| DESIGN DATA | | | | | | |
|---|---|---|---|---|---|---|
| Traffic | Average Daily | | | | | Max Hour |
| Current 2017 | Pass: | N/A | Trucks: | N/A | Total: <100 | N/A |
| Forecast 2037 | Pass: | N/A | Trucks: | N/A | Total: <100 | N/A |
| Clear Zone Distance: 14' | | | Design Speed: 55 MPH | | | |
| Minimum Sight Distance (Non Passing): 495' | | | Bridges: HL-93 | | | |
| Minimum Sight Distance (Safe Passing): N/A | | | | | | |
| Sight Distance for No Passing Zone: N/A | | | | | | |
| Pavement Design Life: N/A | | | | | | |

# *BENSON COUNTY*

*NORTH DAKOTA*

*FEDERAL AID PROJECT BRO-CNOC-0003(050)*

*STRUCTURE REPLACEMENT*

*STRUCTURE #03-137-36.0*

THE PROJECT CONSISTS OF REMOVING THE EXISTING BRIDGE AND REPLACING IT WITH A 134 FT TWO SPAN BRIDGE WITH 2:1 END SLOPES AND 67 FT SPANS
THE PROJECT IS LOCATED 3.5 MILES EAST AND 1.5 MILES NORTH OF SHEYENNE, ND

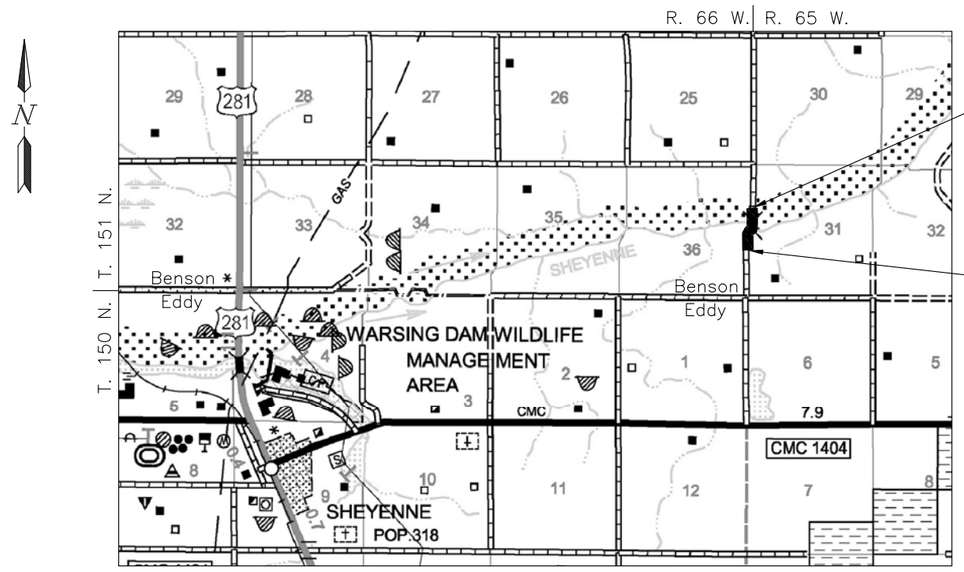
| PCN 21293 | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|---|
| | ND | BRO-CNOC-0003(050) | 1 | 1 |

**Job #1**

## GOVERNING SPECIFICATIONS

2014 Standard Specifications adopted by the NDDOT and the Supplemental Specifications effective on the date the project is advertised.

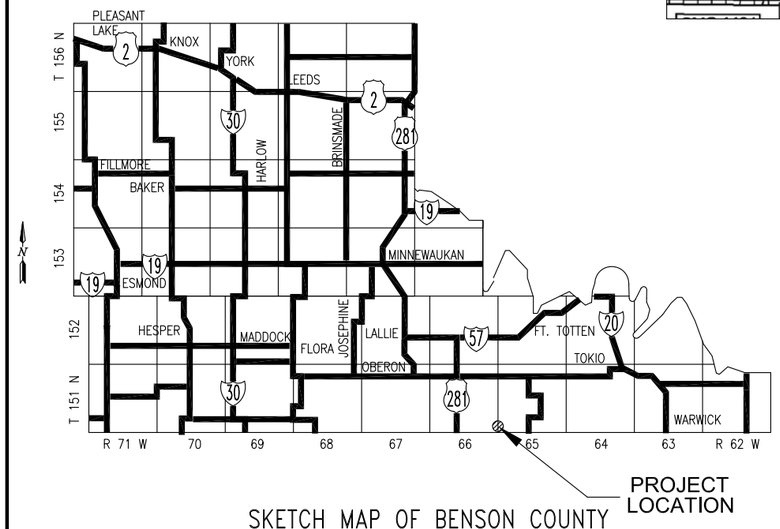
| LENGTH OF PROJECT | | |
|---|---|---|
| PROJECT | MILES-GROSS | MILES-NET |
| BRO-CNOC-0003(050) | 0.587 | 0.587 |
| TOTALS | 0.587 | 0.587 |




End Project BRO-CNOC-0003(050)
STA. 47+00 = A Point 861.75' South of the NW Corner of S. 31, T. 151 N., R. 65 W.

Begin Project BRO-CNOC-0003(050)
STA. 16+00 = A Point 1,600.00' North of the SW Corner of S. 31, T. 151 N., R. 65 W.

## LOCATION MAP




SKETCH MAP OF BENSON COUNTY

SURVEYED & DESIGNED *06/15/2017*

PS & E REVISIONS MADE *09/19/2017*


Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
915 East 11th Street ~ PO Box 237 ~ Bottineau, ND 58318
316 Eastdale Drive ~ PO Box 1277 ~ Bismarck, ND 58502
110 8th Avenue Southwest ~ Minot, ND 58701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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
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| ND | BRO-CNOC-0003(050) | 2 | 1 |

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## PLAN SECTIONS



## LIST OF STANDARD DRAWINGS



## SPECIAL PROVISIONS

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 6 | 1 |

# NOTES

**100-P01 UTILITIES:** Notice shall be given to the utility companies a minimum of 2 weeks prior to work on the project. Utilities that the engineer has been made aware of are shown on the plans. Other utilities may exist that are not shown. Power lines, telephone cables, rural water lines, and other utilities may be encountered on this project. The contractor shall be responsible to verify the locations and to notify all utility and pipeline companies to have the locations flagged and marked prior to beginning construction. Any charges by the utility companies for locates shall be paid by the contractor. The contractor will be liable for any costs resulting from damage to utilities or pipelines.

Utility companies will move or adjust conflicting facilities in conjunction with or prior to the highway construction. The contractor will not be responsible for costs associated with the moving or adjustment of utilities on the project right of way.

One-Call Service: 1-800-795-0555 or 811

**105-P01 CONTROL OF WORK:** The Contractor shall keep the existing bridge and existing roadway open to traffic until the new bridge and roadway are completed.

**201-P01 REMOVAL OF TREES:** The Contractor shall remove and dispose of all trees within the grading limits and include all costs in “Common Excavation-Type B”.

