINE-TYPE R | LF | |
| 762-0430 | SHORT TERM 4IN LINE - TYPE NR | LF | |

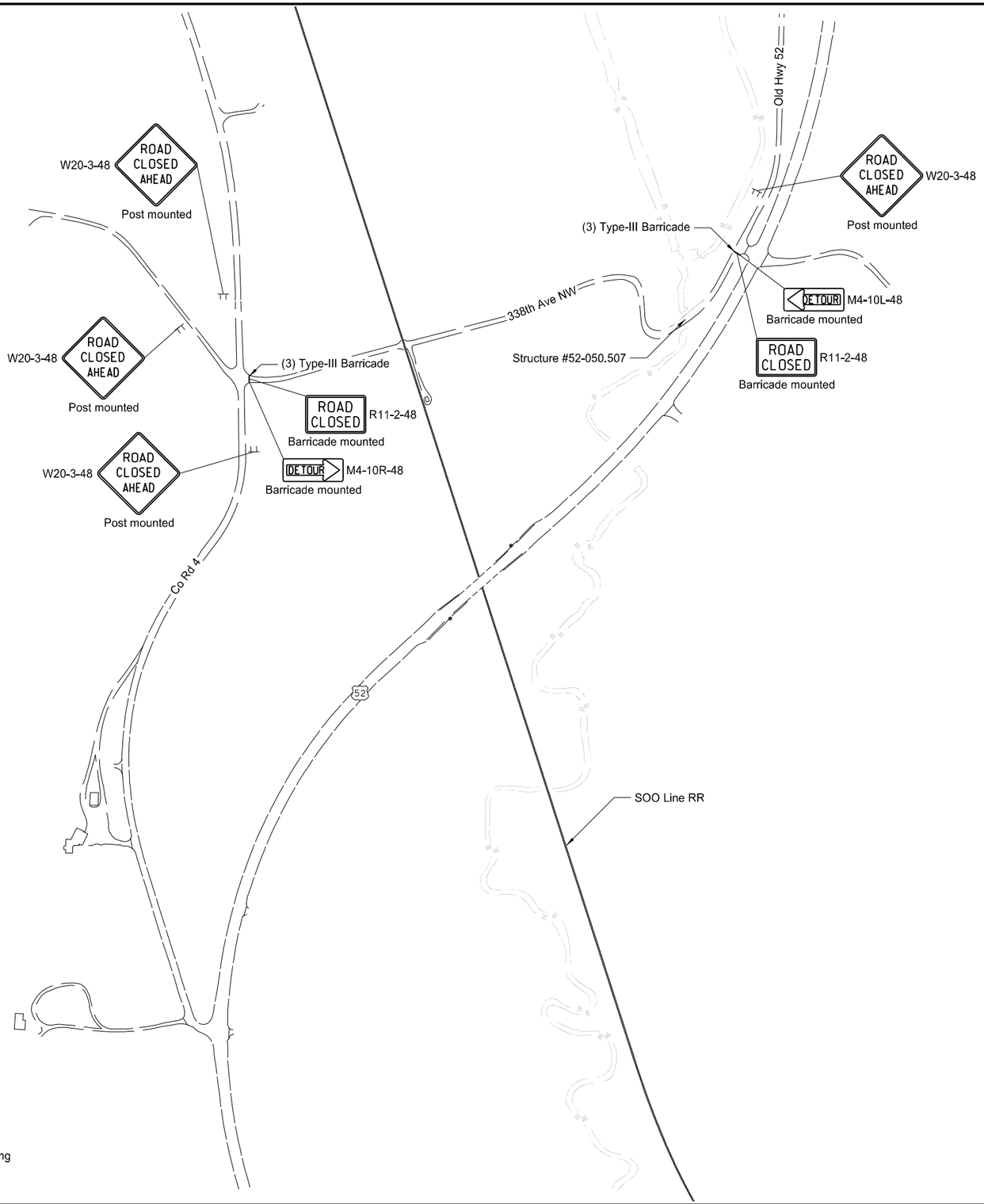
NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
Fedorienko
DATE 06/02/2023
NORTH DAKOTA

Traffic Control Devices List

Structural Repair
Various Structures - Statewide

| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 100 | 2 |




Note: See Standard Drawing
D-704-21 for sign spacing

Work Zone Traffic Control

Structure #52-050.507

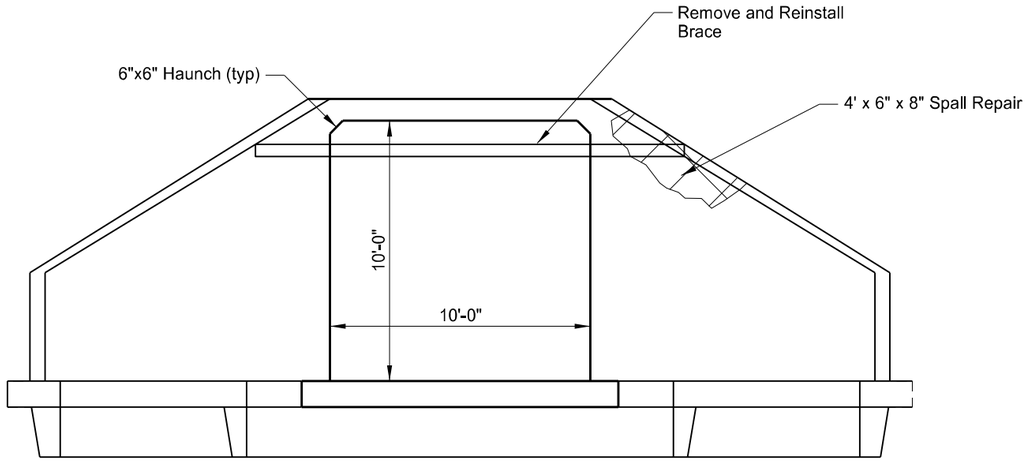
Structural Repair
Various Structures - Statewide

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/02/2023
NORTH DAKOTA

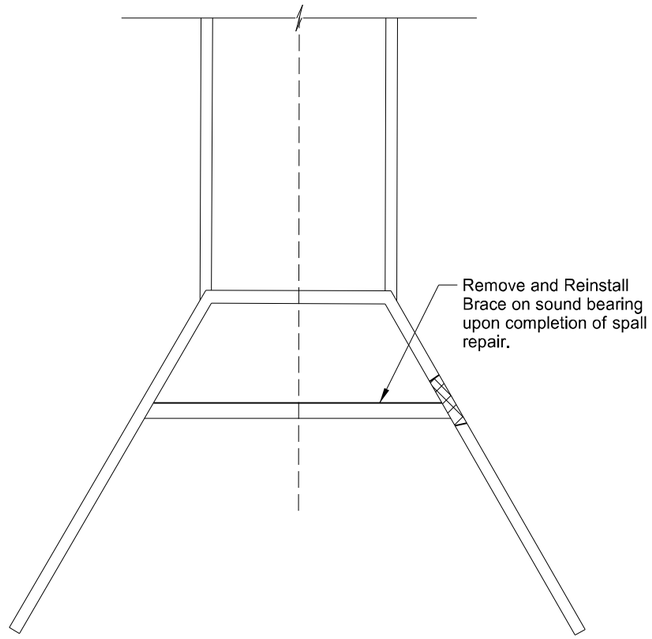
6/1/2023 10:40:13 AM conrad.ramirez G:\2022\22.22554\9999502\Design\Sheets\100WZ_002.dgn

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 1 |

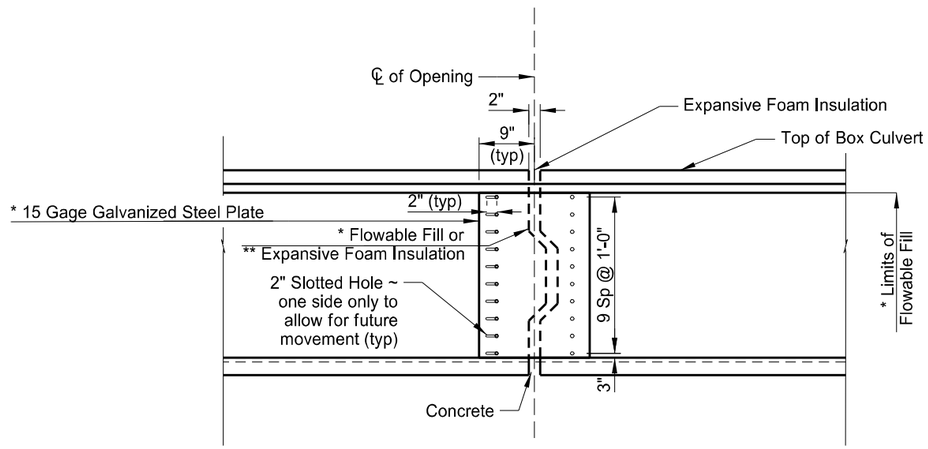



BARREL SECTION


PART PLAN

Indicates spall repair area. Dimensions for estimating purposes only.




JOINT REPAIR DETAIL

* Option 1: See Notes for details
** Option 2: See Notes for details

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 3 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 4 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

BRANCH OF OAK CREEK
ND 5, 4 WEST OF ND 60

BOX CULVERT REPAIRS
5-179.794

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
Fedorienko
DATE 06/01/2023
NORTH DAKOTA

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23
Jon Ketterling

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 2 |

# NOTES

100 SCOPE OF WORK: Work at this site consists of repairing the spalled concrete on the southeast wingwall and repairing joints at this single 10x10 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on the southeast wing of the original box culvert. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1" clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair and removing and reinstalling brace in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The construction joint near mid length has separated approximately 2". Voids measured from the inside of the box culvert measured up to 4' deep.

If the box culvert needs to be dewatered, include the price in the amount bid for "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 4 joint segments will be paid for at the construction joint: 2 exterior walls, 1 floor segment, and 1 roof segment.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

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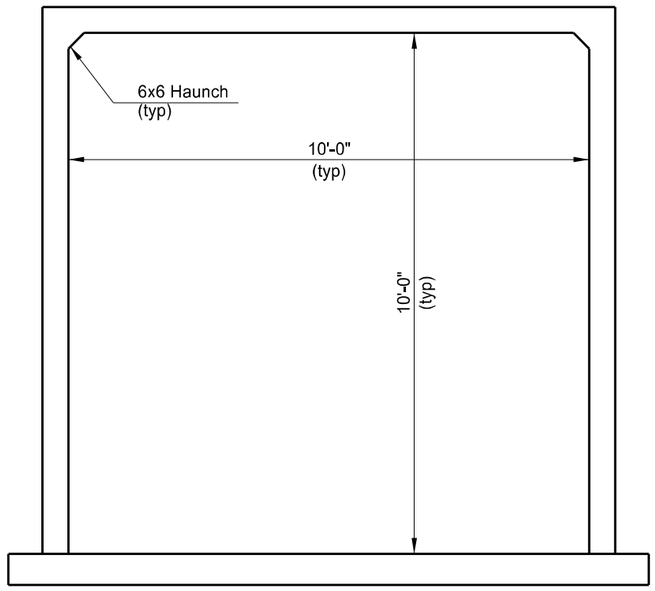
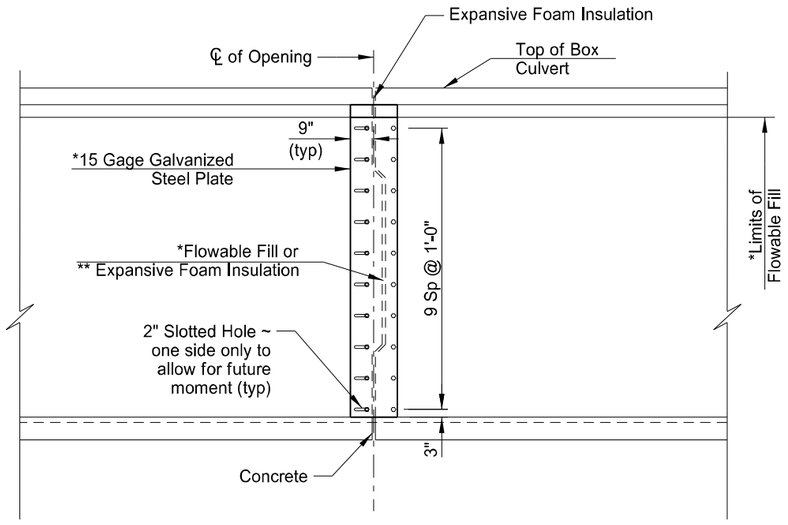
PE-29340
DATE 06/01/2023
NORTH DAKOTA

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 3 |




BARREL SECTION




JOINT REPAIR DETAIL

NOTES:

100 SCOPE OF WORK: Work at this location consists of repairing the joint at this concrete box culvert.

930 BOX CULVERT JOINT REPAIR: The middle construction joint of the reinforced concrete box culvert has separated approximately 2".

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 PSI | ASTM D 638 |
| Compressive Strength | 90 PSI | ASTM D 1621 |
| Shear Strength | 25 PSI | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 4 joint segments will be paid for at the construction joint: 2 exterior walls, 1 floor segment, and 1 roof segment.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair."

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 4 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

BRANCH OF OAK CREEK
ND 5, 4 WEST OF ND 60

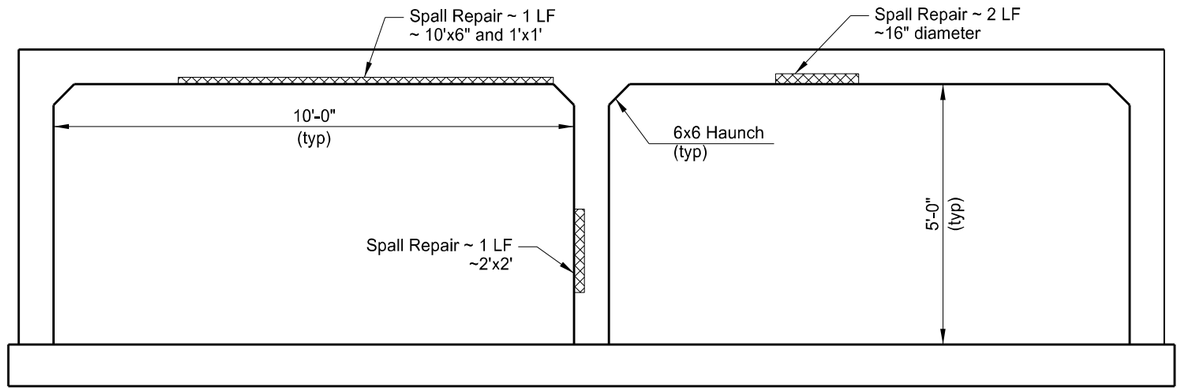
BOX CULVERT REPAIRS
5-179.972

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 4 |

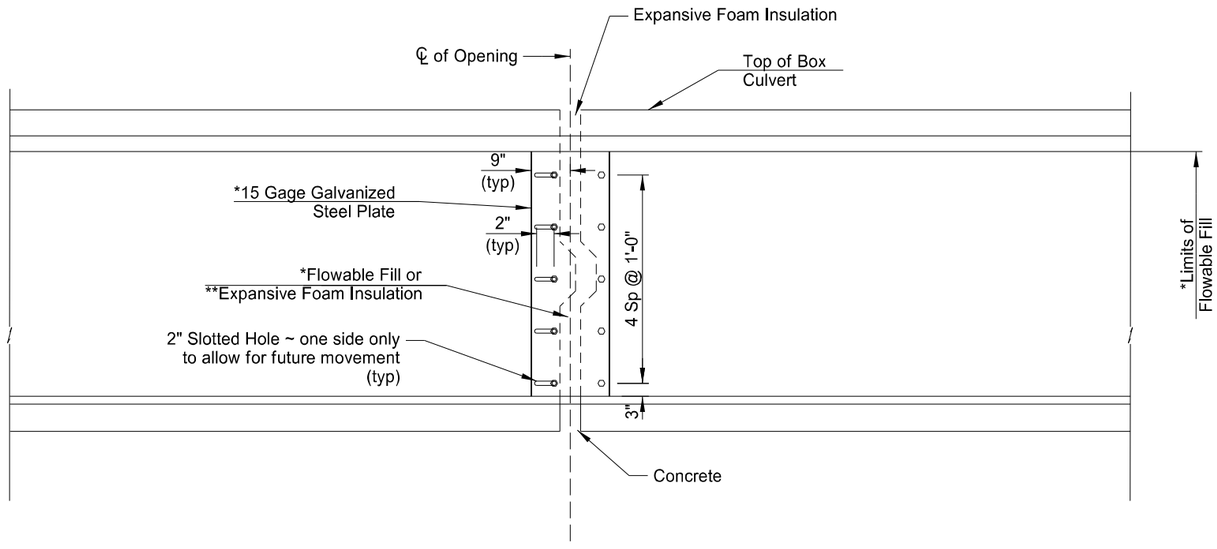



BARREL SECTION

Indicates spall repair area. dimensions for estimating purposes only.

## BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 12 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 12 |




JOINT REPAIR DETAIL

* Option 1: See Notes for details
** Option 2: See Notes for details

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DATE 06/01/2023
NORTH DAKOTA

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 17, 1 EAST OF ND 281

BOX CULVERT REPAIRS
17-039.840

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Ketterling, Jonathan
06/12/23

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the spalled areas on Barrel 1 (east wall and ceiling) and Barrel 2 (ceiling) and repairing joints at this double 10x5 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on Barrel 2 (east), ceiling near midpoint, Barrel 1 (west) east wall near midpoint, and Barrel 1 (west) ceiling. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1" clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair and removing and reinstalling brace in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The construction joints have separated approximately as follows: Barrel 1 (west) south joint separating horizontally up to 1" and north joint up to 2 1/2" and faulted 1 1/2". Barrel 2 (east) south joint separating horizontally up to 1" and north joint up to 2" and faulted 1 1/2".