**203-P01 TOPSOIL:** The payment for bid item “Topsoil” shall be per plan quantity.

**203-P02 SHRINKAGE:** Thirty percent (30%) additional volume in yardage is included for shrinkage in earth embankment.

**203-P03 COMMON EXCAVATION:** Placement of embankment material shall be in accordance with Section 203.04 E3 of the Standard Specifications (Compaction Control, Type B).

**203-P04 ROADWAY OBLITERATION:** The Contractor shall remove the existing roadway excavation and dispose of in the Contractor’s pit. The Contractor shall not fill in adjacent wetlands in the obliteration areas outside of the proposed roadway. All costs associated with this work shall be included in the bid price for “Roadway Obliteration”.

**216-P01 WATER:** The application of water for compaction of subgrade and aggregates, and for use as a dust palliative, as required, shall be included in the cost for other bid items.

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NOTES

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 6 | 2 |

# ENVIRONMENTAL NOTES

**ENVIRONMENTAL NOTES (EN):** Benson County, the North Dakota Department of Transportation and FHWA have made several environmental commitments to various agencies and the public to secure approval of this project. The environmental commitments are as follows:

**EN #1 – SPAWNING RESTRICTION:** Do not work within the waterway from April 15 to June 1.

**EN #2 – HAZARDOUS WASTE:** Any waste material from this project will be disposed of properly. No asbestos containing materials have been found on the existing structure. It will be the Contractor's responsibility to contact the ND Department of Health, Division of Air Quality at (701)328-5188 prior to the demolition of the existing structure.

**EN #3 - DUST EMISSIONS:** Dust will be minimized as much as possible during construction through the use of water.

**EN #4 – STORM WATER:** The Contractor will be required to submit a storm water permit before construction begins.

**EN #5 - EROSION CONTROL:** An erosion control plan has been developed and included on the plans. It will be the Contractor's responsibility to install erosion control as specified and at the direction of the Engineer and assure avoidable erosion doesn't occur. Any disturbed areas that do not receive riprap will be reseeded with an approved grass mixture.

**EN #6 - CONSTRUCTION NOISE:** Construction noise levels would be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Impact to noise levels would be minimized by limiting construction activities that occur during early morning or late evening hours. Noise levels are not expected to exceed limits and will be short-term.

**EN #7 – WETLAND IMPACTS:** There are jurisdictional wetlands within the project limits that will be permanently impacted by the project. Of the 1.77 acres of permanent impacts to jurisdictional waters, 1.68 acres will require mitigation. The mitigation will take place in-lieu credits with Ducks Unlimited. The wetland tables are located in Section 75 of the plans.

**EN #8 - 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, Jessica Howell by e-mail jmhowell@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). If an inspection is not required, no follow up documentation is required.

**EN #9 – MIGRATORY BIRD TREATY ACT:** Active migratory bird nests with eggs or chicks are protected by the Federal Migratory Bird Treaty Act. NDDOT's special provision, SP 0004 (14) for compliance with the Federal Regulation is to be followed.

**EN #10 – CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION:** As part of the CWA Section 401 Water Quality Certification, the Contractor shall follow general conditions during construction that are listed on the 401 certification letter in SP 5185(14). General Conditions 1 through 8 shall be completed by the Contractor. General Conditions 9 through 13 shall be completed by the County and Engineer.

**PERMITS REQUIRED:**

1. North Dakota Department of Health – NDPDES Permit
*Status: To be obtained by the Contractor prior to construction, Owner is to be Benson County.*

2. USACE – Section 404 Permit
*Status: Authorization under Nationwide Permit 23 has been obtained by Benson County. Permit No. NWO-2015-02141-BIS was issued on 11-2-17.*

3. EPA – Section 401 Water Quality Certification
*Status: A Section 401 water quality certification has been obtained by Benson County. Ref. No. 8WP-AAP was issued on 11-16-17.*

4. ND State Water Commission – Sovereign Lands Permit
*Status: A Sovereign Lands Permit has been obtained by Benson County. Permit No. S-2093 was issued on 11-13-17.*

5. Tribal Employment Rights Ordinance (TERO) – TERO Work Permits
*Status: To be obtained by the Contractor prior to construction.*

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 8 | 1 |

# ESTIMATE OF QUANTITIES

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 103 | 0100 | CONTRACT BOND | L SUM | 1 |
| 202 | 0105 | REMOVAL OF STRUCTURE | L SUM | 1 |
| 202 | 0170 | REMOVAL OF CULVERTS-ALL TYPES & SIZES | LF | 40 |
| 202 | 0312 | REMOVE EXISTING FENCE | LF | 1,625 |
| 203 | 0102 | COMMON EXCAVATION-TYPE B | CY | 12,013 |
| 203 | 0109 | TOPSOIL | CY | 4,929 |
| 203 | 0140 | BORROW-EXCAVATION | CY | 39,444 |
| 203 | 0180 | ROADWAY OBLITERATION | LF | 1,200 |
| 210 | 0111 | CLASS 2 EXCAVATION | L SUM | 1 |
| 210 | 0127 | CHANNEL EXCAVATION | L SUM | 1 |
| 210 | 0201 | FOUNDATION PREPARATION | EA | 1 |
| 251 | 0200 | SEEDING CLASS II | ACRE | 8.5 |
| 251 | 1000 | WETLAND SEED | ACRE | 1.0 |
| 251 | 2000 | TEMPORARY COVER CROP | ACRE | 8.5 |
| 253 | 0101 | STRAW MULCH | ACRE | 18.0 |
| 256 | 0200 | RIPRAP GRADE II | CY | 1,059 |
| 261 | 0112 | FIBER ROLLS 12IN | LF | 5,820 |
| 261 | 0113 | REMOVE FIBER ROLLS 12IN | LF | 2,910 |
| 262 | 0100 | FLOTATION SILT CURTAIN | LF | 300 |
| 262 | 0101 | REMOVE FLOTATION SILT CURTAIN | LF | 300 |
| 302 | 0356 | AGGREGATE SURFACE COURSE CL 13 | TON | 2,001 |
| 602 | 0130 | CLASS AAE-3 CONCRETE | CY | 125.7 |
| 602 | 1130 | CLASS AE-3 CONCRETE | CY | 79.1 |
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 447.0 |
| 604 | 9620 | PRESTRESSED BOX BEAM-33IN | LF | 520 |
| 612 | 0115 | REINFORCING STEEL-GRADE 60 | LBS | 8,601 |
| 612 | 0116 | REINFORCING STEEL-GRADE 60-EPOXY COATED | LBS | 25,621 |
| 616 | 0364 | STRUCTURAL STEEL M270-GRADE 36 | LBS | 565 |
| 622 | 0014 | STEEL H-PILING POINTS 12 X 53 | EA | 8 |
| 622 | 0016 | STEEL H-PILE TIPS 14 X 73 | EA | 5 |
| 622 | 0040 | STEEL PILING HP 12 X 53 | LF | 640 |
| 622 | 0060 | STEEL PILING HP 14 X 73 | LF | 430 |
| 624 | 0151 | RAILING | LF | 268 |
| 626 | 0120 | PIER COFFERDAM | EA | 1 |
| 702 | 0100 | MOBILIZATION | L SUM | 1 |
| 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | 106 |
| 704 | 1052 | TYPE III BARRICADE | EA | 4 |
| 704 | 1060 | DELINEATOR DRUMS | EA | 50 |
| 709 | 0155 | GEOSYNTHETIC MATERIAL TYPE RR | SY | 1,589 |
| 714 | 5015 | PIPE CORR STEEL .064IN 18IN | LF | 124 |
| 714 | 5810 | END SECT CORR STEEL .064IN 18IN | EA | 4 |
| 752 | 0320 | FENCE BARBED WIRE 4 STRAND-STEEL POST | LF | 1,677 |
| 752 | 0900 | FENCE TEMPORARY INSTALL & REMOVE | LF | 1,677 |
| 752 | 0993 | FENCE TERMINAL | EA | 1 |
| 752 | 2100 | VEHICLE GATE | EA | 1 |
| 752 | 3140 | CORNER ASSEMBLY BARBED WIRE | EA | 4 |
| 764 | 0131 | W-BEAM GUARDRAIL | LF | 263.24 |
| 764 | 0145 | W-BEAM GUARDRAIL END TERMINAL | EA | 4 |

**BASIS OF ESTIMATE**

AGGREGATE SURFACE COURSE CL 13
3179 Ton/Mile Aggregate Surface Course-CL 13 (25% Shrink * 1.5 Tons/CY = 1.875 Ton/CY)
30 Ton/Side of Bridge for Guardrail Surfacing

36 Ton Per Section Line and Private Drive Approaches
15 Ton Per Field Approach

RIPRAP GRADE II
1.5 Tons/CY

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 11 | 1 |

## Earthwork Tables

| Station | Embankment Area (SF) | Embankment Volume + 30% (CY) | Cumulative Embankment Volume (CY) (A) | Common Excavation - Type B Area (SF) | Common Excavation - Type B Volume (CY) | Cumulative Common Excavation - Type B Volume (CY) (B) | Cumulative Borrow - Excavation (C) = (A) - (B) |
|---|---|---|---|---|---|---|---|
| 14+00.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15+00.00 | 0.07 | 0.18 | 0.18 | 0.06 | 0.12 | 0.12 | 0.06 |
| 16+00.00 | 32.73 | 78.97 | 79.15 | 5.18 | 9.71 | 9.83 | 69.32 |
| 17+00.00 | 1.58 | 82.61 | 161.76 | 100.34 | 195.41 | 205.24 | 43.49 |
| 18+00.00 | 0.00 | 3.81 | 165.57 | 165.42 | 492.14 | 697.39 | 531.82 |
| 19+00.00 | 0.00 | 0.00 | 165.57 | 248.82 | 767.11 | 1464.50 | 1298.93 |
| 20+00.00 | 0.00 | 0.00 | 165.57 | 388.47 | 1180.17 | 2644.67 | 2479.10 |
| 20+11.12 | 0.00 | 0.00 | 165.57 | 406.27 | 163.70 | 2808.37 | 2642.80 |
| 21+00.00 | 1.03 | 2.20 | 167.77 | 489.96 | 1475.09 | 4283.46 | 4115.69 |
| 21+02.16 | 0.54 | 0.08 | 167.85 | 485.58 | 38.98 | 4322.44 | 4154.59 |
| 21+10.00 | 1.98 | 0.48 | 168.33 | 468.88 | 138.61 | 4461.05 | 4292.72 |
| 21+93.19 | 0.01 | 4.00 | 172.34 | 524.73 | 1530.76 | 5991.81 | 5819.47 |
| 22+00.00 | 0.00 | 0.00 | 172.34 | 520.62 | 131.78 | 6123.59 | 5951.25 |
| 22+04.16 | 0.00 | 0.00 | 172.34 | 511.33 | 79.55 | 6203.14 | 6030.80 |
| 22+55.16 | 0.00 | 0.00 | 172.34 | 421.06 | 867.94 | 7071.08 | 6898.74 |
| 22+92.53 | 0.00 | 0.00 | 172.34 | 367.92 | 539.06 | 7610.15 | 7437.81 |
| 23+00.00 | 0.01 | 0.00 | 172.34 | 343.56 | 98.41 | 7708.55 | 7536.21 |
| 23+29.90 | 1.82 | 1.37 | 173.71 | 233.86 | 316.36 | 8024.91 | 7851.20 |
| 23+42.00 | 0.42 | 0.65 | 174.36 | 172.19 | 90.95 | 8115.86 | 7941.50 |
| 23+80.90 | 37.37 | 35.05 | 209.41 | 80.11 | 179.97 | 8295.83 | 8086.42 |
| 23+91.87 | 64.65 | 26.94 | 236.35 | 60.95 | 28.66 | 8324.48 | 8088.13 |
| 24+00.00 | 85.95 | 29.48 | 265.83 | 49.75 | 16.67 | 8341.15 | 8075.32 |
| 24+82.90 | 435.19 | 1040.11 | 1305.94 | 24.10 | 113.38 | 8454.53 | 7148.59 |
| 25+00.00 | 541.99 | 402.17 | 1708.11 | 17.48 | 13.16 | 8467.69 | 6759.59 |
| 25+73.94 | 817.13 | 2419.25 | 4127.36 | 7.42 | 34.09 | 8501.78 | 4374.42 |
| 26+00.00 | 860.83 | 1052.73 | 5180.09 | 6.05 | 6.50 | 8508.28 | 3328.20 |
| 27+00.00 | 1006.85 | 4496.26 | 9676.35 | 0.00 | 11.20 | 8519.48 | 1156.86 |
| 28+00.00 | 0.00 | 2423.90 | 12100.24 | 0.00 | 0.00 | 8519.48 | 3580.76 |
| 29+00.00 | 551.53 | 1327.77 | 13428.01 | 228.95 | 423.98 | 8943.46 | 4484.55 |
| 29+08.55 | 551.61 | 226.94 | 13654.95 | 228.28 | 72.35 | 9015.81 | 4639.14 |
| 29+99.58 | 487.81 | 2277.97 | 15932.92 | 232.00 | 775.96 | 9791.77 | 6141.15 |
| 30+00.00 | 486.33 | 9.84 | 15942.76 | 231.52 | 3.60 | 9795.37 | 6147.39 |
| 30+40.00 | 498.48 | 948.33 | 16891.10 | 187.27 | 310.21 | 10105.59 | 6785.51 |
| 30+90.62 | 243.48 | 904.09 | 17795.18 | 163.36 | 328.65 | 10434.24 | 7360.95 |
| 31+00.00 | 196.84 | 99.48 | 17894.66 | 117.79 | 48.86 | 10483.10 | 7411.57 |
| 31+01.59 | 186.78 | 14.64 | 17909.31 | 110.96 | 6.72 | 10489.82 | 7419.49 |
| 31+27.93 | 173.53 | 229.03 | 18138.34 | 128.57 | 117.07 | 10606.89 | 7531.45 |
| 31+40.25 | 219.63 | 116.66 | 18255.00 | 183.27 | 71.18 | 10678.07 | 7576.93 |
| 31+52.58 | 257.14 | 141.47 | 18396.47 | 225.18 | 93.23 | 10771.30 | 7625.17 |
| 31+78.92 | 274.24 | 338.42 | 18734.89 | 193.20 | 199.22 | 10970.51 | 7764.38 |
| 31+89.89 | 266.49 | 142.80 | 18877.70 | 143.81 | 68.46 | 11038.98 | 7838.72 |
| 32+00.00 | 257.29 | 127.43 | 19005.13 | 95.98 | 44.88 | 11083.86 | 7921.28 |
| 32+80.93 | 192.48 | 876.27 | 19881.40 | 74.70 | 255.78 | 11339.64 | 8541.76 |
| 33+00.00 | 177.96 | 170.08 | 20051.48 | 73.20 | 52.23 | 11391.87 | 8659.61 |
| 33+71.96 | 137.23 | 546.06 | 20597.54 | 55.08 | 170.95 | 11562.81 | 9034.73 |
| 34+00.00 | 129.87 | 180.28 | 20777.83 | 48.77 | 53.91 | 11616.73 | 9161.10 |
| 35+00.00 | 136.07 | 640.23 | 21418.06 | 37.12 | 159.04 | 11775.77 | 9642.28 |
| 35+89.80 | 176.33 | 675.34 | 22093.40 | 8.90 | 76.52 | 11852.29 | 10241.11 |
| 36+00.00 | 184.44 | 88.59 | 22181.99 | 6.80 | 2.97 | 11855.25 | 10326.74 |