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 12 joint segments will be paid for at the construction joint: 4 exterior walls, 4 floor segments, and 4 roof segments. The voids will not be filled on the interior walls.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

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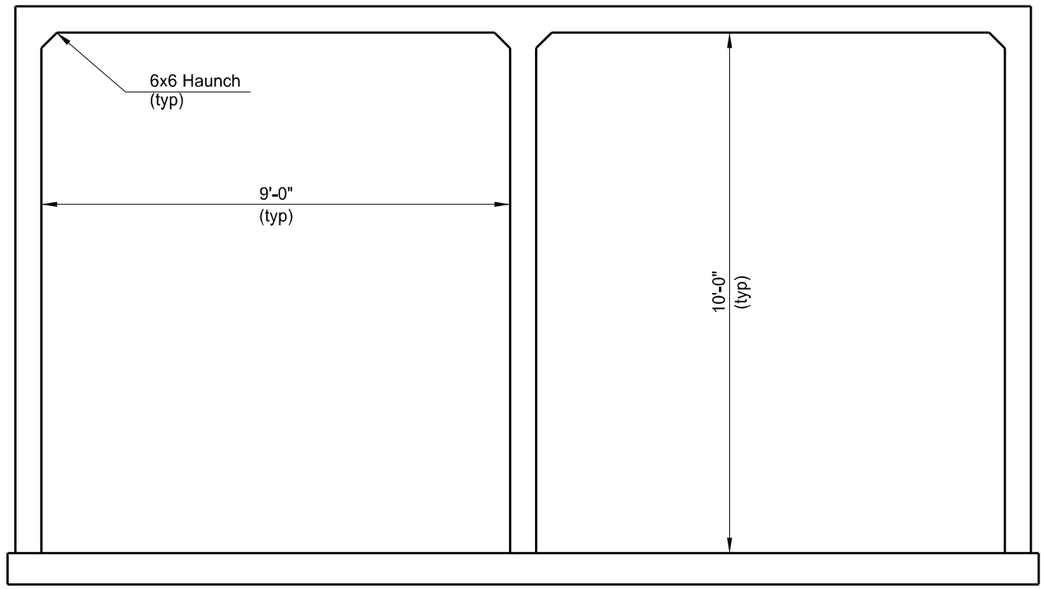
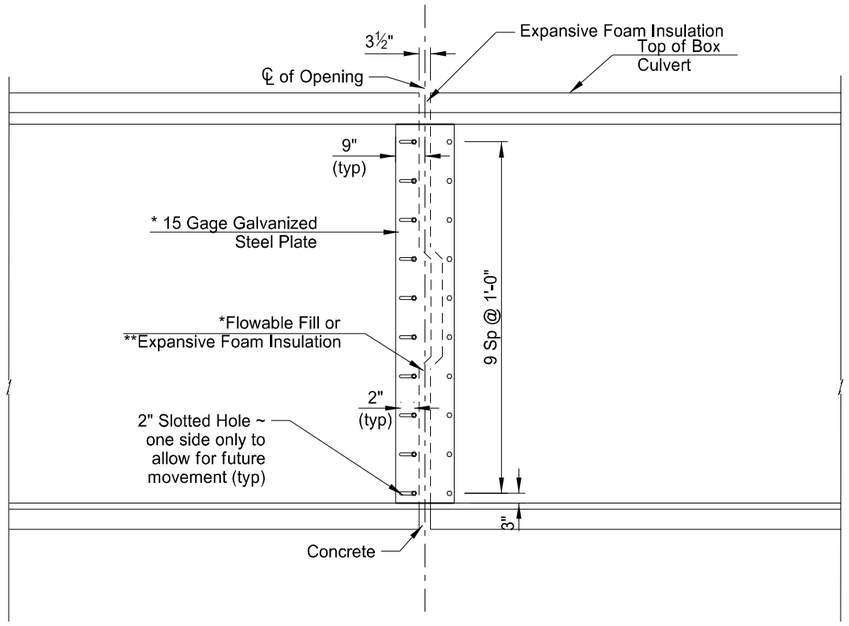
NORTH DAKOTA

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 6 |




BARREL SECTION




JOINT REPAIR DETAIL

## NOTES:

100 SCOPE OF WORK: Work at this location consists of repairing the joint at this concrete box culvert.

930 BOX CULVERT JOINT REPAIR: The construction joint of the reinforced concrete box culvert has separated approximately 3 1/2". Voids measured from the inside of the box culvert measured up to 5' deep behind east wall.

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following opitons at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 PSI | ASTM D 638 |
| Compressive Strength | 90 PSI | ASTM D 1621 |
| Shear Strength | 25 PSI | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 6 joint segments will be paid for at the construction joint: 2 exterior walls, 2 floor segments, and 2 roof segments. The voids will not be filled on the interior walls.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

## BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 6 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 21, 5 EAST OF CARSON

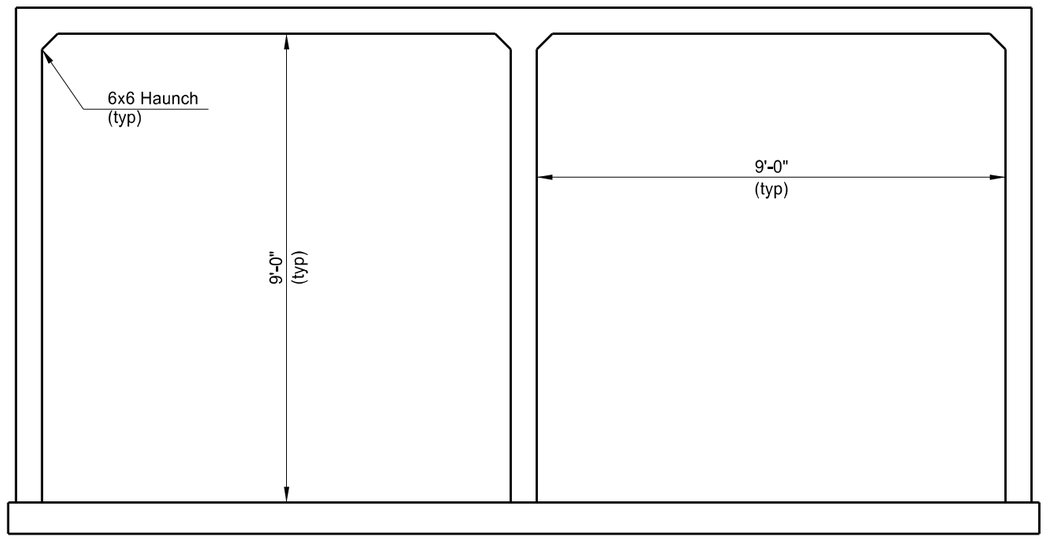
BOX CULVERT REPAIRS
21-095.497

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

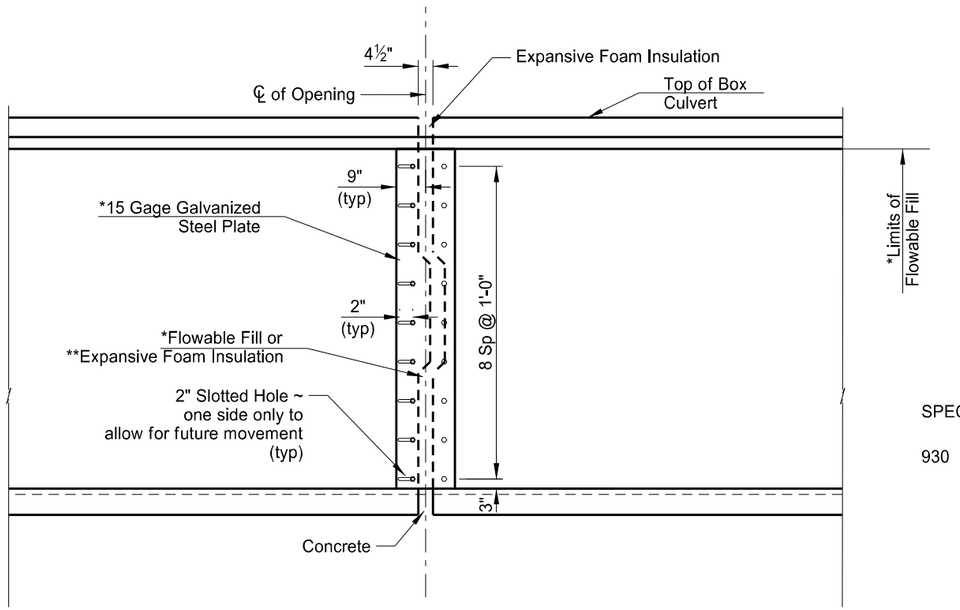
ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 7 |




BARREL SECTION




JOINT REPAIR DETAIL

## NOTES:

100 SCOPE OF WORK: Work at this location consists of repairing the joint at this concrete box culvert.

930 BOX CULVERT JOINT REPAIR: The center construction joint of the reinforced concrete box culvert has separated approximately 4½". Voids measured from inside the box culvert measured up to 2.5' deep in the wall.

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 PSI | ASTM D 638 |
| Compressive Strength | 90 PSI | ASTM D 1621 |
| Shear Strength | 25 PSI | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 6 joint segments will be paid for at the construction joint: 2 exterior walls, 2 floor segments, and 2 roof segments. The voids will not be filled on the interior walls.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

## BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 6 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 21, 10 EAST OF CARSON

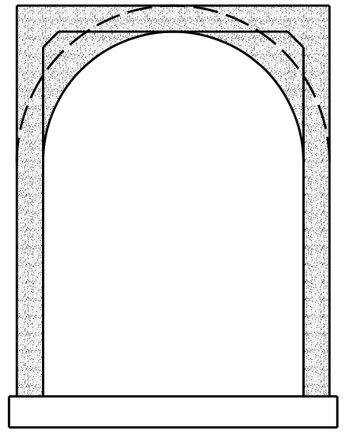
BOX CULVERT REPAIRS
21-100.041

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

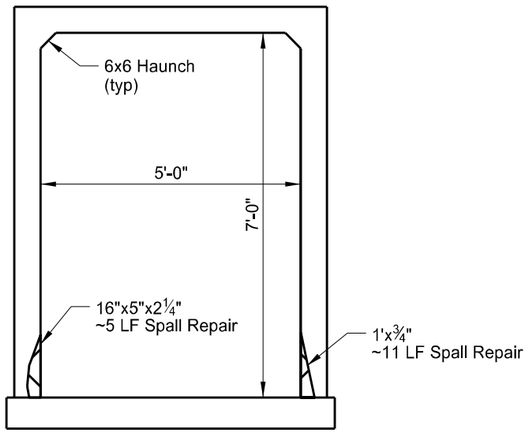
ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 8 |

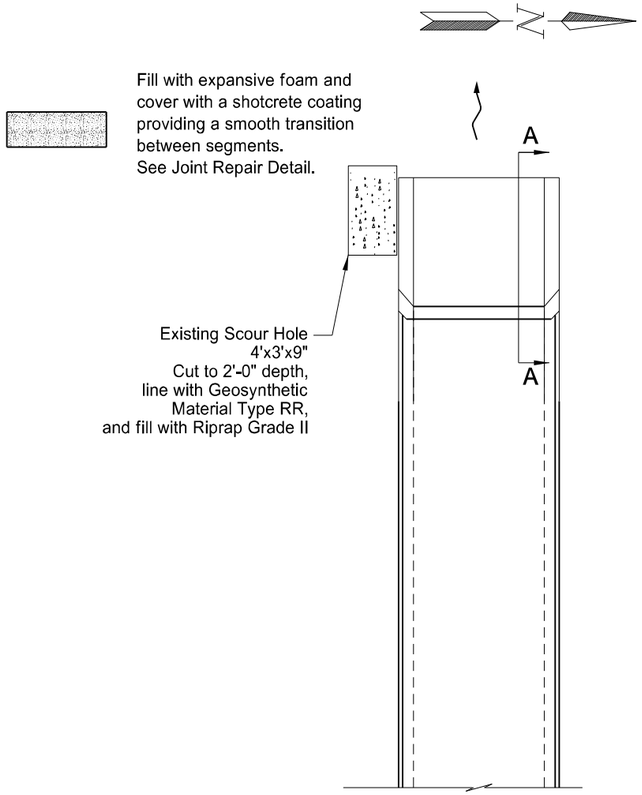


BARREL EXTENSION INTERFACE

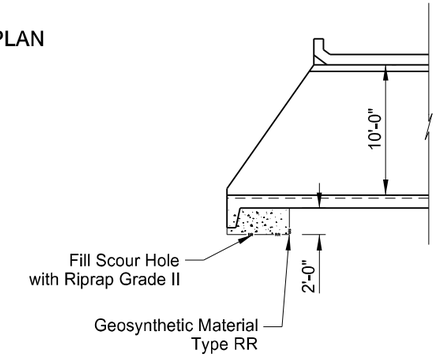



ORIGINAL BARREL SECTION

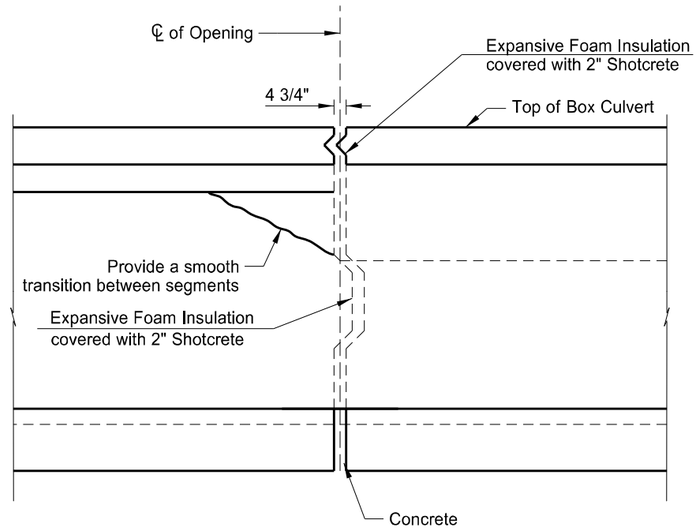
Indicates spall repair area.
Dimensions for estimating
purposes only.




PART PLAN




A-A




JOINT REPAIR DETAIL

## BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 256 | 0200 | RIPRAP GRADE II | CY | 1 |
| 930 | 9612 | SPALL REPAIR | SF | 16 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 8 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 28, 3 SOUTH OF US 52

BOX CULVERT REPAIRS
28-052.462

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/12/2023
NORTH DAKOTA

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 9 |

# NOTES

100 SCOPE OF WORK: Work at this site consists of filling the scour hole at west end with riprap and repairing the joint closures at both extension joints.

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. 2 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 "Riprap Grade II".

930 BOX CULVERT JOINT REPAIR: The middle construction joints have separated up to approximately 4 3/4". Voids measured from the inside of the box culvert measured up to 3' up from inside of the culvert ceiling.

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Clean the joints of debris and fill voids above the roof and behind the walls with expansive foam insulation.

Use one of the following options:
Option 1: Stop the foam outside of the roof and walls to allow for shotcrete anchorage. Cover with a shotcrete coating a minimum of 2" thick providing a smooth transition between segments in accordance with SP 498(22) Shotcrete. Place and cure the material as recommended by the manufacturer.

Option 2: Cut expansive foam flush with the interior of the box culvert after it has dried. Apply a Concrete Bonding Agent, such as Weld-Crete or approved equivalent installed per the manufacturer's instructions, to 3" minimum on either side of the joint repair prior to the application shotcrete. Cover with a shotcrete coating a minimum of 2" thick providing a smooth transition between segments in accordance with SP 498(22) Shotcrete. Place and cure the material as recommended by the manufacturer.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 8 joint segments will be paid for at the construction joint: 4 exterior walls, 2 floor segments, and 2 roof segments.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on the bottom walls of the original box culvert. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1" clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

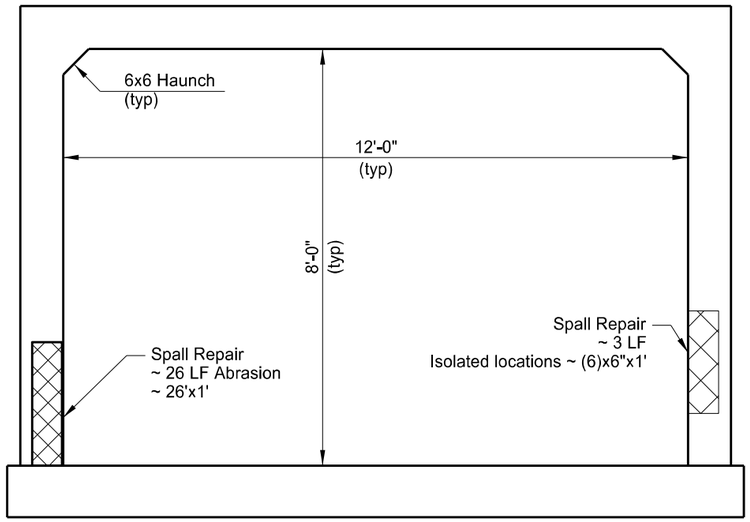
At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair and removing and reinstalling brace in the price bid for "Spall Repair".

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

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

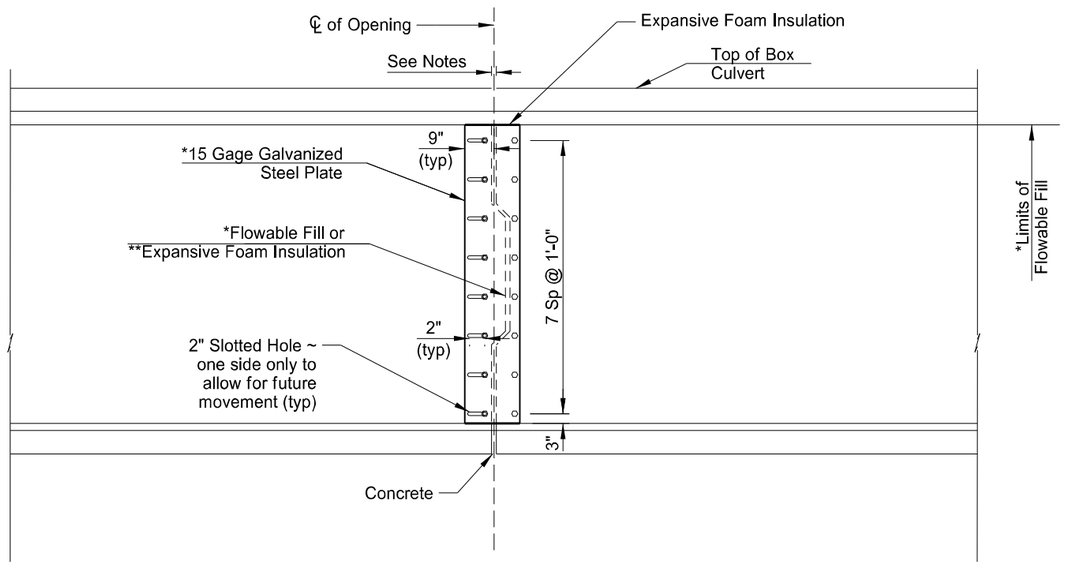
| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 10 |




BARREL SECTION

NOTE:
All areas to be verified by Engineer in the field prior to removal.

Indicates spall repair area. Dimensions for estimating purposes only.




JOINT REPAIR DETAIL

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 29 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 8 |

* Option 1: See Notes for details
** Option 2: See Notes for details

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CUT BANK CREEK
ND 28, 15 NORTH OF ND 5

BOX CULVERT REPAIRS
28-095.668

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the spalled concrete on the walls and repairing joints at this single 12x8 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1” clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

For the 26 LF Abrasion repair, cover with a Shotcrete coating in accordance with SP 498(22) Shotcrete. Place and cure the material as recommended by the manufacturer.

For the 3 LF Spall provide a repair in accordance with SP 498(22) Shotcrete.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair and removing and reinstalling brace in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The south construction joint of the reinforced concrete box culvert has separated approximately 3" and the north construction joint has separated approximately 1 1/2".

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 8 joint segments will be paid for at the construction joint:4 exterior walls, 2 floor segments, and 2 roof segments. The voids will not be filled on the interior walls.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

REGISTERED PROFESSIONAL ENGINEER
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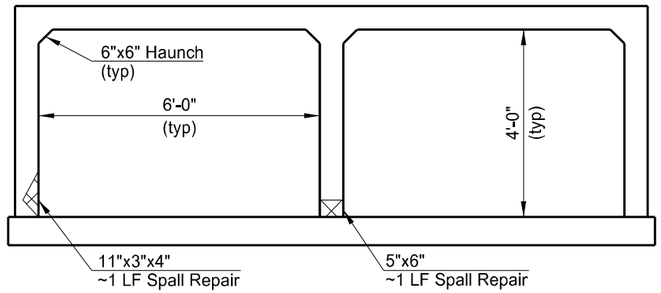
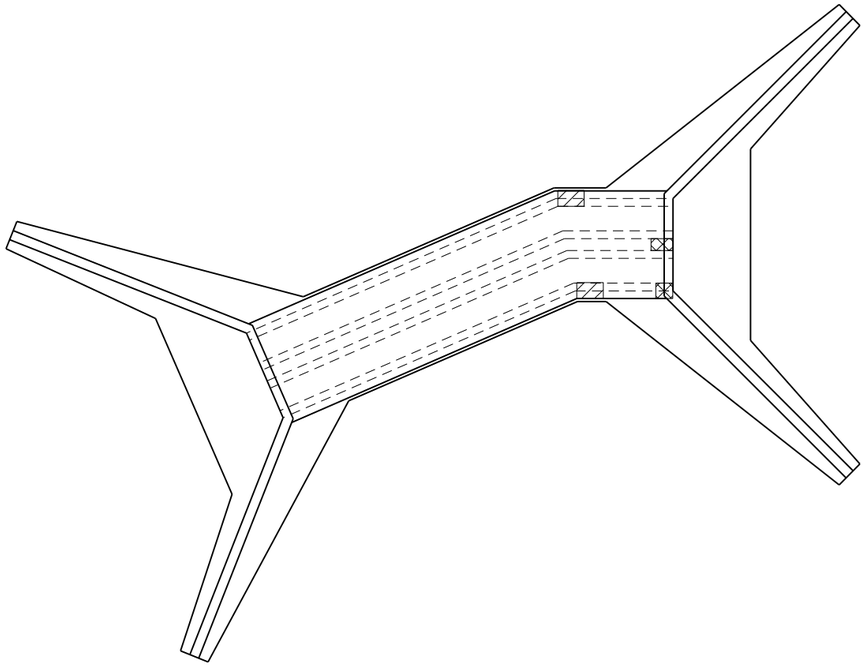
DATE 06/01/2023
NORTH DAKOTA

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

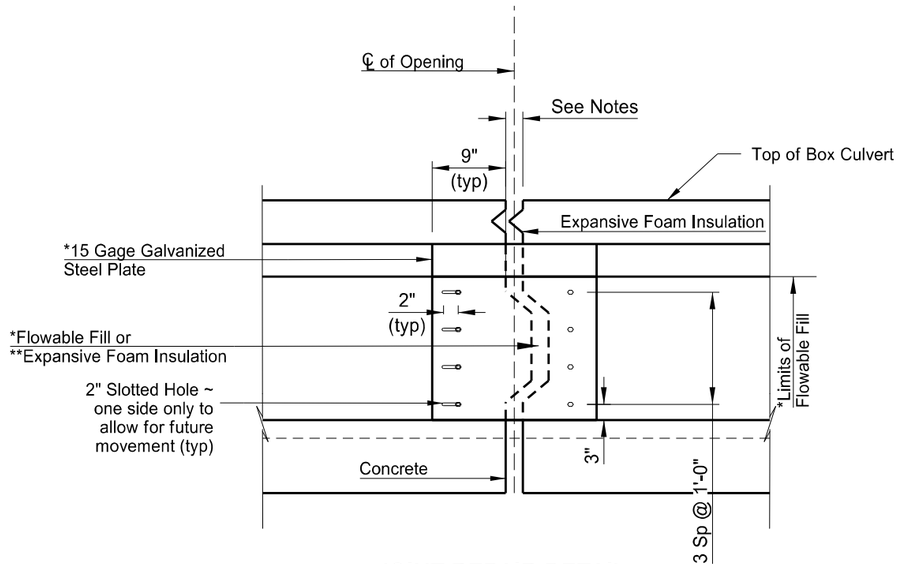
| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 12 |




BARREL SECTION



BOX CULVERT PLAN




JOINT REPAIR DETAIL

* Option 1: See Notes for details
** Option 2: See Notes for details

Hatched area indicates joint treatment.
Dimensions for estimating purposes only.

Indicates spall repair area.
Dimensions for estimating purposes only.

**NOTE:**

All areas to be verified by Engineer
in the field prior to removal.

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 2 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 6 |
| 950 | 9712 | JOINT TREATMENT | LF | 8 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 40, 3 NORTH ND 5

BOX CULVERT REPAIRS
40-058.713

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the spalled concrete on the east middle wall and exterior wall, repairing, and treating joints at this double 6x4 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on the east walls. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1" clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The construction joints have separated approximately as follows: 1 1/4" and faulted 1 3/8".

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete. Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 6 joint segments will be paid for at the construction joint: 2 exterior walls, 2 floor segments, and 2 roof segments.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

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DATE 06/01/2023
NORTH DAKOTA

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 14 |

# NOTES

950 JOINT TREATMENT: The reinforced concrete box culvert has severe damage at the extension joints. The Engineer will sound and mark out areas of unsound concrete prior to removal.

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 concrete to a depth that provides a minimum clearance of 1" around the periphery of the rebar. Take care not to damage existing reinforcement.

Sand blast clean any rust scale found on the exposed reinforcing steel. Clean the existing concrete surface by light sand blasting or high-pressure water blasting. After the surface has dried just before the patching material is placed, coat the surface with an epoxy bonding agent.

Use shotcrete in accordance with SP 498(22) Shotcrete. Apply and cure the material as recommended by the manufacturer.

The plan quantity is based on the assumption that the areas to be repaired are to the dimensions shown in plan view. The actual limits of the repair are to be determined by the Engineer in the field.

Include all labor, equipment, and materials needed to repair the spall areas in the bid item "Joint Treatment".

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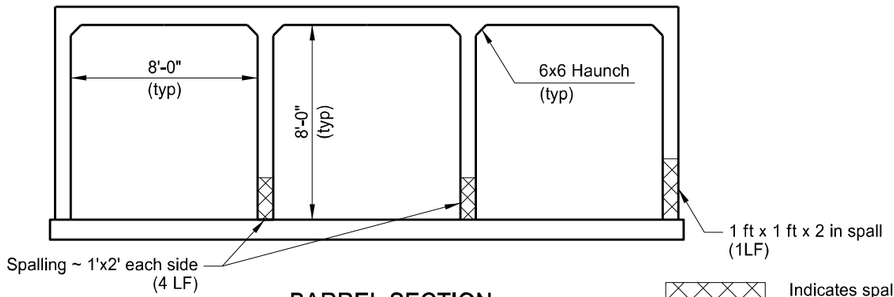
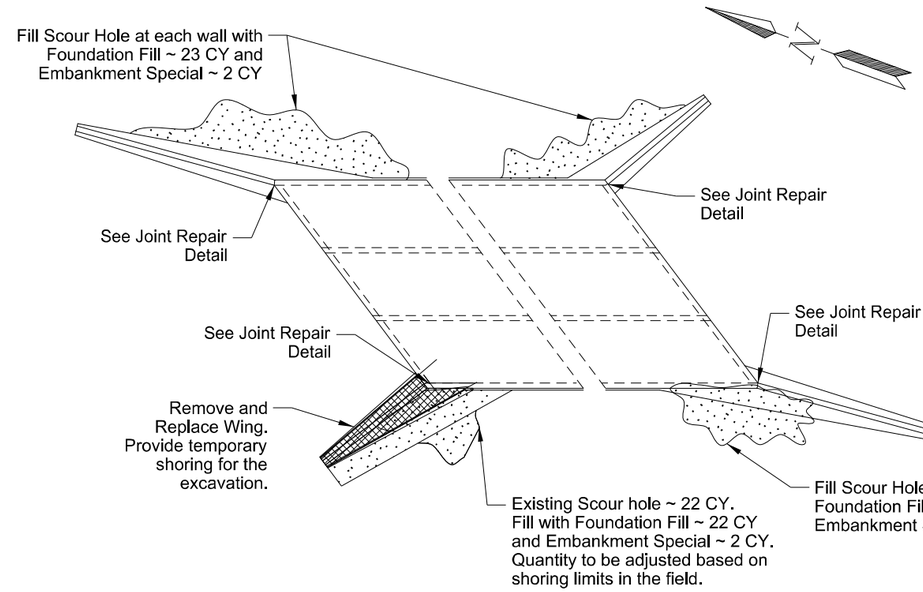
23 U.S.C. 407
NDDOT Reserves All Objections

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 15 |



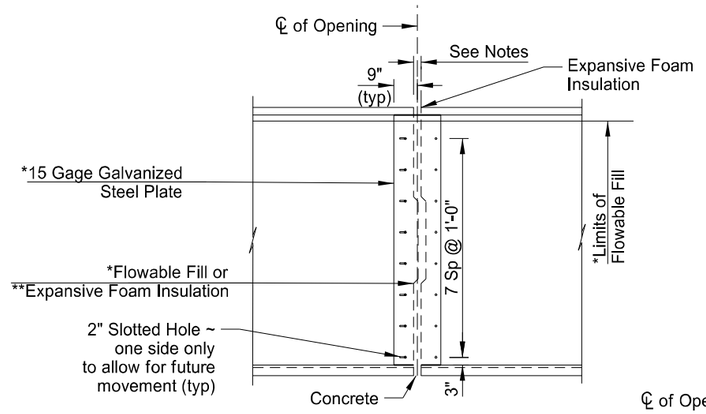

BARREL SECTION

Indicates spall repair area



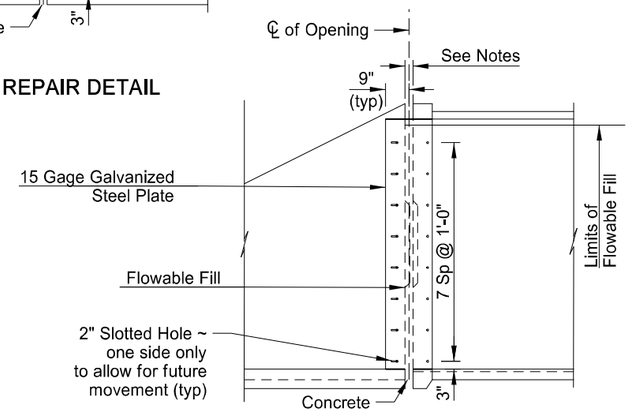

BOX CULVERT PLAN

Foundation Fill with Embankment Special




* Option 1: See Notes for details
** Option 2: See Notes for details

JOINT REPAIR DETAIL




WINGWALL JOINT REPAIR DETAIL

## BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 202 | 0101 | REMOVAL OF CONCRETE | EA | 1 |
| 203 | 0195 | EMBANKMENT SPECIAL | L SUM | 1 |
| 210 | 0210 | FOUNDATION FILL | CY | 97 |
| 255 | 0101 | ECB TYPE I | SY | 44 |
| 602 | 1131 | CLASS AE-3 CONCRETE-BOX CULVERT | CY | 9.1 |
| 612 | 0114 | REINFORCING STEEL-GRADE 60-BOX CULVERT | LBS | 555 |
| 930 | 8230 | SHORING | EA | 1 |
| 930 | 9612 | SPALL REPAIR | SF | 5 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 12 |

NOTE:

Place a 1'-0" minimum depth of foundation fill and bedding under the wingwall footing and extending 3'-0" laterally from the footing limits, ~8 CY. Provide bedding in accordance with Section 606.E.1. Remove and replace all unsound material under the box with foundation fill. The Engineer will determine the depth required.

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

DES LACS RIVER
ND 52, SOUTHEAST OF KENMARE

BOX CULVERT REPAIRS
52-050.507

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the northwest wingwall, repairing joints and scour at this triple 8x8 reinforced concrete box culvert.

100 GENERAL: Include the cost of furnishing and placing preformed expansion joint filler, concrete inserts, rebar couplers, silicone sealant, and other miscellaneous items in the price bid for “Class AE-3 Concrete”.

202 REMOVAL OF CONCRETE: Remove existing northeast wingwall in its entirety. Cut wing footing to the limits shown and cut rebar protruding from the barrel into the wing footing flush with the wall of the barrel. Leave the barrel roof, walls, floor, and cutoff walls in place.

203 EMBANKMENT SPECIAL: The fill behind the wingwalls has erosion from failed joints. After the joint is replaced and repairs are completed, repair the erosion with foundation fill and the top 6” as imported topsoil meeting specification 203.04B.2. Place and compact the topsoil in layers not exceeding 6 inches loose. Shape and compact the imported topsoil with a juming jack compactor to match the surrounding embankment. It is estimated that less than 8 cubic yds of imported topsoil will be required for the repairs. Include all labor, equipment, and material to repair the erosion in the bid item “EMBANKMENT SPECIAL”.

255 ECB TYPE I: After repairing the erosion behind the wingwalls, seed the imported topsoil with Class II seed mixture, meeting specification 251.03 D. Place seed by broadcasting the area at a rate of 0.06 pounds per SY. Prior to broadcasting, loosen the soil by means of a hand rake or drag. After seeding, rake the area loosely to cover the seed. Place Erosion Control Blanket Type 1 meeting specification 255 over the repaired embankment. Staple the blanket in accordance with Standard D-255-2, trench the top edge of the blanket along the wingwall, but do not trench the sides of the blanket. Place a small amount of topsoil along the sides of the blanket to hold it down in place. It is estimated that approximately 44 SY of ECB Type 1 will be required for repairs. Include all labor, equipment, and material to seed and blanket the erosion in the bid item “ECB Type I”.

602 CONCRETE: Cast the following elements of each section in one continuous run:

1. Wing footings
2. Wing complete to the top

If the existing wall thicknesses is different than the new thickness, set the inner surfaces flush and the exterior surfaces tapered in the first 1’-6” of the wing.

602 CURING CONCRETE: Wet cure all concrete surfaces not covered by forms. Cover the concrete with a double thickness of burlap. Maintain surface moisture between the final finish and placement of burlap by periodic applications of a light fog spray of water. Keep the burlap continuously moist until the end of the curing period.

602 POST INSTALLED ANCHORAGES: Concrete anchorages for the wing footing will require drilling and anchoring to existing concrete using a chemical adhesive. Provide an adhesive with a minimum characteristic bond strength in uncracked concrete of 1.5 ksi. Drill holes 1/8” larger in diameter than anchorage bar or per manufacturer’s recommendations and to the depths shown in the details. The Contractor will verify that no reinforcement will be encountered while drilling and any modifications to anchorage spacing will be approved by the Engineer prior to drilling.

Submit to the Engineer one system, including installation instructions, for approval prior to beginning work. Install all anchors as specified by the Manufacturer’s Printed Installation Instructions. Adhesive anchorage installers must hold current ACI-CRSI Adhesive Anchor Installer Certification credentials. Prior to installation of the anchorages on the project, meet with the Project Engineer, Inspectors, and Installers to review the installation process and requirements. At the Pre-installation meeting, submit a record of the contractor/installer ACI-CRSI certification card to the Project Engineer.

Meet the following conditions prior to installing:

- Ensure concrete surface is free of water prior to drilling
- Ensure the hole is dry
- Install anchorages per Manufacturer’s Printed Installation Instructions

Include the price for installation and testing of anchorage of individual bars in the bid items “Reinforcing Steel-Grade 60”.

612 REINFORCING STEEL: Dimensions of bent bars are given out to out.

930 SHORING: Temporary shoring is required for the excavation and replacement of the wingwall. The Contractor will design, construct, maintain, and remove the temporary shoring. All excavation, labor, equipment, and material needed for this work shall be included in the bid item, “Shoring”.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on both walls of the original box culvert. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1” clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

Use a two component, polymer-modified, cementitious repair

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DATE 06/01/2023
NORTH DAKOTA

## NOTES

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.

At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The north construction joint has separated a maximum of 5 in.

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

At the wingwall joints, attach an 18" wide, 15 gage galvanized steel plate to both side walls. Bend the steel plate to match the angle at the wingwall, approximately 45 degrees. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

Use one of the following options at the walls:

*Option 1: Attach an 18" wide, 15 gage galvanized steel plate to both side walls. Install the anchorage system according to the manufacturer's recommendation with a high strength adhesive specifically intended for concrete anchorage in accordance with Section 806.02. Fill the voids behind the walls with flowable fill from inside the box culvert.