## Earthwork Tables

| Station | Embankment Area (SF) | Embankment Volume + 30% (CY) | Cumulative Embankment Volume (CY) (A) | Common Excavation - Type B Area (SF) | Common Excavation - Type B Volume (CY) | Cumulative Common Excavation - Type B Volume (CY) (B) | Cumulative Borrow - Excavation (C) = (A) - (B) |
|---|---|---|---|---|---|---|---|
| 36+80.83 | 288.34 | 920.03 | 23102.03 | 10.55 | 25.98 | 11881.24 | 11220.79 |
| 37+00.00 | 309.71 | 275.94 | 23377.96 | 8.79 | 6.87 | 11888.10 | 11489.86 |
| 37+71.87 | 381.89 | 1196.59 | 24574.56 | 0.20 | 11.97 | 11900.08 | 12674.48 |
| 37+82.84 | 395.34 | 205.26 | 24779.82 | 0.00 | 0.04 | 11900.12 | 12879.70 |
| 38+00.00 | 423.27 | 338.19 | 25118.01 | 0.02 | 0.01 | 11900.12 | 13217.89 |
| 38+33.83 | 519.08 | 766.13 | 25884.14 | 0.10 | 0.08 | 11900.20 | 13983.93 |
| 39+00.00 | 773.94 | 2064.53 | 27948.67 | 0.00 | 0.14 | 11900.34 | 16048.33 |
| 39+13.43 | 813.29 | 513.30 | 28461.97 | 0.02 | 0.01 | 11900.34 | 16561.62 |
| 39+93.03 | 1193.14 | 3863.34 | 32325.31 | 0.00 | 0.03 | 11900.37 | 20424.93 |
| 40+00.00 | 1233.14 | 407.00 | 32732.31 | 0.00 | 0.00 | 11900.37 | 20831.94 |
| 40+44.03 | 1256.99 | 2651.16 | 35383.47 | 0.00 | 0.00 | 11900.37 | 23483.09 |
| 40+55.00 | 1265.86 | 666.27 | 36049.74 | 0.00 | 0.00 | 11900.37 | 24149.36 |
| 41+00.00 | 1411.68 | 2900.86 | 38950.60 | 0.00 | 0.00 | 11900.37 | 27050.22 |
| 41+33.00 | 1307.12 | 2159.94 | 41110.54 | 0.00 | 0.00 | 11900.37 | 29210.16 |
| 41+46.03 | 1143.94 | 768.98 | 41879.52 | 0.00 | 0.00 | 11900.37 | 29979.14 |
| 42+00.00 | 915.01 | 2675.05 | 44554.57 | 0.01 | 0.01 | 11900.38 | 32654.19 |
| 42+13.57 | 852.29 | 577.14 | 45131.71 | 0.00 | 0.00 | 11900.38 | 33231.33 |
| 42+37.07 | 601.48 | 822.53 | 45954.24 | 0.45 | 0.20 | 11900.58 | 34053.66 |
| 43+00.00 | 472.09 | 1626.52 | 47580.75 | 0.00 | 0.52 | 11901.10 | 35679.65 |
| 44+00.00 | 247.45 | 1732.22 | 49312.97 | 0.00 | 0.00 | 11901.10 | 37411.87 |
| 45+00.00 | 217.85 | 1120.17 | 50433.14 | 0.00 | 0.00 | 11901.10 | 38532.04 |
| 46+00.00 | 98.22 | 760.93 | 51194.07 | 0.08 | 0.15 | 11901.25 | 39292.81 |
| 47+00.00 | 5.36 | 249.38 | 51443.44 | 30.04 | 55.78 | 11957.03 | 39486.41 |
| 48+00.00 | 0.00 | 12.92 | 51456.36 | 0.00 | 55.63 | 12012.66 | 39443.70 |
| 49+00.00 | 0.00 | 0.00 | 51456.36 | 0.00 | 0.00 | 12012.66 | 39443.70 |
| 50+00.00 | 0.00 | 0.00 | 51456.36 | 0.00 | 0.00 | 12012.66 | 39443.70 |

## Earthwork Summary

| Item | Common Excavation (CY) | Borrow - Excavation (CY) | Topsoil (CY) |
|---|---|---|---|
| Mainline Sta. 16+00 to 47+00 | 12,013 | 39,444 | 4,929 |

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors

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# Earthwork Tables

STA. 14+00 TO 50+00

0 100 200 300
SCALE IN FEET

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 20 | 1 |

| | |
|---|---|
| P.C. Station | 22+04.16 |
| P.I. Station | 22+92.73 |
| Delta = | 9° 21' 14.00" (RT) |
| Degree = | 5° 17' 33.00" |
| Tangent = | 88.56' |
| Length = | 176.74' |
| Radius = | 1,082.58' |
| External = | 88.56' |
| P.T. Station | 23+80.90 |

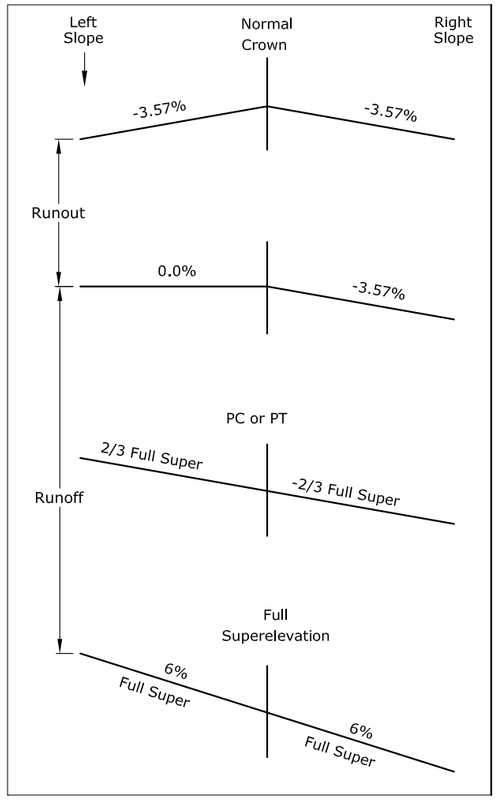
| Station | Left Slope | Right Slope |
|---|---|---|
| PC - 193.04' | -3.57 | -3.57 |
| PC - 102.00' | 0.00 | -3.57 |
| PC | 4.00 | -4.00 |
| PC + 51.00' | 6.00 | -6.00 |
| PT - 51.00' | 6.00 | -6.00 |
| PT | 4.00 | -4.00 |
| PT + 102.00' | 0.00 | -3.57 |
| PT + 193.04' | -3.57 | -3.57 |

| | |
|---|---|
| P.C. Station | 31+01.59 |
| P.I. Station | 31+40.27 |
| Delta = | 4° 05' 35.00" (RT) |
| Degree = | 5° 17' 33.00" |
| Tangent = | 38.69' |
| Length = | 77.34' |
| Radius = | 1,082.58' |
| External = | 38.69' |
| P.T. Station | 31+78.92 |

| Station | Left Slope | Right Slope |
|---|---|---|
| PC - 193.04' | -3.57 | -3.57 |
| PC - 102.01' | 0.00 | -3.57 |
| PC | 4.00 | -4.00 |
| PC + 26.34' | 6.00 | -6.00 |
| PT - 26.34' | 6.00 | -6.00 |
| PT | 4.00 | -4.00 |
| PT + 102.01' | 0.00 | -3.57 |
| PT + 193.04' | -3.57 | -3.57 |

| | |
|---|---|
| P.C. Station | 37+82.84 |
| P.I. Station | 39+14.07 |
| Delta = | 13° 49' 24.00" (LT) |
| Degree = | 5° 17' 33.00" |
| Tangent = | 131.23' |
| Length = | 261.19' |
| Radius = | 1,082.58' |
| External = | 131.23' |
| P.T. Station | 40+44.03 |

| Station | Left Slope | Right Slope |
|---|---|---|
| PC - 193.04' | -3.57 | -3.57 |
| PC - 102.01' | -3.57 | 0.00 |
| PC | -4.00 | 4.00 |
| PC + 51.00' | -6.00 | 6.00 |
| PT - 51.00' | -6.00 | 6.00 |
| PT | -4.00 | 4.00 |
| PT + 102.01' | -3.57 | 0.00 |
| PT + 193.04' | -3.57 | -3.57 |




Note: Calculations based on a design speed of 55 mph and maximum superelevation of 6%.

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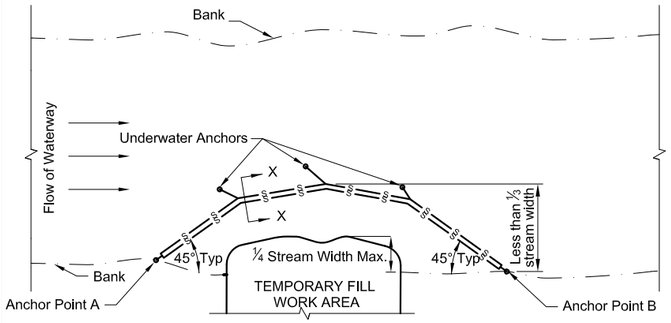
# Superelevation Data

0 100 200 300
SCALE IN FEET

TYPICAL INSTALLATIONS
May vary with conditions

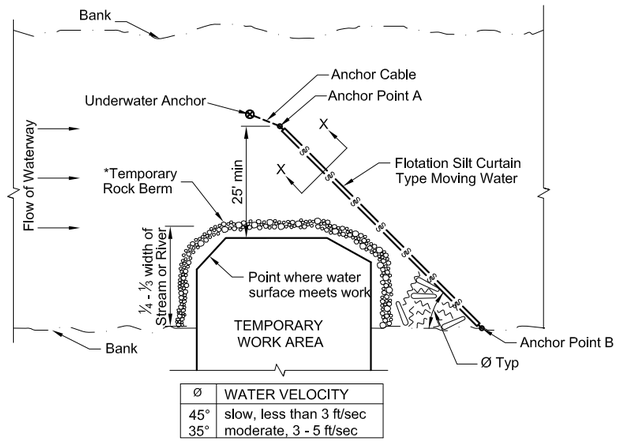
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 20 | 2 |




PLAN VIEW

## FLOTATION SILT CURTAIN - TYPE WORK AREA

DESIGN GUIDELINES:
When temporary work encroaches less than ¼ of the width of stream.




| Ø | WATER VELOCITY |
|---|---|
| 45° | slow, less than 3 ft/sec |
| 35° | moderate, 3 - 5 ft/sec |

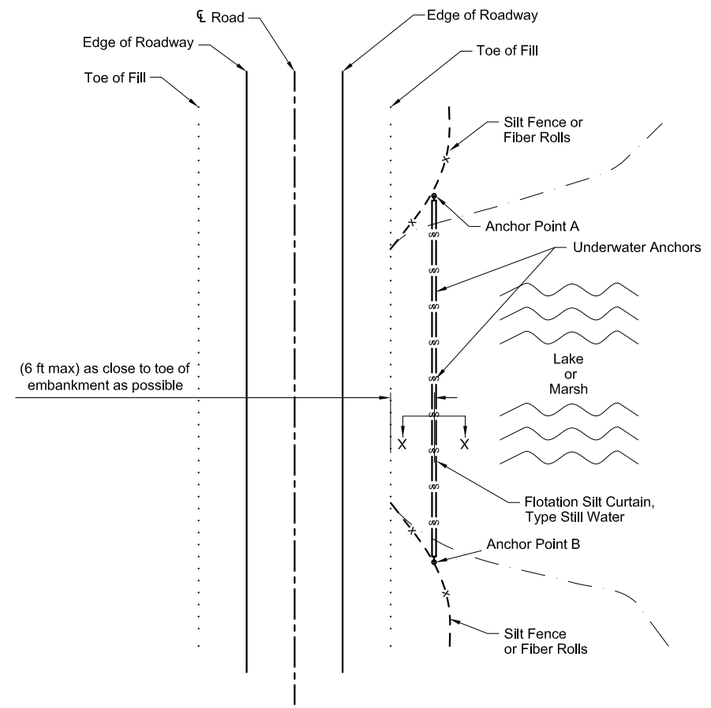
PLAN VIEW

## FLOTATION SILT CURTAIN - TYPE MOVING WATER

DESIGN GUIDELINES:
When temporary work encroaches more than ¼ but less than ⅓ width of the stream.

For narrow waterways, the curtain may be placed 1 foot above the bottom of waterway to allow water flow.