**Option 2: Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 12 joint segments will be paid for at the construction joint: 4 wingwall joints, 2 exterior walls, 3 floor segments, and 3 roof segments.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

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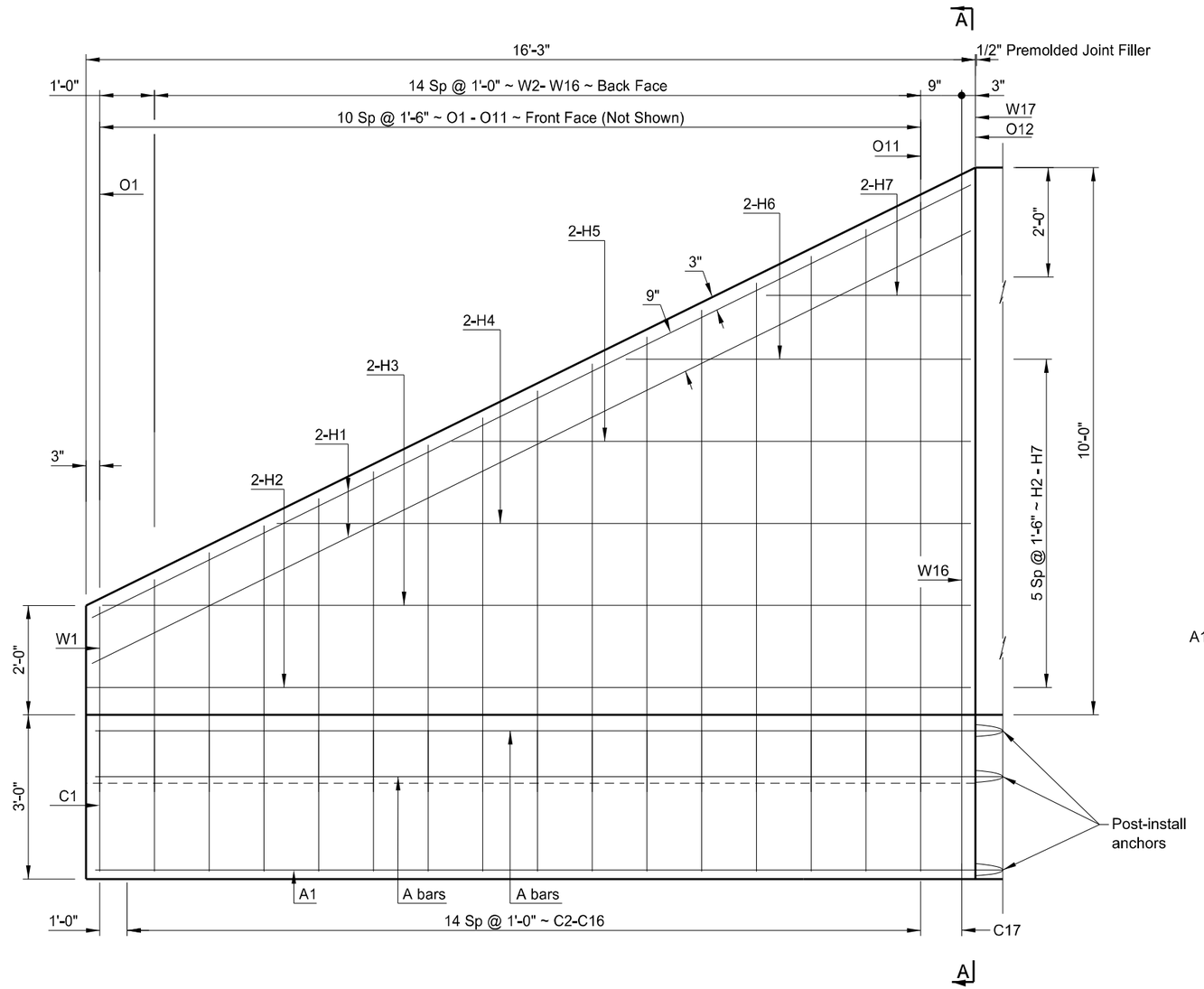
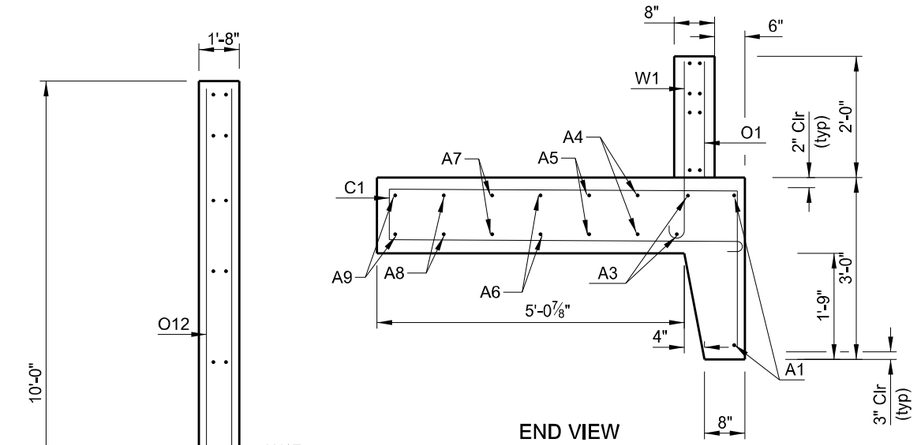
23 U.S.C. 407
NDDOT Reserves All Objections

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 18 |




WING ELEVATION




END VIEW




A-A

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

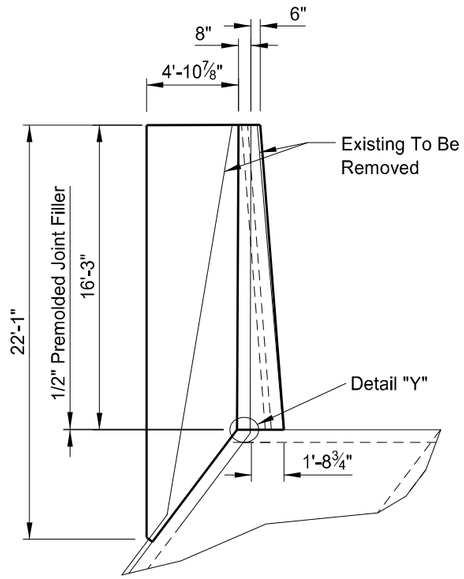
DES LACS RIVER
ND 52, SOUTHEAST OF KENMARE

BARREL SECTION &
WING DETAILS

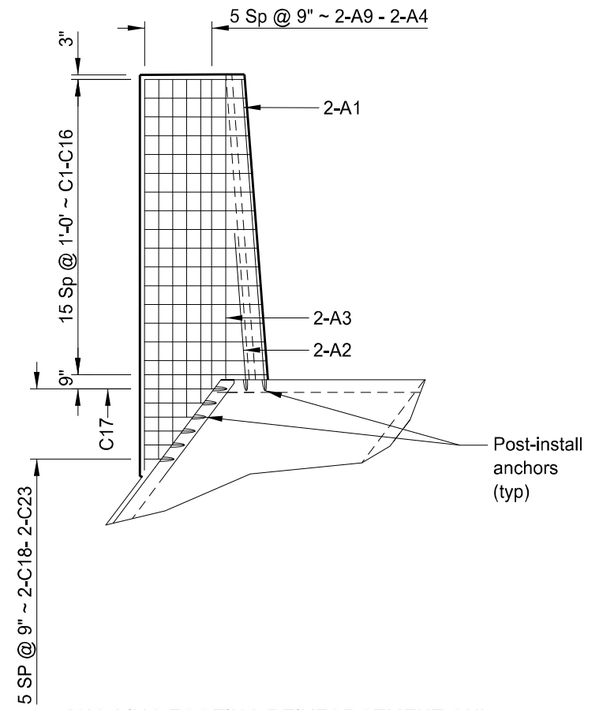
ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

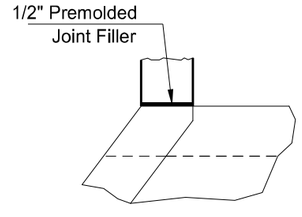
| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 19 |




(SHOWING DIMENSIONS ONLY)




(SHOWING FOOTING REINFORCEMENT ONLY)




DETAIL 'Y'

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
Fedorienko
DATE 06/01/2023
NORTH DAKOTA

DES LACS RIVER
ND52, SOUTHEAST OF KENMARE

FLOOR DETAIL

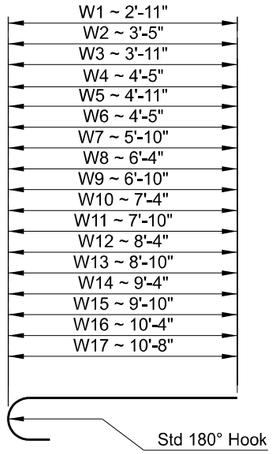
ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

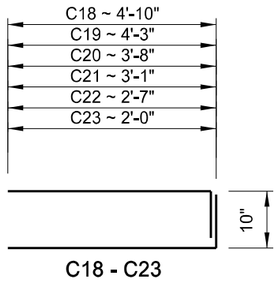
| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 20 |

## BAR LIST (CONSTANT)

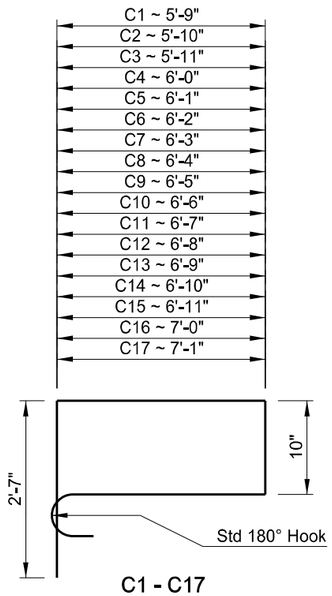
| MARK | SIZE | NO. | LENGTH | SHAPE |
|---|---|---|---|---|
| W1 | 5 | 1 | 3'-6" | BENT |
| W2 | 5 | 1 | 4'-0" | BENT |
| W3 | 5 | 1 | 4'-6" | BENT |
| W4 | 5 | 1 | 5'-0" | BENT |
| W5 | 5 | 1 | 5'-6' | BENT |
| W6 | 5 | 1 | 6'-0" | BENT |
| W7 | 5 | 1 | 6'-5" | BENT |
| W8 | 5 | 1 | 6'-11" | BENT |
| W9 | 5 | 1 | 7'-5" | BENT |
| W10 | 5 | 1 | 7'-11" | BENT |
| W11 | 5 | 1 | 8'-5" | BENT |
| W12 | 5 | 1 | 8'-11" | BENT |
| W13 | 5 | 1 | 9'-5" | BENT |
| W14 | 5 | 1 | 9'-11" | BENT |
| W15 | 5 | 1 | 10'-5" | BENT |
| W16 | 5 | 1 | 10'-11" | BENT |
| W17 | 5 | 1 | 11'-3" | BENT |
| C1 | 5 | 1 | 15'-6" | BENT |
| C2 | 5 | 1 | 15'-8" | BENT |
| C3 | 5 | 1 | 15'-10" | BENT |
| C4 | 5 | 1 | 16'-0" | BENT |
| C5 | 5 | 1 | 16'-2" | BENT |
| C6 | 5 | 1 | 16'-4" | BENT |
| C7 | 5 | 1 | 16'-6" | BENT |
| C8 | 5 | 1 | 16'-8" | BENT |
| C9 | 6 | 1 | 16'-10" | BENT |
| C10 | 6 | 1 | 17'-0" | BENT |
| C11 | 6 | 1 | 17'-2" | BENT |
| C12 | 6 | 1 | 17'-4" | BENT |
| C13 | 6 | 1 | 17'-6" | BENT |
| C14 | 6 | 1 | 17'-8" | BENT |
| C15 | 6 | 1 | 17'-10" | BENT |
| C16 | 6 | 1 | 18'-0" | BENT |
| C17 | 6 | 1 | 18'-2" | BENT |
| C18 | 5 | 2 | 5'-7" | BENT |
| C19 | 5 | 2 | 5'-1" | BENT |
| C20 | 5 | 2 | 4'-6" | BENT |
| C21 | 5 | 2 | 3'-11" | BENT |
| C22 | 5 | 2 | 3'-4" | BENT |
| C23 | 5 | 2 | 2'-10" | BENT |
| H1 | 4 | 4 | 17'-9" | STR. |
| H2 | 4 | 2 | 16'-1" | STR. |
| H3 | 4 | 2 | 15'-8" | STR. |
| H4 | 4 | 2 | 12'-7" | STR. |
| H5 | 4 | 2 | 9'-7" | STR. |
| H6 | 4 | 2 | 6'-6" | STR. |
| H7 | 4 | 2 | 3'-6" | STR. |
| O1 - O12 | 4 | 1 SET | 71'-2" | STR. |
| A1 | 6 | 2 | 16'-6" | STR. |
| A2 | 6 | 2 | 8'-4" | STR. |
| A3 | 6 | 2 | 16'-1" | STR. |
| A4 | 6 | 2 | 16'-9" | STR. |
| A5 | 6 | 2 | 18'-3" | STR. |
| A6 | 6 | 2 | 19'-3" | STR. |
| A7 | 6 | 2 | 20'-3" | STR. |
| A8 | 6 | 2 | 21'-2" | STR. |
| A9 | 6 | 2 | 21'-11" | STR. |



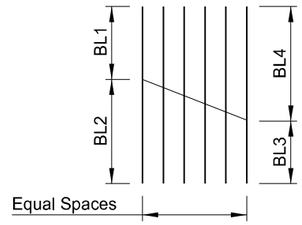

W1 - W17




C18 - C23




C1 - C17




1 SET SHOWN

| MARK | LENGTH 1 SET | BL1 | BL2 | BL3 | BL4 | SPACES |
|---|---|---|---|---|---|---|
| O1-O12 | 71'-2" | 1'-11" | 9'-8" | 5'-7" | 6'-4" | 5 |

BAR CUTTING DETAILS

| CONCRETE QUANTITIES (0° SKEW) | |
|---|---|
| FLOOR | 6.7 CY |
| WING | 2.4 CY |
| TOTAL | 9.1 CY |

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DES LACS RIVER
ND 52, SOUTHEAST OF KENMARE

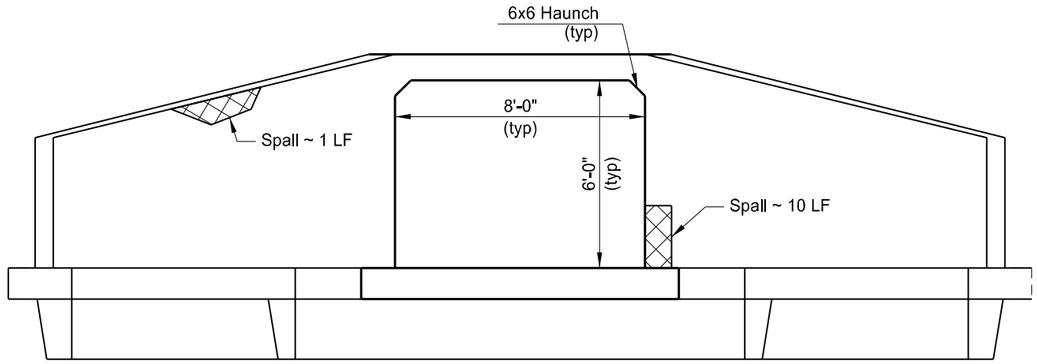
REINFORCING BAR LIST

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Ketterling, Jonathan
06/12/23

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 21 |

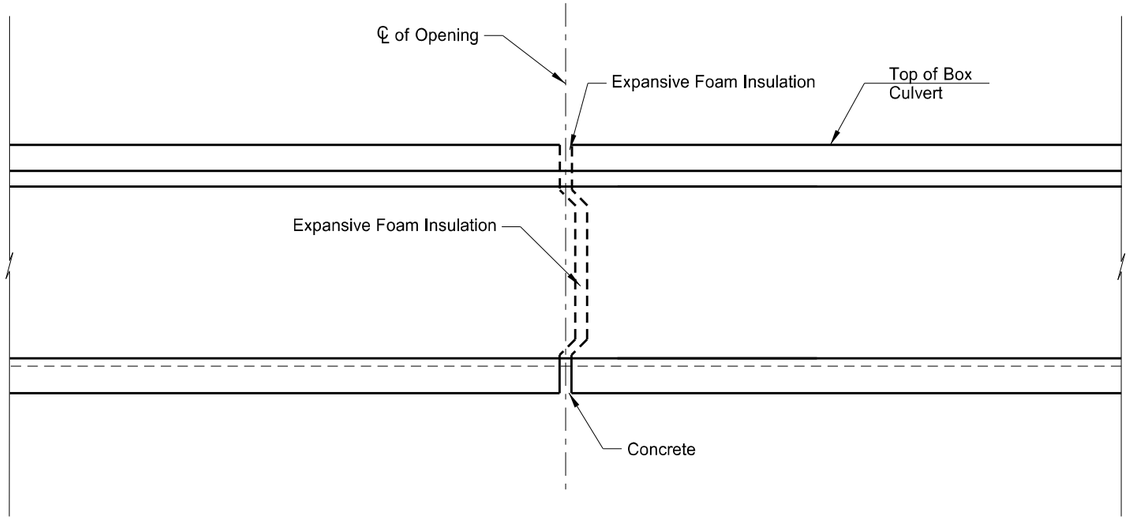



Indicates spall repair area.
Dimensions for estimating purposes only.

BARREL SECTION

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 20 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 4 |




JOINT REPAIR DETAIL

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 52, 8 NORTHWEST OF ND 28

BOX CULVERT REPAIRS
52-060.290

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Ketterling, Jonathan
06/12/23

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

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 22 |

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the unsound concrete on the southwest wing and repairing the center joint at this single 8x6 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on the southwest wing. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1” clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The center construction joint has separated approximately 1/2”.

If the box culvert needs to be feathered, include the price in the "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof and behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 4 joint segments will be paid for at the construction joint: 2 exterior walls, 1 floor segment, and 1 roof segment.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

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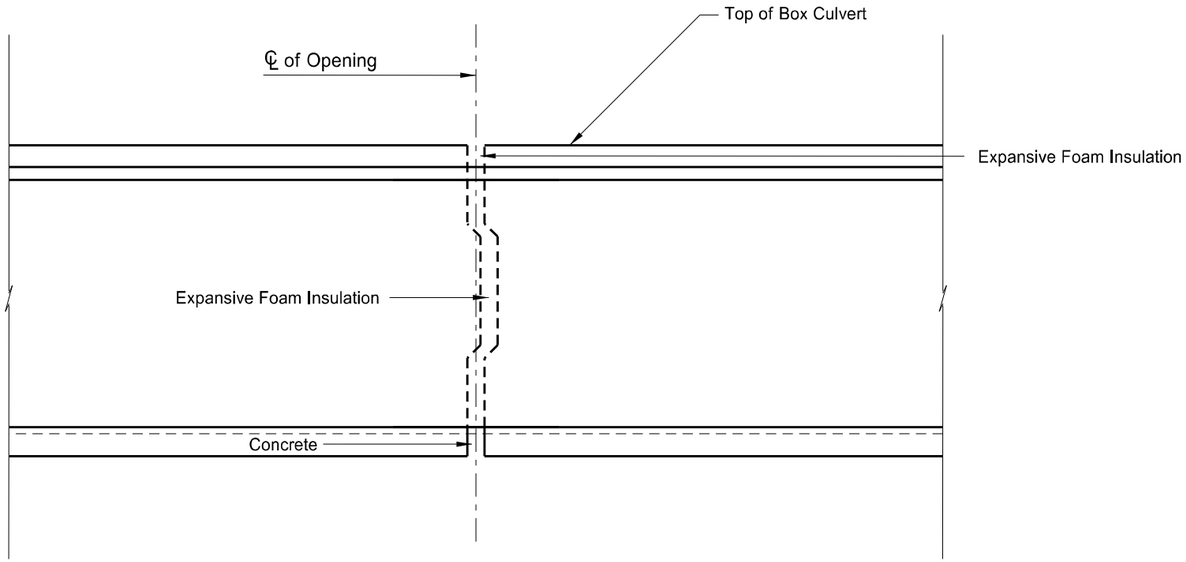
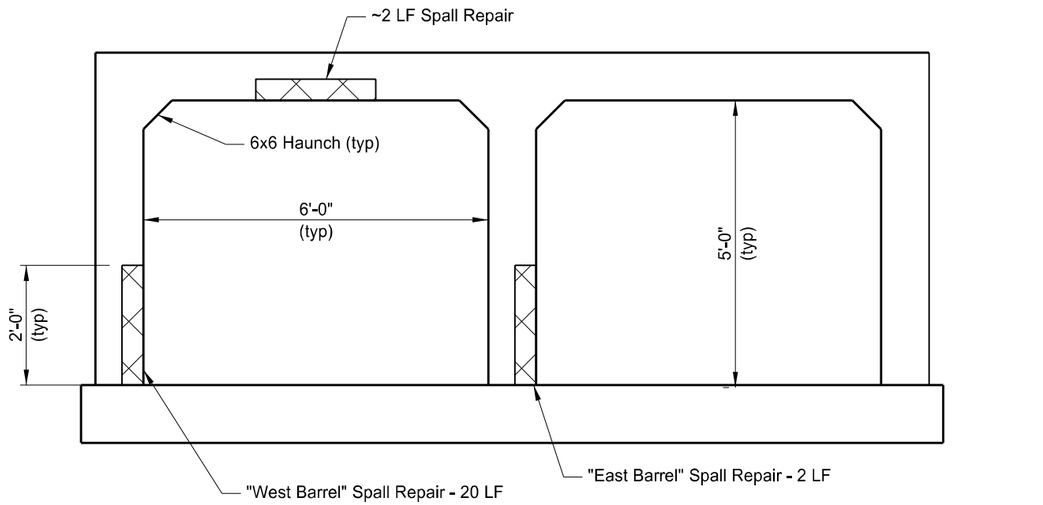
23 U.S.C. 407
NDDOT Reserves All Objections

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 23 |




JOINT REPAIR DETAIL




Indicates spall repair area. Dimensions for estimating purposes only.