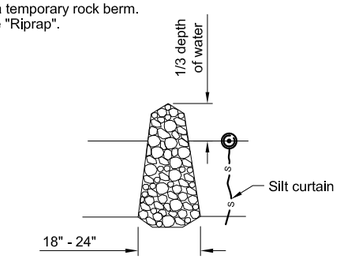
*In areas where the plans call for riprap at the bridge, provide a temporary rock berm. Include all costs for the temporary rock berm in price bid for the "Riprap".



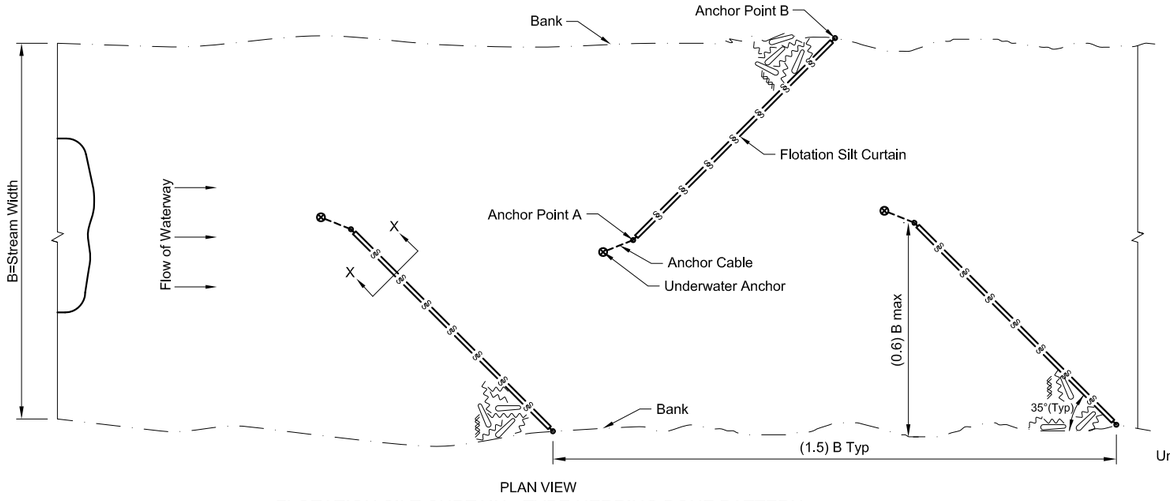

PLAN VIEW

## FLOTATION SILT CURTAIN - TYPE STILL WATER

The silt curtain shall extend onto shore and shall also be anchored there.



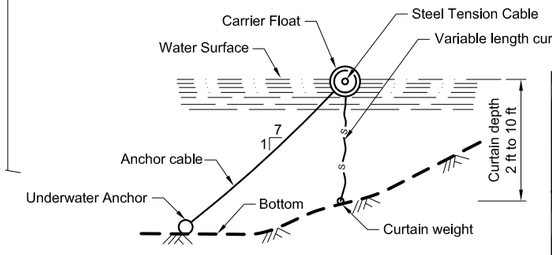

## TEMPORARY ROCK BERM




PLAN VIEW

## FLOTATION SILT CURTAIN - TYPE HERRING BONE PATTERN

DESIGN GUIDELINES:
When temporary work encroaches more than ⅓ width of the stream
Or where stream width doesn't allow use of Type Moving Water




SECTION X-X
FLOTATION SILT CURTAINS

Note:
Maximum water velocity for moving water = 5 ft/sec

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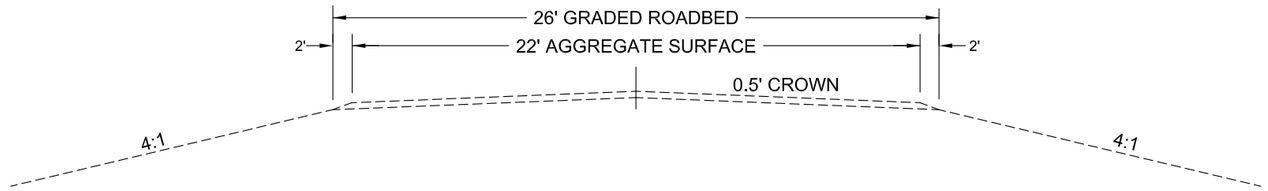
# Temporary Erosion Control Flotation Silt Curtain

REVISED: 00/00/0000

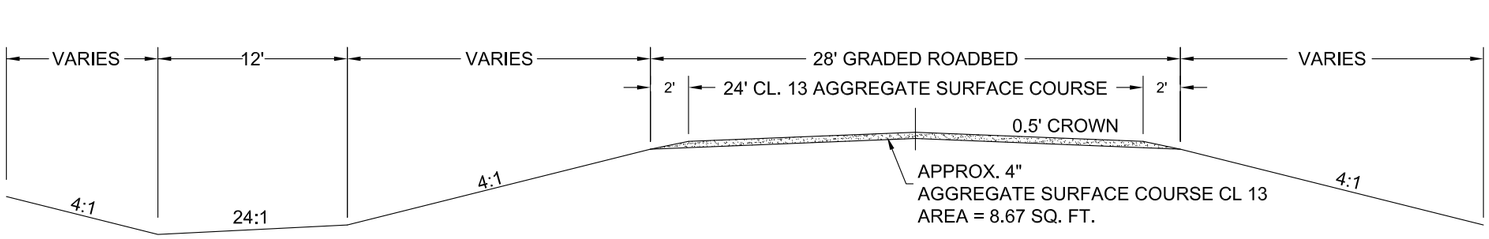
Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