BARREL SECTION

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 46 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 12 |

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| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 52, 7 NORTHWEST OF ND 28

BOX CULVERT REPAIRS
52-060.700

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Ketterling, Jonathan
06/12/23

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

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 24 |

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the unsound concrete on the west walls and repairing the extension joints at this double 6x5 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on the west walls of the original box culvert. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1” clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

Sand blast clean the existing concrete and exposed reinforcing steel. Repair any damaged epoxy coating on the reinforcing steel according to Section 612.04E. 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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The construction joint at the south extension joint in Barrel 1 has separated approximately 7/8”. The north extension joint in Barrel 1 has separated approximately 3/8”. The south and north extension joints in Barrel 2 have separated approximately 3/8”.

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 12 joint segments will be paid for at the construction joint: 4 exterior walls, 4 floor segments, and 4 roof segments.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

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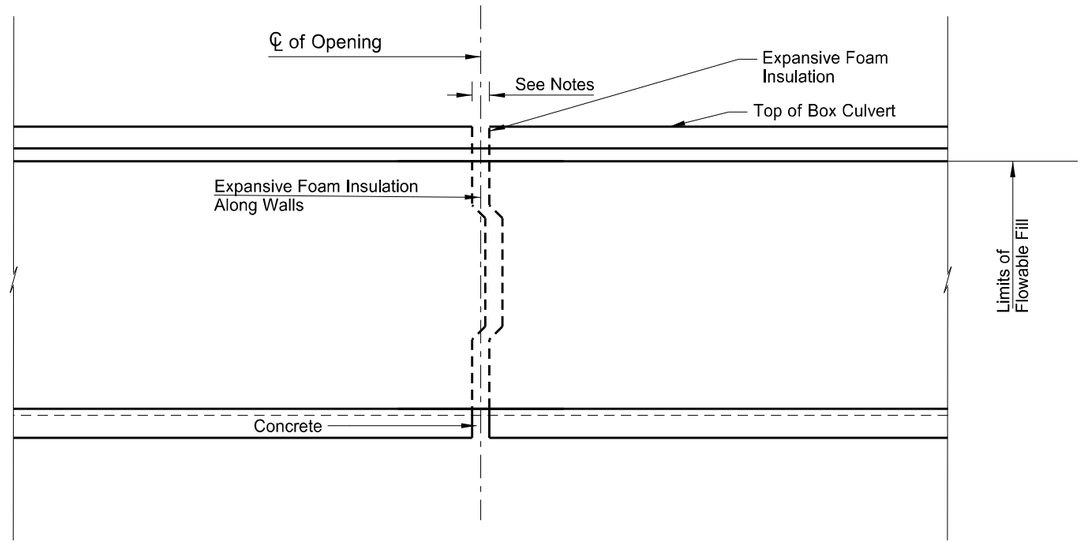
NDDOT Reserves All Objections

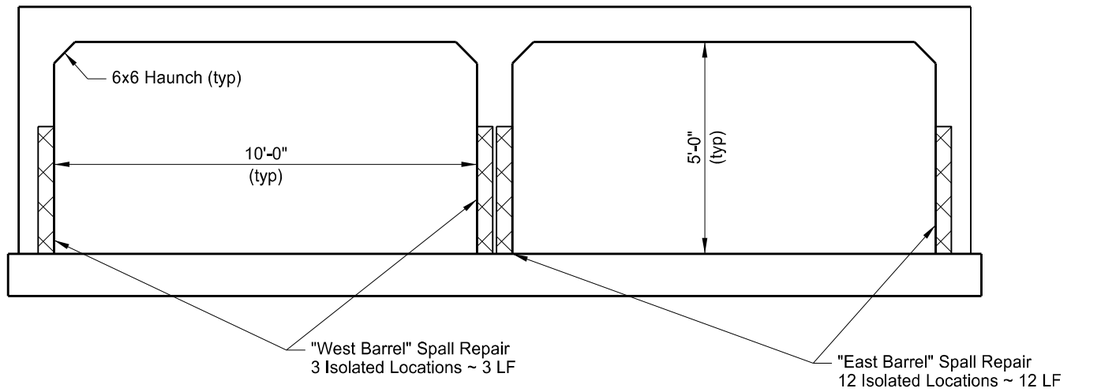
| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 25 |




JOINT REPAIR DETAIL

## BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9612 | SPALL REPAIR | SF | 15 |
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 6 |




BARREL SECTION

Indicates spall repair area. Dimensions are for estimating purposes only.

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

CREEK
ND 52, 7 NORTHWEST OF ND 28

BOX CULVERT REPAIRS
52-061.068

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 26 |

# NOTES

100 SCOPE OF WORK: Work at this site consists of removing and replacing the unsound concrete on the walls and repairing the center construction joints at this double 10x5 concrete box culvert.

930 SPALL REPAIR: The bid item "Spall Repair" is for the saw cutting, removal, and replacement of the unsound concrete on walls of the original box culvert. Restore the spalled areas to their original cross section.

Use a 15-pound maximum size chipping hammer on any unsound concrete removal. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Within the removal area, remove concrete to provide a minimum 1” clearance around the periphery of the reinforcing steel. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Take care in the removal process to ensure no damage is done to the reinforcing steel.

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 that includes a migratory corrosion inhibitor. The bonding agent and corrosion inhibitor may be Sika FerroGard 903 (Sika Corp.), Tamms Duralprep A.C., Pro-Poxy 204 (Unitex) or an approved equal.

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.

At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform spall repairs using shotcrete in lieu of cementitious repair mortar. Any additional cost for this option must be borne by the contractor.

The actual limits of spall repair are to be determined by the Engineer in the field. Include the cost of all labor, equipment, and materials needed for spall repair in the price bid for "Spall Repair".

930 BOX CULVERT JOINT REPAIR: The west barrel center construction joint has separated approximately 1/2”. The east barrel center construction joint has separated approximately 5/8”.

If the box culvert needs to be dewatered, include the price in the "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor’s option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof and behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 psi | ASTM D 638 |
| Compressive Strength | 90 psi | ASTM D 1621 |
| Shear Strength | 25 psi | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 6 joint segments will be paid for at the construction joint: 2 exterior walls, 2 floor segments, and 2 roof segments.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

REGISTERED PROFESSIONAL ENGINEER
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PE-29340
DATE 06/01/2023
NORTH DAKOTA

23 U.S.C. 407
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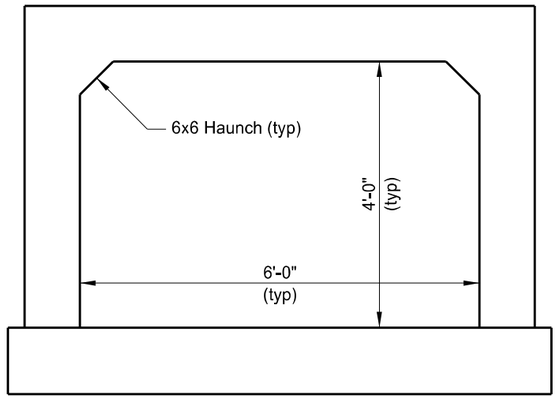
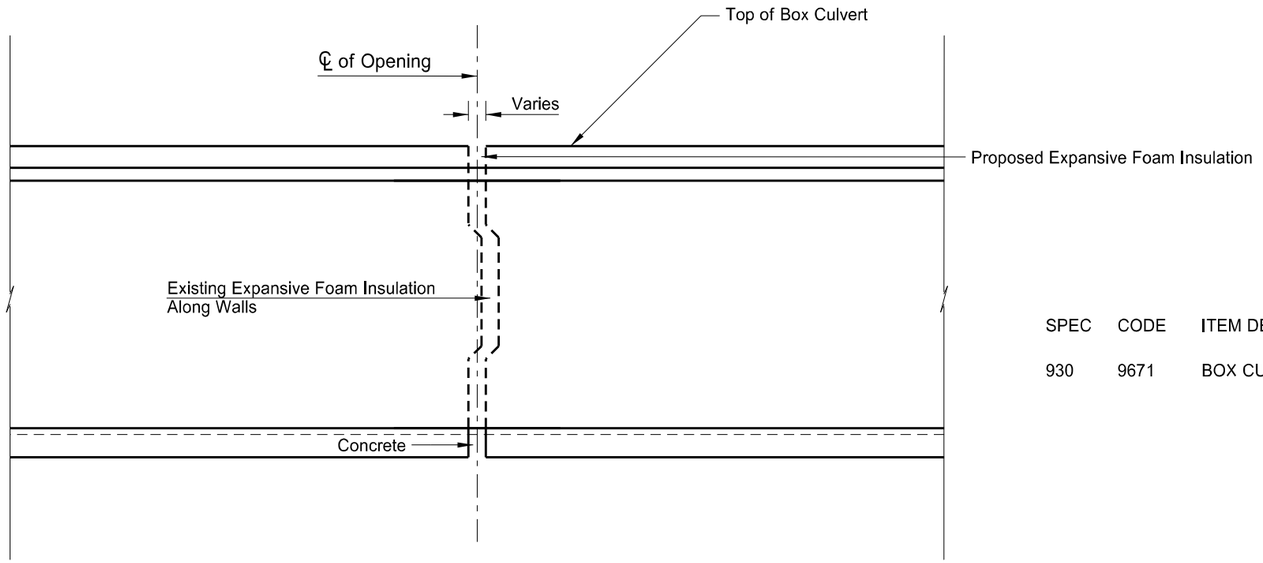
| STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SS-9-999(502) | 170 | 27 |




BARREL SECTION




JOINT REPAIR DETAIL

NOTES:

100 SCOPE OF WORK: Work at this location consists of repairing the joint at this concrete box culvert.

930 BOX CULVERT JOINT REPAIR: The east construction joint of the reinforced concrete box culvert has separated.

If the box culvert needs to be dewatered, include the price in the amount bid for "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 PSI | ASTM D 638 |
| Compressive Strength | 90 PSI | ASTM D 1621 |
| Shear Strength | 25 PSI | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 2 joint segments will be paid for at the construction joint: 1 floor segment, and 1 roof segment.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 2 |

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

REGISTERED PROFESSIONAL ENGINEER
TATYANA FEDORENKO
PE-29340
DATE 06/01/2023
NORTH DAKOTA

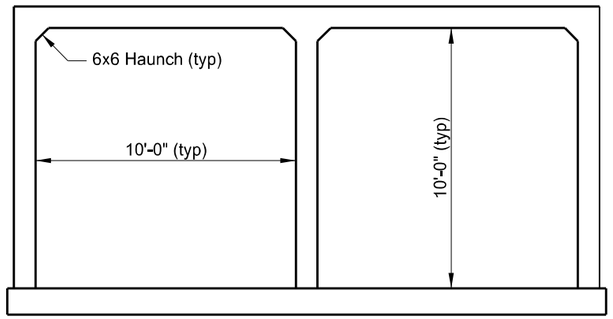
CREEK
ND 281, 4 SOUTH OF ND 13

BOX CULVERT REPAIRS
281-026.351

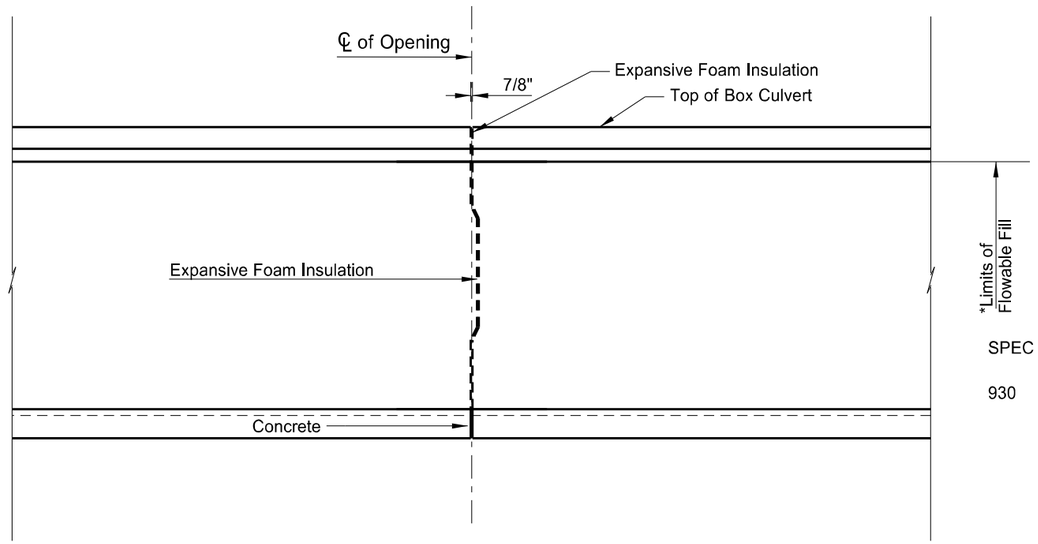
ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

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

| | STATE | PROJECT NUMBER | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | SS-9-999(502) | 170 | 28 |




BARREL SECTION




JOINT REPAIR DETAIL

NOTES:

100 SCOPE OF WORK: Work at this location consists or repairing the joint at this concrete box culvert.

930 BOX CULVERT JOINT REPAIR: The west and east construction joints of the reinforced concrete box culvert have separated approximately 7/8".

If the box culvert needs to be dewatered, include the price in the amount bid for "Box Culvert Joint Repair".

Fill the voids along the box culvert floor with concrete. Provide AE-3 Concrete in accordance with Section 602 or a commercially packaged mix meeting ASTM C387. Mix concrete according to manufacturer's instructions. Wet cure concrete a minimum of 5 days. At the contractor's option, and in accordance with SP 498(22) Shotcrete, the contractor may perform joint repair along the floor using shotcrete in lieu of concrete.

Fill voids above the roof with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Fill voids behind the walls with expansive foam insulation. Cut expansive foam flush with the interior of the box culvert after it has dried.

Expansive foam insulation must consist of a high expansion hydrophobic polyurethane foam that is nontoxic, nonflammable, and meets the following requirements:

| Test | Requirement | Method |
|---|---|---|
| Tensile Strength | 50 PSI | ASTM D 638 |
| Compressive Strength | 90 PSI | ASTM D 1621 |
| Shear Strength | 25 PSI | ASTM D 732 |
| Water Absorption | < 2% by volume | ASTM D 2842 |

The bid item "Box Culvert Joint Repair" applies to all different types of joint segments in a box culvert. At this site, a total of 6 joint segments will be paid for at the construction joint: 2 exterior walls, 2 floor segments, and 2 roof segments.

Include the cost of all equipment, labor, and materials required for the joint repair work at each segment in the price bid for "Box Culvert Joint Repair".

BOX CULVERT BID ITEMS

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 930 | 9671 | BOX CULVERT JOINT REPAIR | EA | 6 |

REGISTERED PROFESSIONAL ENGINEER
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PE-29340
DATE 06/01/2023
NORTH DAKOTA

| SPECIAL PROVISIONS | |
|---|---|
| SSP 2 | MIGRATORY BIRD TREATY ACT |
| SP 498(22) | SHOTCRETE |

MAPLE RIVER
2 SOUTH OF ND 13

BOX CULVERT REPAIRS
281-028.719

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
Ketterling, Jonathan
06/12/23

# 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 ℄ | 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 |
| Dlnt | delineate |
| Dlntr | delineator |
| Depr | depression |
| Desc | description |
| Det | detail |
| DWP | detectable warning panel |
| Dtr | detour |
| Dia or ø | 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 |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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| 07-01-14 | |
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| DATE | CHANGE |
| 04-23-18 | General Revisions |
| 09-20-18 | General Revisions |
| 12-18-20 | General Revisions |
| 08-16-22 | General Revisions |