| DRAWN BY: JWM | CHECKED BY: MRR | DATE: 08/25/2017 |
|---|---|---|

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 30 | 1 |




EXISTING TYPICAL SECTION
STA. 16+00 TO 47+00




PROPOSED TYPICAL SECTION
STA. 16+00 TO 47+00

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# Typical Section

REVISED: 00/00/0000

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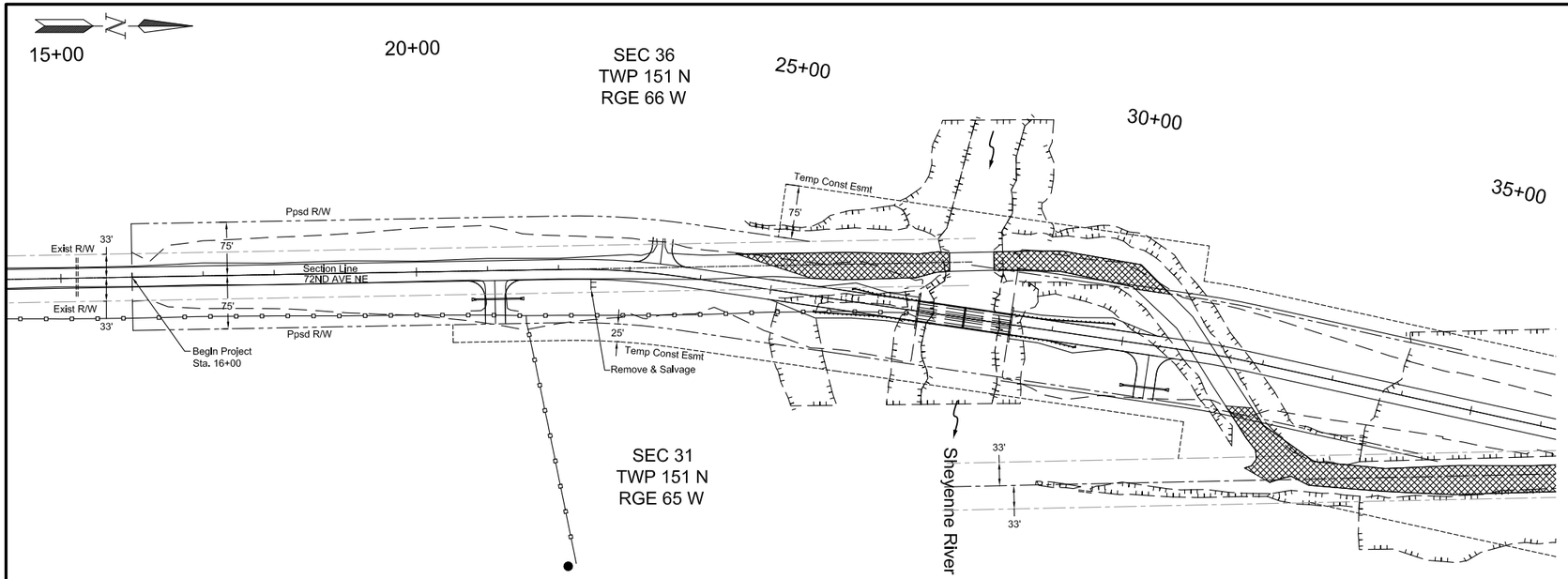
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

| DRAWN BY: JAB | CHECKED BY: MRR | DATE: 09/08/2017 |
|---|---|---|

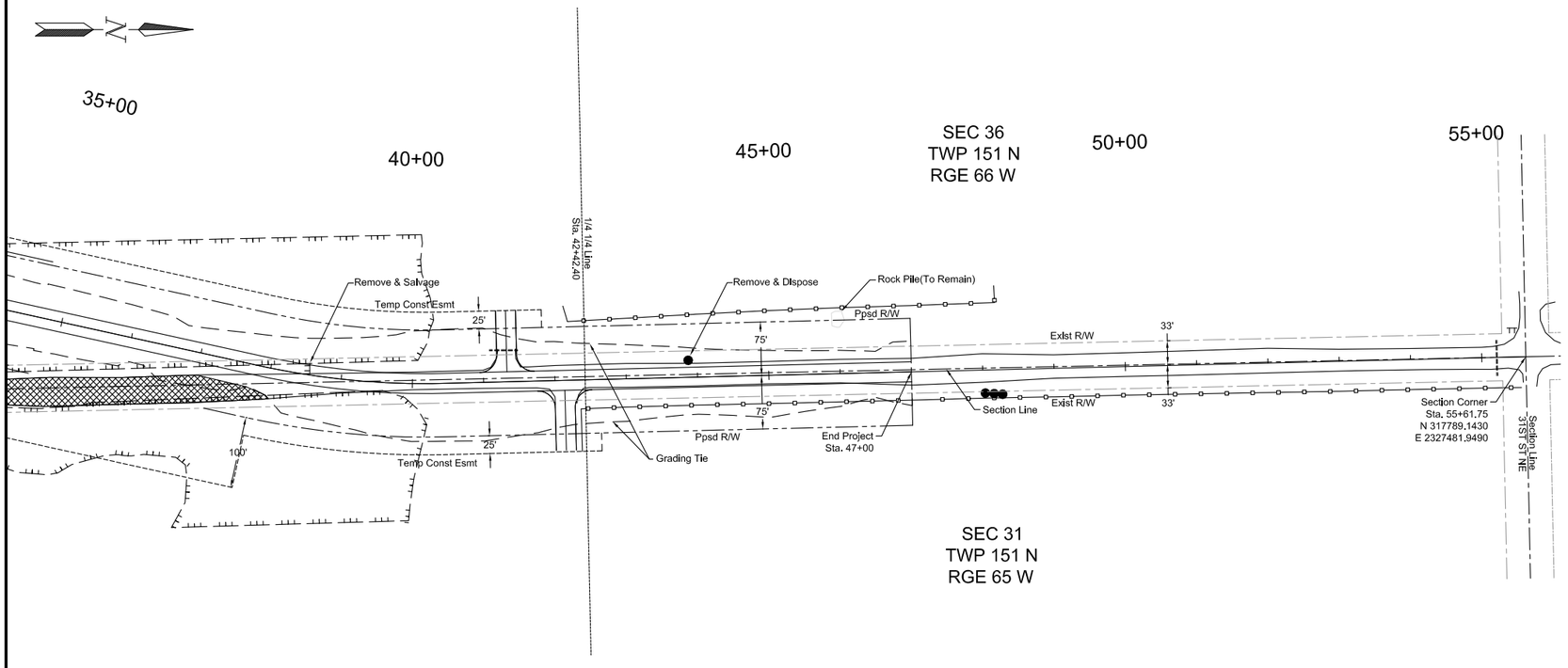


z:\benson\2017 ~ bro-cnoc-0003(050) -pcn 21293 - 15-128 - bridge 03-137-36.0\plans\030tp_001_tp_typical.dwg 9/6/2017 8:05:14 PM

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 40 | 1 |




SCALES:
1" = 200'




SCALES:
1" = 200'

## REMOVAL OF CULVERTS - ALL TYPES & SIZES

| | |
|---|---|
| STA. 41+33 LT - 24" CSP | 40 LF |

## ROADWAY OBLITERATION

| | |
|---|---|
| STA. 24+50 TO 27+50 LT | 300 LF |
| STA. 28+00 TO 30+50 LT | 250 LF |
| STA. 31+50 TO 38+00 RT | 650 LF |

## REMOVAL OF STRUCTURE

| | |
|---|---|
| STA. 27+43 - 74' LT TO STA. 28+05 - 84' LT | 1 L SUM |

STRUCTURE NO. 03-137-36.0
BEAMS: TIMBER
CURBS: TIMBER
RAIL: TIMBER
PIERS: TIMBER
ABUTMENTS: TIMBER
OVERALL LENGTH: 62.99 FT
OVERALL WIDTH: 25.9 FT