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA
08/16/22

# NDDOT ABBREVIATIONS

D-101-2

| | |
|---|---|
| Galv | galvanized |
| Gar | garage |
| Gs L | gas line |
| G Reg | gas line regulator |
| GMV | gas main valve |
| G Mtr | gas meter |
| GSV | gas service valve |
| GVP | gas vent pipe |
| GV | gate valve |
| Ga | gauge |
| Gov | government |
| Grd | graded/grade |
| Grnd | ground |
| GWM | ground water monitor |
| Gdrl | guardrail |
| Gtr | gutter |
| | |
| H Plg | H piling |
| Hdwl | headwall |
| Ht | height |
| Hel | helical |
| HDPE | high density polyethylene |
| HM | high mast |
| HP | high pressure |
| HPS | high pressure sodium |
| HTCG | high tension cable guardrail |
| Hwy | highway |
| Hor | horizontal |
| HBP | hot bituminous pavement |
| HMA | hot mix asphalt |
| Hyd | hydrant |
| Ph | hydrogen ion content |
| | |
| Id | identification |
| Incl | inclinometer tube |
| IMH | inlet manhole |
| ID | inside diameter |
| Inst | instrument |
| Intchg | interchange |
| Intmdt | intermediate |
| Intscn | intersection |
| Inv | invert |
| IP | iron pipe |
| | |
| Jt | joint |
| Jct | junction |

| | |
|---|---|
| Ln | lane |
| Lg | large |
| Lat | latitude |
| Lt | left |
| Lens | lenses |
| Lvl | level |
| Lvlng | leveling |
| Lht | light |
| LP | light pole |
| Ltg | lighting |
| Liq | liquid |
| LL | liquid limit |
| Loc | location |
| Long. | longitude |
| Lp | loop |
| LD | loop detector |
| Lum | luminaire |
| | |
| Mb | mailbox |
| ML | main line |
| MH | manhole |
| Mkd | marked |
| Mkr | marker |
| Mkg | marking |
| MA | mast arm |
| Matl | material |
| Max | maximum |
| MC | meander corner |
| Meas | measure |
| Mdn | median |
| MD | median drain |
| MC | medium curing |
| MGS | Midwest Guardrail System |
| MM | mile marker |
| MP | mile post |
| Min | minimum |
| Misc | miscellaneous |
| Mon | monument |
| Mnd | mound |
| Mtbl | mountable |
| Mtd | mounted |
| Mtg | mounting |
| Mk | muck |
| | |
| Neop | neoprene |
| Ntwk | network |
| N | North |
| NE | North East |
| NW | North West |
| NB | Northbound |
| No. or # | number |

| | |
|---|---|
| Obsc | obscure(d) |
| Ocpd | occupied |
| Ocpy | occupy |
| O/s | offset |
| OC | on center |
| C | one dimensional consolidation |
| OC | organic content |
| Orig | original |
| O To O | out to out |
| OD | outside diameter |
| OH | overhead |
| | |
| PMT | pad mounted transformer |
| Pg | pages |
| Pntd | painted |
| Pr | pair |
| Pnl | panel |
| Pk | park |
| PSD | passing sight distance |
| Pvmt | pavement |
| Ped | pedestal |
| Ped | pedestrian |
| PPP | pedestrian pushbutton post |
| Pen. | penetration |
| Perf | perforated |
| Per. | perimeter |
| Perm | permanent |
| PL | pipeline |
| Pl | place |
| P&P | plan & profile |
| PL | plastic limit |
| Pl or ℄ | plate |
| Pt | point |
| PE | polyethylene |
| PVC | polyvinyl chloride |
| PCC | Portland Cement concrete |
| PP | power pole |
| Preempt | preemption |
| Prefab | prefabricated |
| Prfmd or Pref | preformed |
| Prep | preperation |
| Press. | pressure |
| PRV | pressure relief valve |
| Prestr | prestressed |
| Pvt | private |
| PD | private drive |
| Prod. | production/produce |
| Prog | programmed |
| Prop. | property |
| Prop Ln | property line |
| Ppsd | proposed |
| PB | pull box |

| | |
|---|---|
| Qty | quantity |
| Qtr | quarter |
| | |
| Rad or R | radius |
| RR | railroad |
| Rlwy | railway |
| Rsd | raised |
| RC | rapid curing |
| Rec | record |
| Rcy | recycle |
| RAP | recycled asphalt pavement |
| RPCC | recycled portland cement concrete |
| Ref | reference |
| R Mkr | reference marker |
| RM | reference monument |
| RP | reference point |
| Refl | reflectorized |
| RCB | reinforced concrete box |
| RCES | reinforced concrete end section |
| RCFES | reinforced concrete flared end section |
| RCP | reinforced concrete pipe |
| RCPS | reinforced concrete pipe sewer |
| RCTES | reinforced concrete traversable end section |
| Reinf | reinforcement |
| Res | reservation |
| Res | residence |
| Ret | retaining |
| Rev | reverse |
| Rt | right |
| R/W | right of way |
| Riv | river |
| Rd | road |
| Rdbd | road bed |
| Rdwy | roadway |
| RWIS | roadway weather information system |
| Rk | rock |
| Rt | route |

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| DATE | CHANGE |
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| 12-18-20 | General Revisions |
| 08-16-22 | General Revisions |

KIRK J. HOFF
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NORTH DAKOTA
08/16/22

| | |
|---|---|
| Salv | salvage(d) |
| San | sanitary sewer line |
| Sec | section |
| SL | section line |
| Sep | separation |
| Seq | sequence |
| Serv | service |
| Sht | sheet |
| Shtng | sheeting |
| Shldr | shoulder |
| Sw or Sdwk | sidewalk |
| SD | sight distance |
| SN | sign number |
| Sig | signal |
| Sgl | single |
| SRCP | slotted reinforced concrete pipe |
| SC | slow curing |
| SS | slow setting |
| Sm | small |
| S | South |
| SE | South East |
| SW | South West |
| SB | Southbound |
| Sp | spaces |
| Spcl | special |
| SA | special assembly |
| SP | special provisions |
| G | specific gravity |
| Spk | spike |
| SB | split barrel sample |
| SH | sprinkler head |
| SV | sprinkler valve |
| Sq | square |
| Stk | stake |
| Std | standard |
| N | standard penetration test |
| Std Specs | standard specifications |
| Stm L | steam line |
| SEC | steel encased concrete |
| SMA | stone matrix asphalt |
| SSD | stopping sight distance |
| SD | storm drain |
| St | street |
| SPP | structural plate pipe |
| SPPA | structural plate pipe arch |
| Str | structure |
| Subd | subdivision |
| Sub | subgrade |
| Sub Prep | subgrade preperation |
| Ss | subsoil |
| SS | supplement specification |
| Supp | supplemental |
| Surf | surfacing |
| Surv | survey |
| Sym | symmetrical |

| | |
|---|---|
| Tel | telephone |
| Tel B | Telephone Booth |
| Tel P | telephone pole |
| Tv | television |
| Temp | temperature |
| Temp | temporary |
| TBM | temporary bench mark |
| T | thinwall tube sample |
| Ts | topsoil |
| Traf | traffic |
| TSCB | traffic signal control box |
| Tr | trail |
| Transf | transformer |
| Trans | transition |
| TT | transmission tower |
| TES | traversable end section |
| Trans | transverse |
| Trtd | treated |
| Trmt | treatment |
| Qc | triaxial compression |
| TERO | tribal employment rights ordinance |
| Tpl | triple |
| Typ | typical |
| Qu | unconfined compressive strength |
| Ugrnd | underground |
| Util | utility |
| VG | valley gutter |
| Vap | vapor |
| Vert | vertical |
| VCP | vitrified clay pipe |
| Vol | volume |
| VSFS | vehicle speed feedback sign |
| Wkwy | walkway |
| W | water content |
| WGV | water gate valve |
| WL | water line |
| WM | water main |
| WMV | water main valve |
| W Mtr | water meter |
| WSV | water service valve |
| WW | water well |
| Wrng | wearing |
| WIM | weigh in motion |
| W | west |
| WB | westbound |
| Wrng | wiring |
| W/ | with |
| W/o | without |
| WC | witness corner |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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| 08-03-15 | General Revisions |
| 04-23-18 | General Revisions |
| 12-18-20 | General Revisions |
| 08-16-22 | General Revisions |

KIRK J. HOFF
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PE-4683
ENGINEER
NORTH DAKOTA

08/16/22

# 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 |

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
07-01-14

REVISIONS

| DATE | CHANGE |
|---|---|
| 12-18-20 | Sheet Added<br>- Continued from D-101-3 |

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# NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
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| REVISIONS | |
| DATE | CHANGE |
| 04-23-18 | General Revisions |
| 09-20-18 | General Revisions |
| 12-18-20 | General Revisions |
| 08-16-22 | General Revisions |

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# LINE STYLES

D-101-20

## Existing Topography

- 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

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REVISIONS

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| 09-23-16<br>12-18-20 | Added and Revised Items, Organized by Functional Groups<br>General Revisions |

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# 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 Typicals

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

## Geotechnical

- Geotextile Fabric Type D (D — D)
- Geogrid (Geo — Geo)
- Geotextile Fabric Type R (R — R)
- Geotextile Fabric Type R1 (R — R)
- Geotextile Fabric Type RR (RR — RR)
- Geotextile Fabric Type S (S — S)
- Subgrade Reinforcement
- Failure Line

## 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
- Floating Silt Curtain (S — S)
- Silt Fence (SF — SF)
- Excavation Limits
- Fiber Rolls

## Environmental

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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| 09-23-16<br>12-18-20 | Added and Revised Items, Organized by Functional Groups<br>General Revisions |

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# SYMBOLS

D-101-30

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

CSB Continuous Split Barrel Sample

FA Flight Auger Sample

SB Split Barrel Sample

T Thinwall Tube Sample

N Standard Penetration Test

Incl Inclinometer Tube

Excavation Unit

Existing Ground Water Well Bore Hole

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# SYMBOLS

D-101-31

- Flexible Delineator
- Flexible Delineator Type A (Exst, Ppsd)
- Flexible Delineator Type B (Exst, Ppsd)
- Flexible Delineator Type C (Exst, Ppsd)
- Flexible Delineator Type D (Exst, Ppsd)
- Flexible Delineator Type E (Exst, Ppsd)
- Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type C (Exst, Ppsd, Diamond Grade)
- Delineator Type D (Exst, Ppsd, Diamond Grade)
- Delineator Type E (Exst, Ppsd, Diamond Grade)
- Barricade (Type I, Type II, Type III}
- Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)
- Attenuation Device
- Truck Mounted Attenuator
- Delineator Drums
- Flagger
- Tubular Marker
- Traffic Cone
- Back to Back Vertical Panel Sign

- Highway Sign (Exst, Ppsd)
- Mile Post Type A (Exst-Ppsd-Reset)
- Mile Post Type B (Exst, Ppsd)
- Mile Post Type C (Exst, Ppsd)
- Object Marker Type I (Exst, Ppsd)
- Object Marker Type II (Exst, Ppsd)
- Object Marker Type III (Exst, Ppsd)
- Existing Reference Marker
- Road Closure Gate 18 Ft (Exst, Ppsd)
- Road Closure Gate 28 Ft (Exst, Ppsd)
- Road Closure Gate 40 Ft (Exst, Ppsd)
- Existing Railroad Battery Box
- Existing RR Profile Spot
- Existing Railroad Crossbuck
- Existing Railroad Frog
- Existing Mailbox (Private, Federal)

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# 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)

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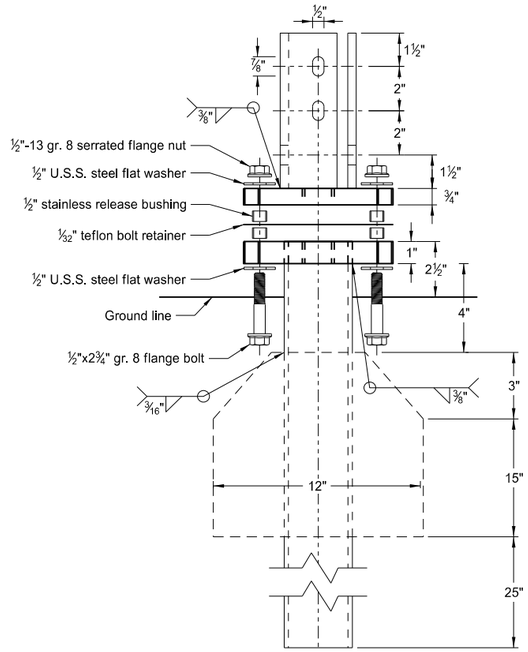
12 18 2020

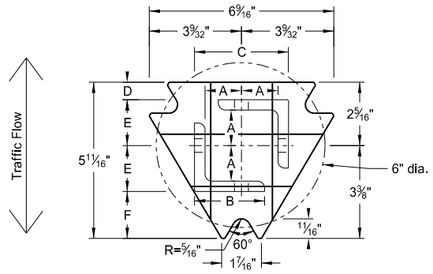
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

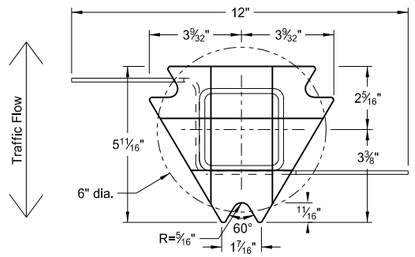



Multi-Directional
Slip Base Assembly

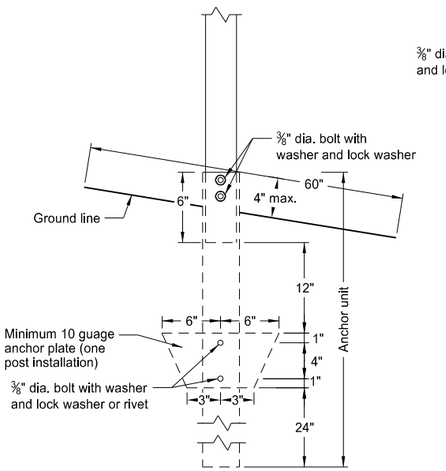
## Perforated Tube



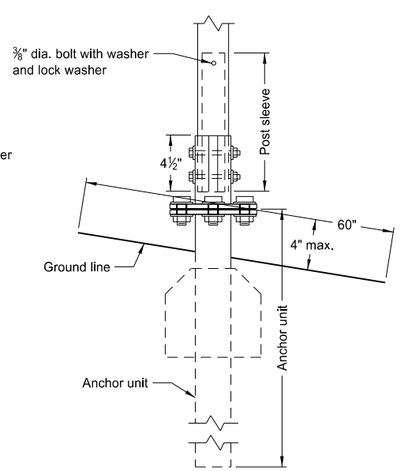

Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



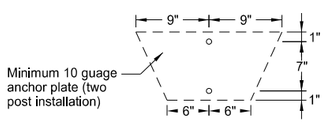

Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

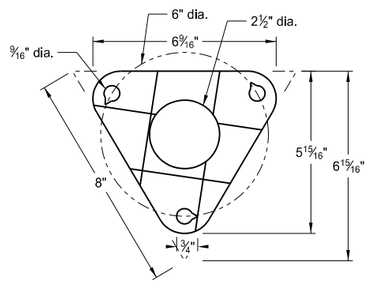



Anchor Unit and Post Assembly




Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly




Bolt Retainer for Base Connection
Bolt Retainer- 1/32" 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 Thick-ness Gauge | Sleeve Size in. | Wall Thick-ness Gauge | Slip Base | Anchor Size without Slip Base in. |
| 1 | 2 | 12 | | | No | 2¼ |
| 1 | 2¼ | 12 | | | No | 2½ |
| 1 | 2½ | 12 | | | (A) | 3 |
| 1 | 2½ | 10 | | | Yes | |
| 1 | 2¼ | 12 | 2 | 12 | Yes | |
| 1 | 2½ | 12 | 2¼ | 12 | Yes | |
| 2 | 2 | 12 | | | No | 2¼ |
| 2 | 2¼ | 12 | | | No | 2½ |
| 2 | 2½ | 12 | | | Yes | |
| 2 | 2½ | 12 | | | Yes | |
| 2 | 2¼ | 10 | 2 | 12 | Yes | |
| 2 | 2½ | 12 | 2¼ | 12 | Yes | |
| 3 & 4 | 2½ | 12 | | | Yes | |
| 3 & 4 | 2½ | 10 | | | Yes | |
| 3 & 4 | 2½ | 12 | 2¼ | 12 | Yes | |
| 3 & 4 | 2¼ | 12 | 2 | 12 | Yes | |
| 3 & 4 | 2½ | 10 | 2³/16 | 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 |
| 1½ x 1½ | 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 |
| 2¼ x 2¼ | 0.105 | 12 | 2.773 | 0.561 | 0.695 | 0.499 |
| 2³/16 x 2³/16 | 0.135 | 10 | 3.432 | 0.605 | 0.841 | 0.590 |
| 2½ x 2½ | 0.105 | 12 | 3.141 | 0.804 | 0.803 | 0.643 |
| 2½ x 2½ | 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 |
| 2³/16"x10 ga. | 1⁹/64" | 2½" | 3¹/32" | 2⁵/32" | 1³³/64" | 1⅞" |
| 2½"x10 ga. | 1⁹/32" | 2½" | 3⁵/16" | ⅝" | 1²¹/32" | 1¾" |

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

(B) For additional wind load, insert the 2³/16"x10 ga. into 2½"x10 ga.

| 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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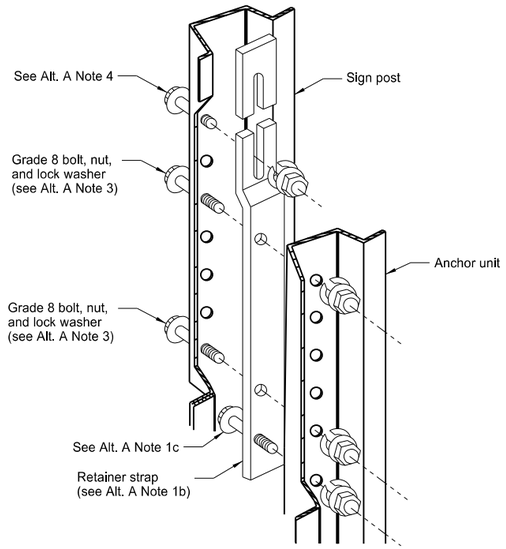
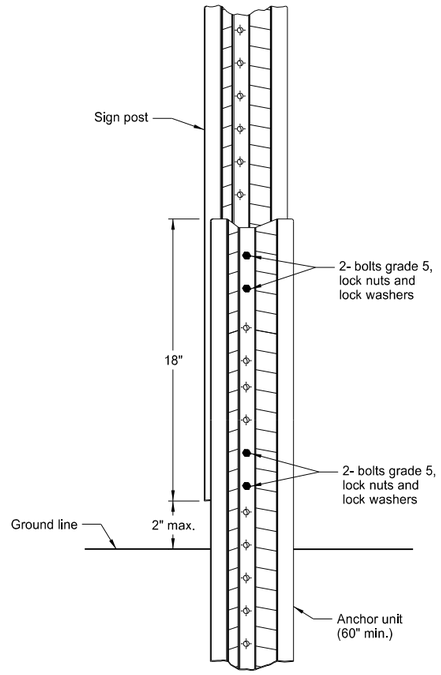
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

## U-Channel Post

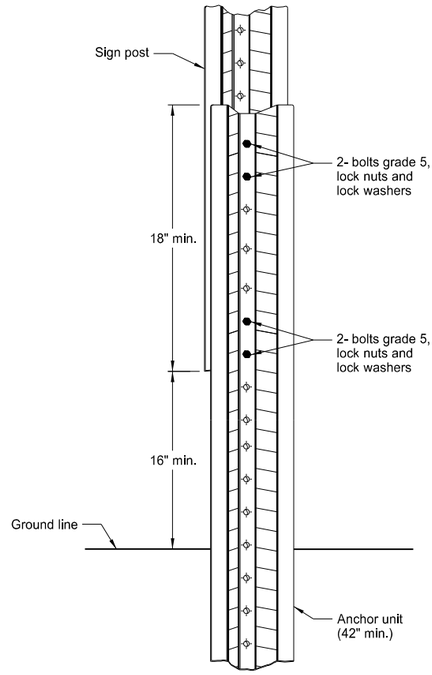



Detail A



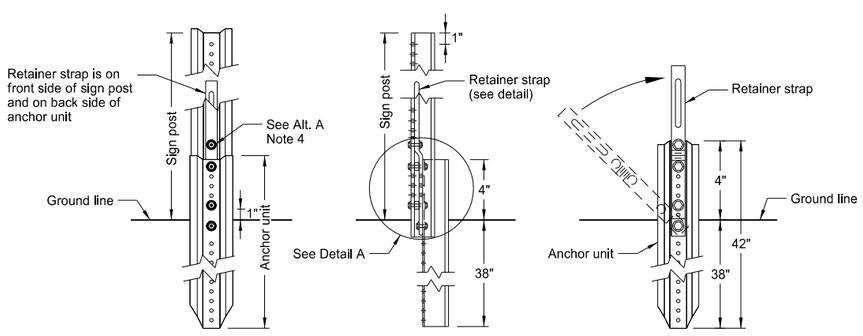

Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.




Breakaway U-Channel Splice Detail
Alternate C
(2.5 and 3 lb/ft)

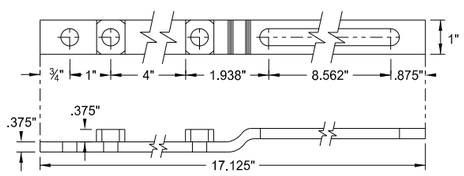
Install a maximum of 3 posts within 7'.




Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.




Retainer Strap Detail

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
   c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
   d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
   b) Rotate strap to vertical position.
3. a) 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.
   b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. 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 | Updated to active voice |
| 10-03-19 | New Design Engr PE Stamp |

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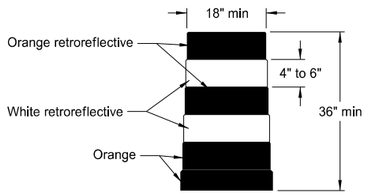
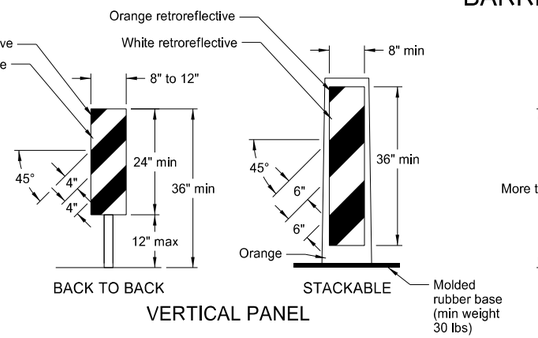
# BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



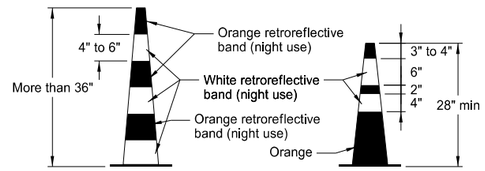

## DELINEATOR DRUM

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.



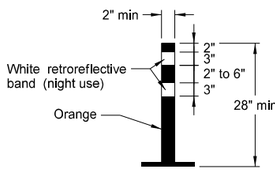

## VERTICAL PANEL

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.



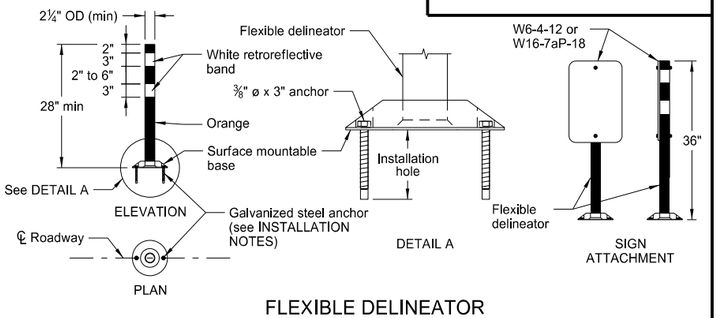

## TRAFFIC CONE

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

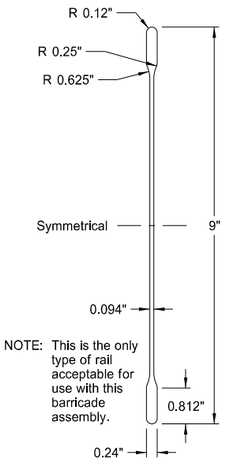
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.




## FLEXIBLE DELINEATOR

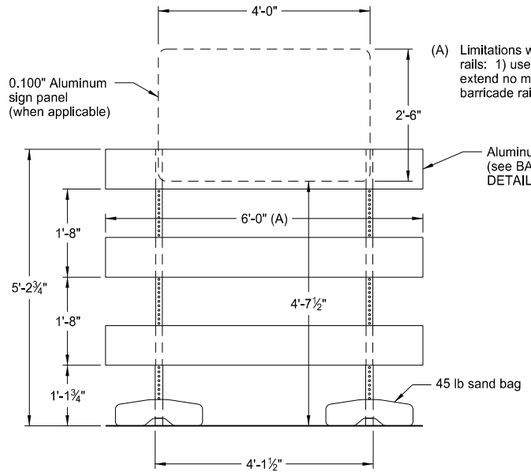
INSTALLATION NOTES:

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.



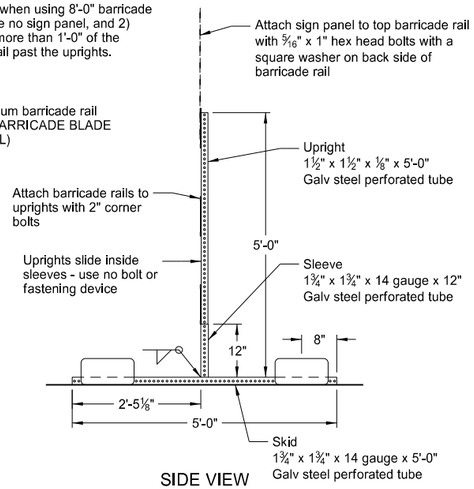

NOTE: This is the only type of rail acceptable for use with this barricade assembly.

## BARRICADE BLADE DETAIL



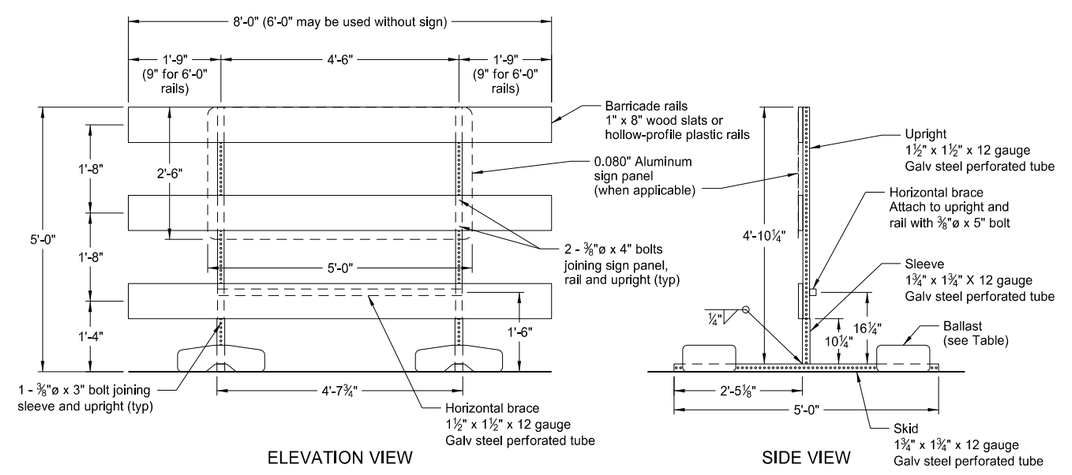

(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.

## ELEVATION VIEW



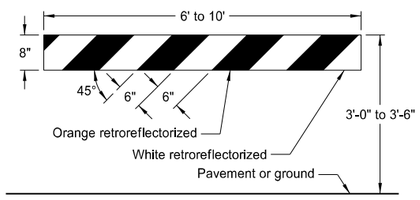

## SIDE VIEW

## BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

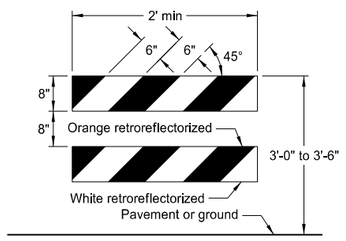



## BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

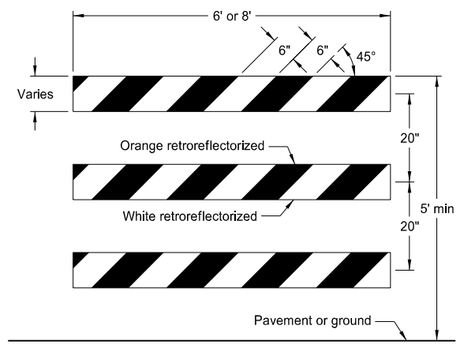
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", use a rail stripe width of 4".




## TYPE I BARRICADE

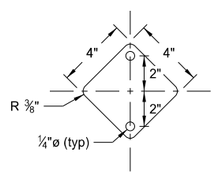


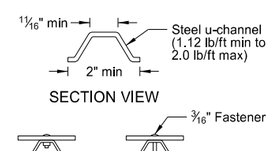

## TYPE II BARRICADE

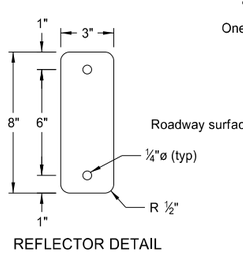



## TYPE III BARRICADE

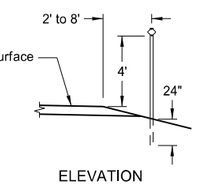
## BARRICADE RAIL DETAILS




## REFLECTOR DETAIL




## ELEVATION

## DELINEATORS

### 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.

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

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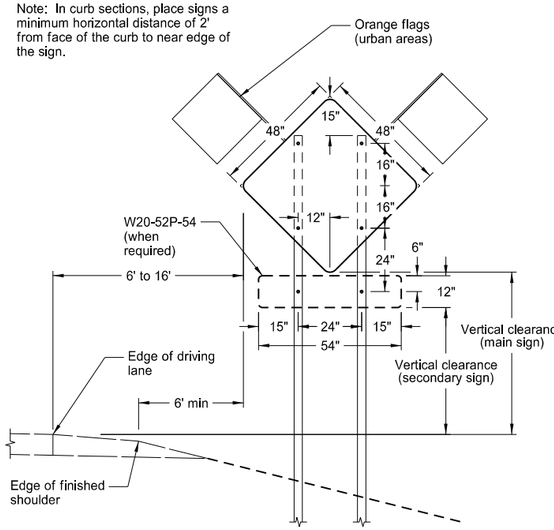
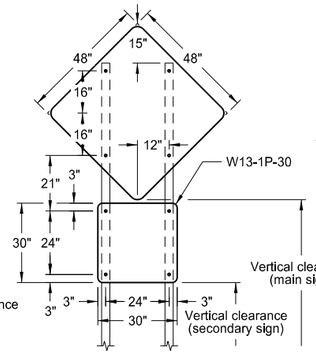
# CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

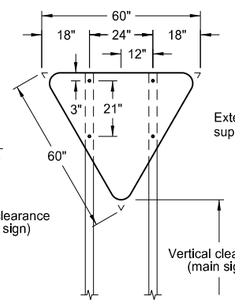
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



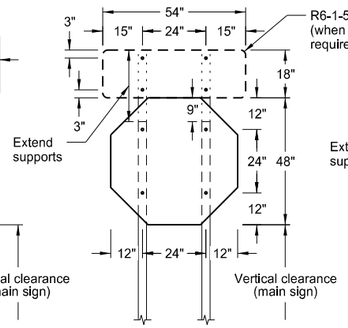

TYPICAL SECTION
(48" x 48" diamond warning sign shown)



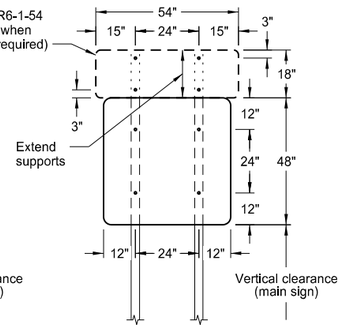

48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



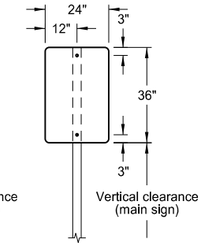

R1-2-60 - YIELD SIGN



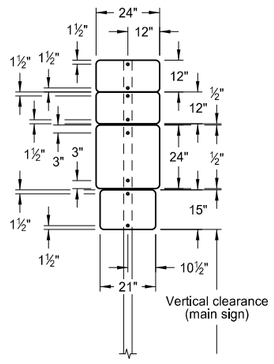

R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



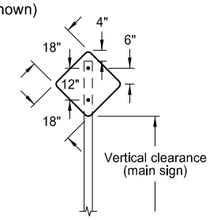

48" x 48" SIGN
(with R6-1-54 sign as required)



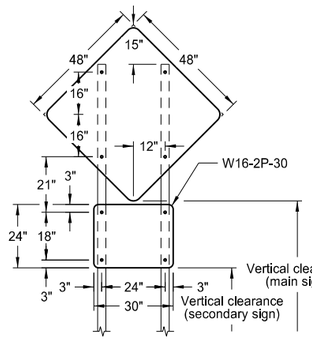

24" x 36" SIGN



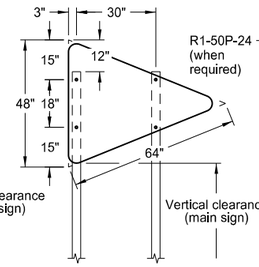

24" x 24"
ROUTE MARKER
ASSEMBLY



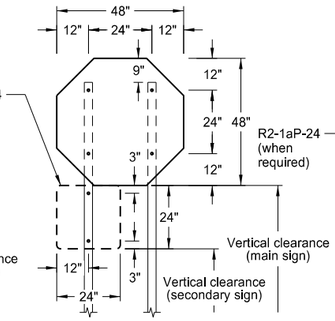

18" x 18"
DIAMOND SIGN



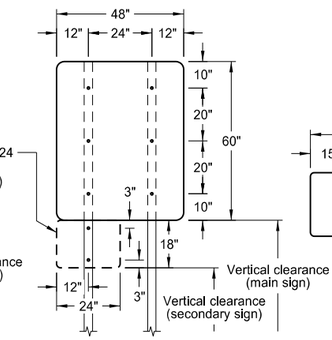

48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



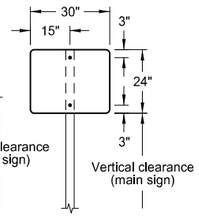

W14-3-64 - PENNANT SIGN



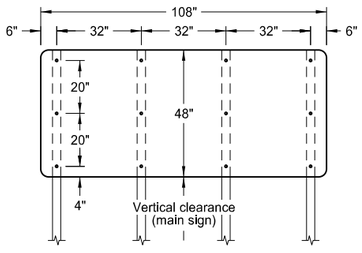

R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



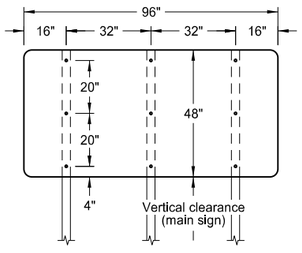

48" x 48" SIGN
(with R2-1aP-24 sign as required)



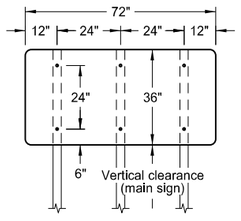

30" x 24" SIGN



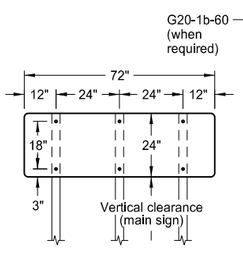

108" x 48" SIGN



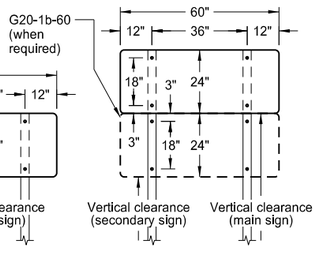

96" x 48" SIGN



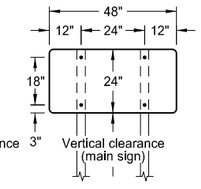

72" x 36" SIGN



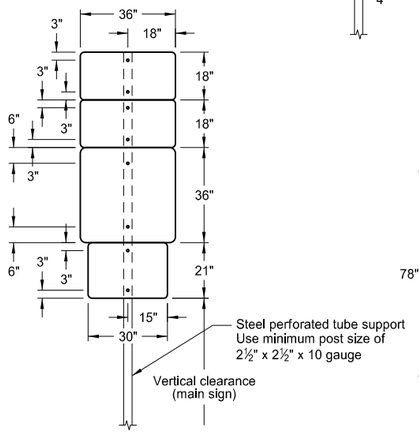

72" x 24" SIGN



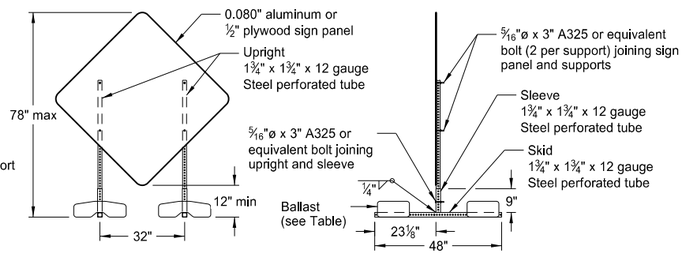

60" x 24" SIGN



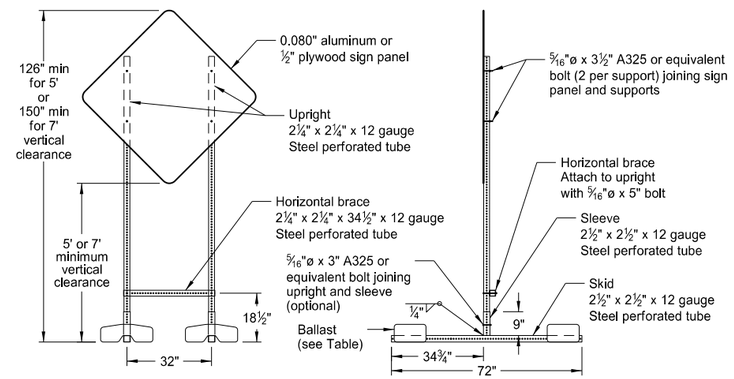

48" x 24" SIGN




36" x 36"
ROUTE MARKER
ASSEMBLY




PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT




PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. 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.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. Punch all holes round for ⅜" bolts.

3. 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)

4. 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

5. 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.

6. 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 unforseen circumstances, such as equipment breakdown, 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 |

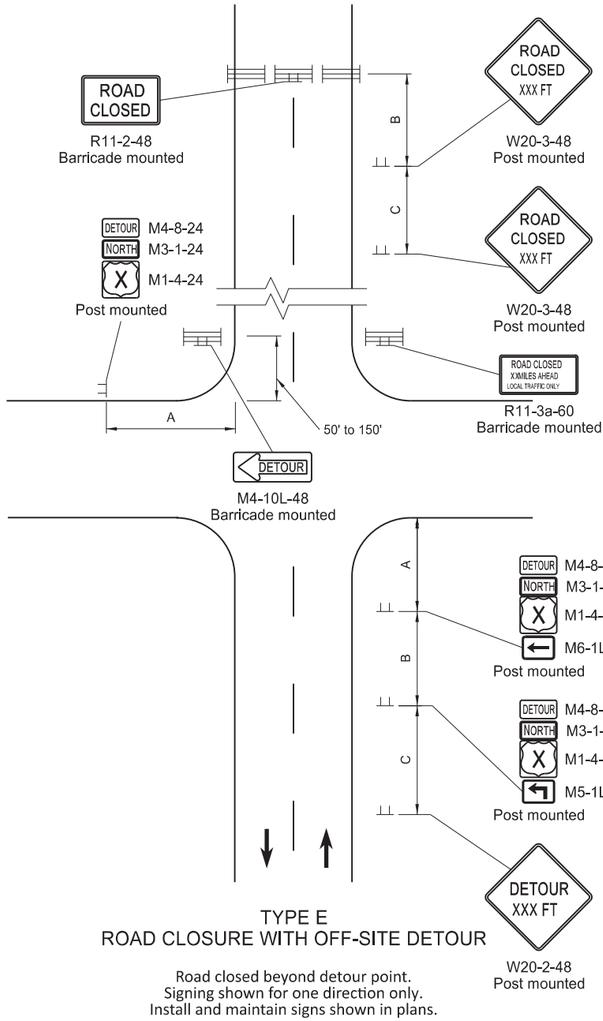
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

| 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

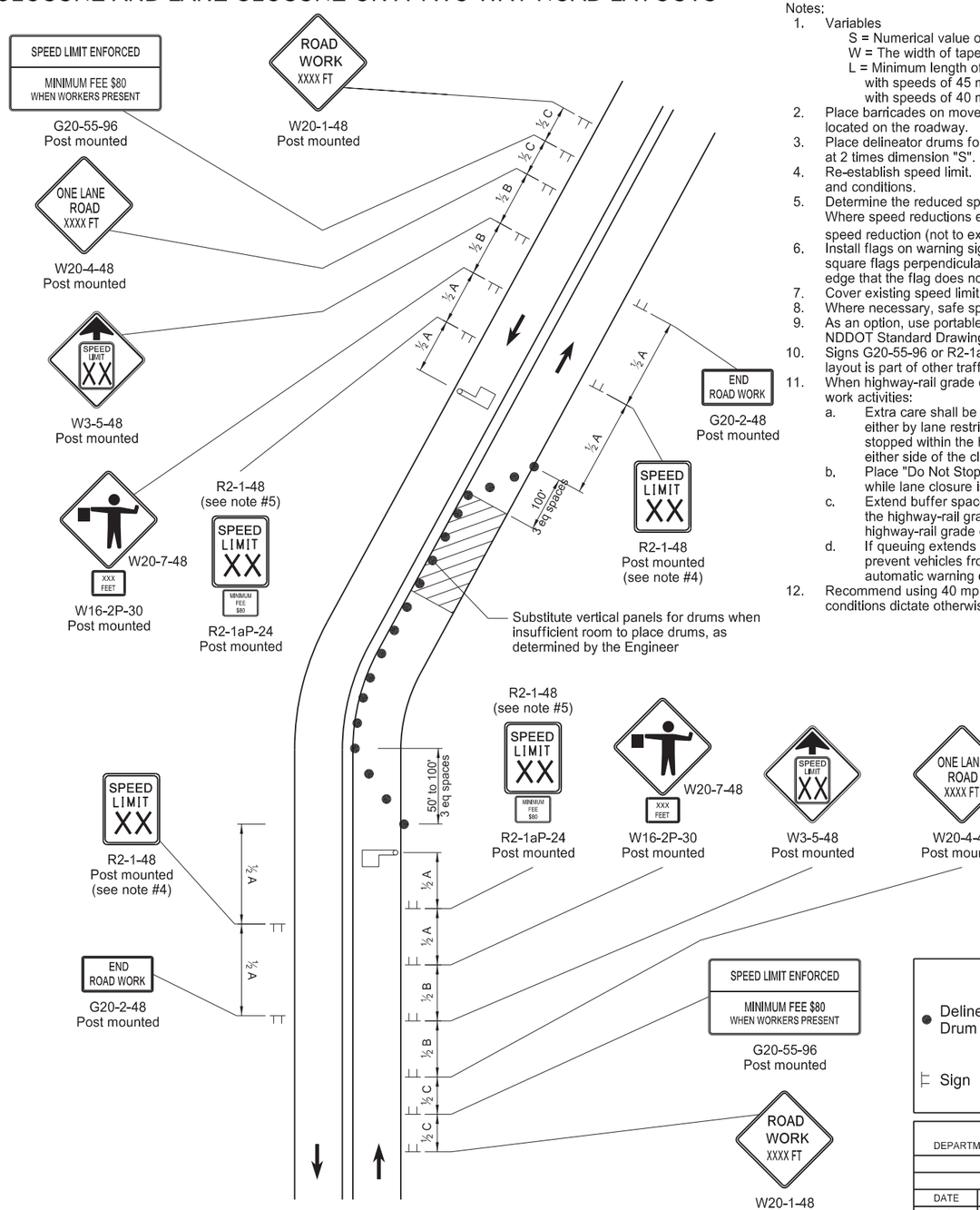
# ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19




TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR

Road closed beyond detour point.
Signing shown for one direction only.
Install and maintain signs shown in plans.




TYPE F
LANE CLOSURE ON A TWO LANE ROAD USING FLAGGERS

Two lane highway with one lane closed.
Flagger at point visible to approaching traffic.

Notes:

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet
   L = Minimum length of taper in feet. S x W for freeways, expressways, and roads with speeds of 45 mph or greater, or W x $S^2/60$ for urban, residential, and streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
3. Place delineator drums for tapering traffic at 3 equal spaces and for tangents space them at 2 times dimension "S".
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. 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 second speed limit sign at ½B.
6. 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.
7. Cover existing speed limit signs within a reduced speed zone.
8. Where necessary, safe speed to be determined by the Engineer.
9. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
10. Signs G20-55-96 or R2-1aP-24 are not required when pilot car operation is used, if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
    a. Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
    b. Place "Do Not Stop on Tracks" sign (R8-8-24) near cross buck in each direction while lane closure is near tracks.
    c. Extend buffer space between work zone and lane closure transition upstream of the highway-rail grade crossing to prevent flagging queue from extending across highway-rail grade crossing.
    d. If queuing extends across highway-rail crossing, provide flagger at crossing to prevent vehicles from stopping within the crossing (even when automatic warning devices are in place.)
12. 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 40mph) | 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

- Delineator Drum
- Type III Barricade
- Flagger
- Sign
- Work/Hazard Area

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

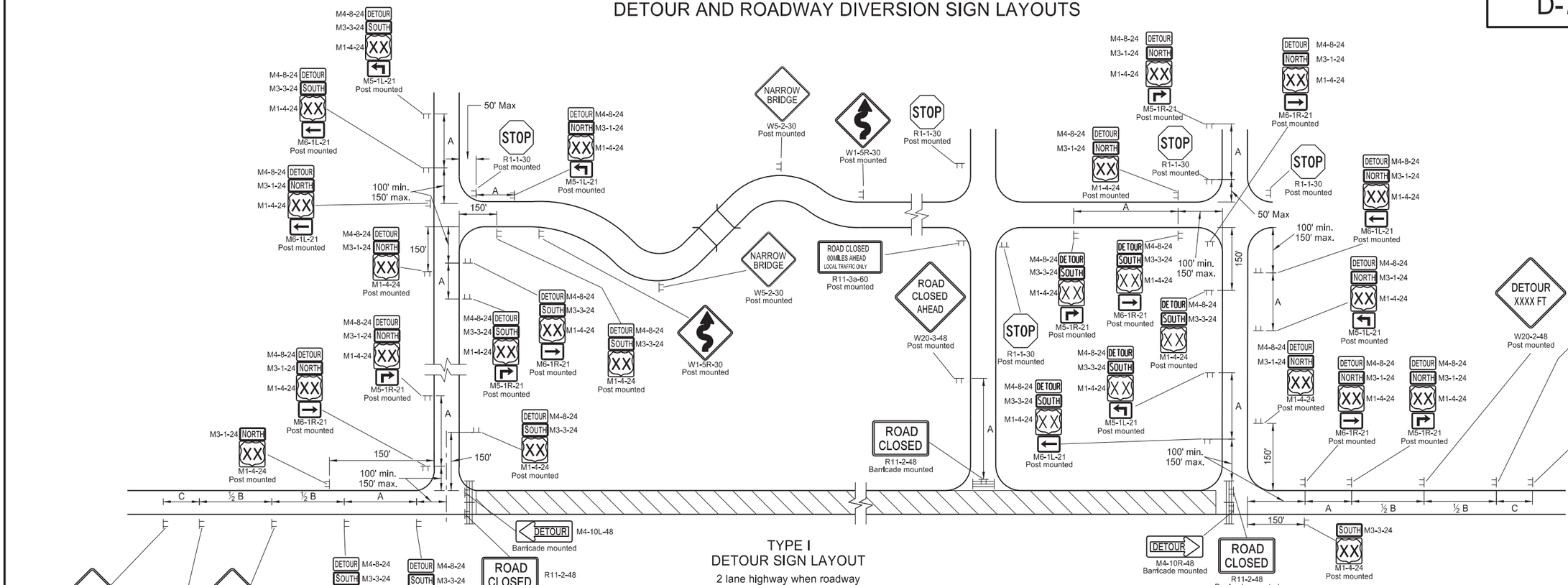
| DATE | CHANGE |
|---|---|
| 03-13-14 | Revised Sign Cell "ROAD WORK XXX FT" |
| 08-17-17 | Update notes & sign numbers |
| 11-01-19 | Revised signs, sign #s, & notes |
| 12-08-21 | Switched order of Road Work XXX and Spd Limit Enforced & added Dollars At Work |
| 11-29-22 | Removed Dollars At Work |

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

11/29/22

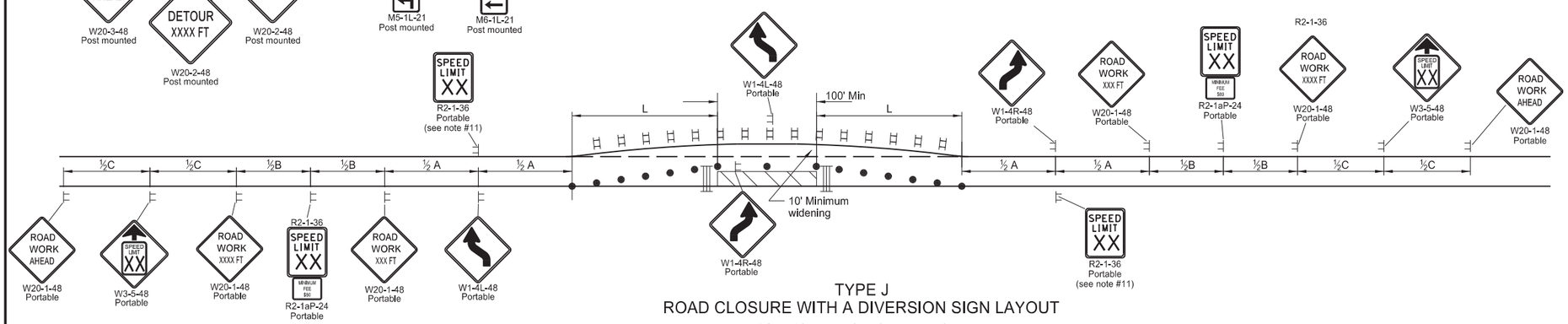
# DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21




## TYPE I
## DETOUR SIGN LAYOUT

2 lane highway when roadway is closed and detour provided




## TYPE J
## ROAD CLOSURE WITH A DIVERSION SIGN LAYOUT

2 lane highway with widened section, traffic maintained in both directions.

Use layout when work is less than 5 days or is within a project.

KEY

- Type III barricade
- Work area
- Sign
- Vertical panels back to back
- Delineator drum

Notes:

1. Variables
   S=Numerical value of speed limit or 85th percentile. W=The width of taper.
   L=Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x $S^2$ / 60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when on roadway.
3. Space delineator drums and vertical panels at dimension "S" for tapering traffic. Space delineator drums, tubular markers and vertical panels at 2 times "S" for tangents.
4. Determine the reduced speed limit based on the in place speed limit before construction. Where speed limits 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 ½ B.
5. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inches 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. Cover existing speed limit signs within a reduced speed limit zone.
7. Covered (when approved by engineer) or obliterated payment marking measured as Obliteration of Pavement Marking.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. If the tangent between tapers is less than 600', as an option, use sign W24-1-48 in place of double reverse curve signs.
10. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
11. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.

| 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 | Updated notes & added spd limit |
| 11-01-19 | Revised sign #s and note 8 |
| 12-08-21 | Added Dollars At Work sign |
| 11-29-22 | Removed Dollars At Work |

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

11/29/22

# Two-Lane Roadway Portable Rumble Strips

D-704-33

KEY

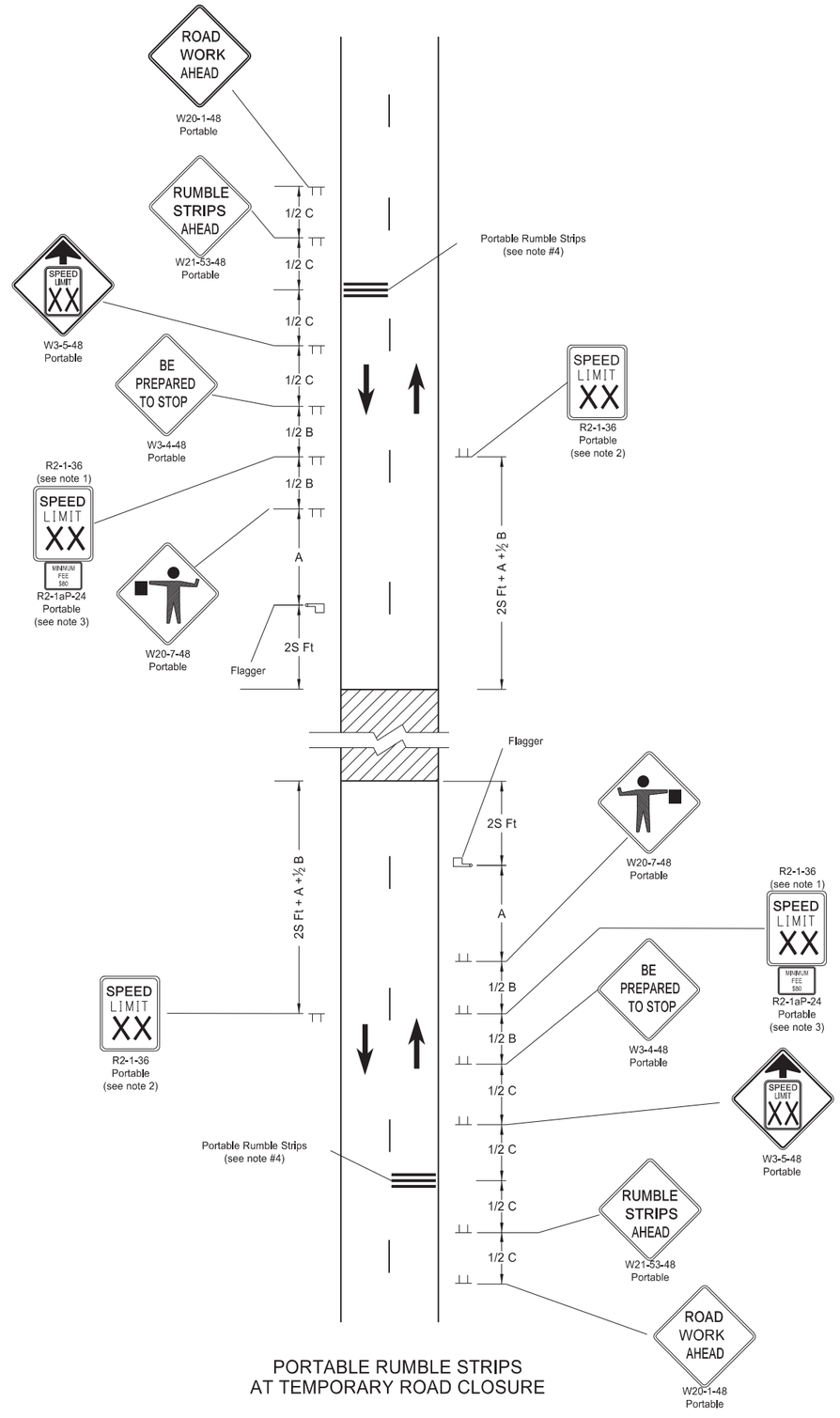
Work area

Flagger

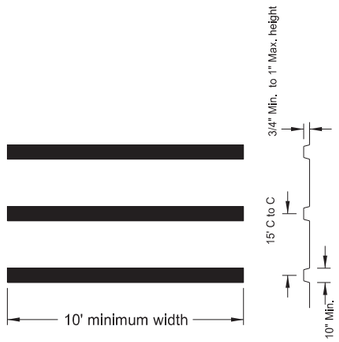
Sign

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

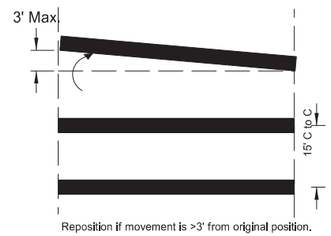
| ADVANCE WARNING SIGN SPACING | | | |
|---|---|---|---|
| Road Type | Distance Between Signs Min. (ft) | | |
| | A | B | C |
| Urban - High Speed (over 45 mph to 50 mph) | 360 | 360 | 360 |
| Rural - High Speed (over 50 mph to 65 mph) | 720 | 720 | 720 |




PORTABLE RUMBLE STRIPS AT TEMPORARY ROAD CLOSURE




PORTABLE RUMBLE STRIPS ARRAY DETAIL

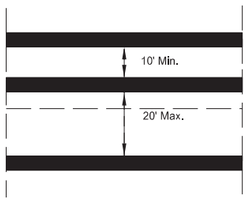



Reposition if movement is >3' from original position.

Skewing


Reposition if movement is >2' from original position.

Lateral




Reposition if distance between strips is <10' or >20'.

Perpendicular to Travel with or against traffic

## PORTABLE RUMBLE STRIPS ARRAY TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

Notes:

1. Determine speed in the field based on location and conditions.
2. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
3. Sign R2-1aP-24 is not required when pilot car operation is used.
4. Do not use rumble strips on a non paved surface or in a pre-construction speed zone of 45 mph or less.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 02-22-22 | |
| REVISIONS | |
| DATE | CHANGE |
| 03/07/23 | Use changed to min 45 mph. |

KIRK J. HOFFMANN
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03/07/23