## REMOVE EXISTING FENCE

| | |
|---|---|
| STA. 16+00 TO 27+08 RT | 1,120 LF |
| STA. 42+35 TO 47+00 RT | 505 LF |

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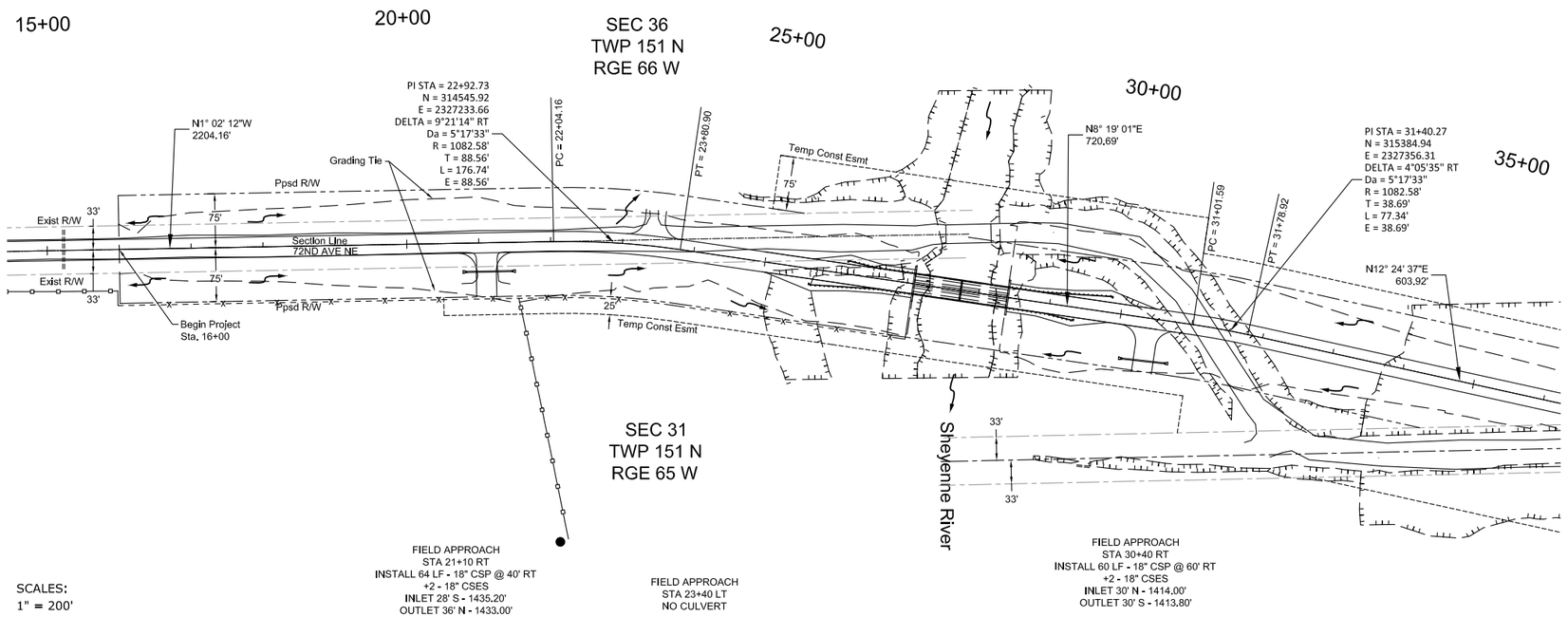
# Removals

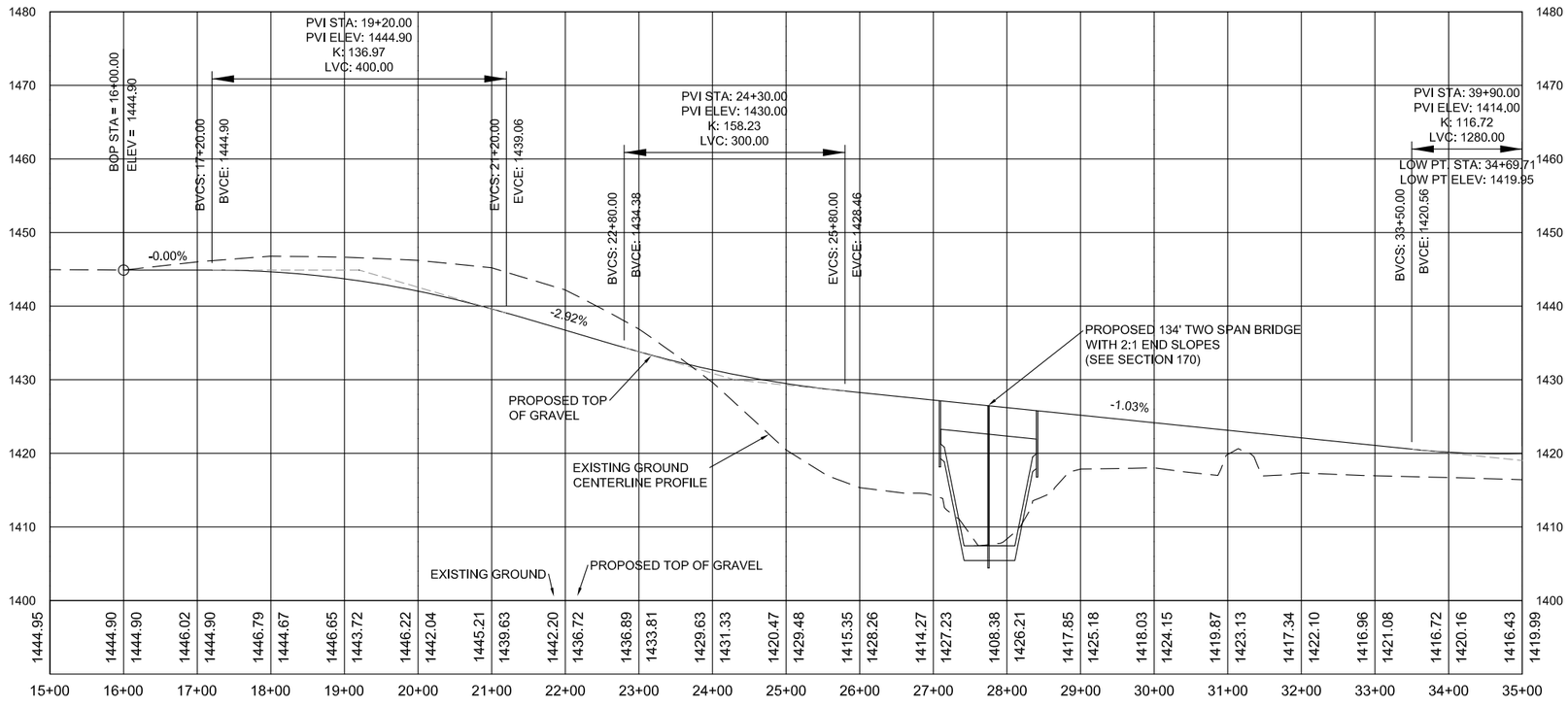
STA. 15+00 TO 55+00

0 100 200 300
SCALE IN FEET

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 60 | 1 |




SCALES:
1" = 200'




## PIPE CORR STEEL .064IN 18IN

| | |
|---|---|
| STA. 21+10 RT | 64 LF |
| STA. 30+40 RT | 60 LF |

## END SECT CORR STEEL .064IN 18IN

| | |
|---|---|
| STA. 21+10 RT | 2 EA |
| STA. 30+40 RT | 2 EA |

## FENCE TEMPORARY INSTALL & REMOVE

| | |
|---|---|
| STA. 16+00 TO 27+08 RT | 1,172 LF |

## FENCE BARBED WIRE 4 STRAND-STEEL POST

| | |
|---|---|
| STA. 16+00 TO 27+08 RT | 1,172 LF |

## VEHICLE GATE

| | |
|---|---|
| STA. 21+10 RT | 1 EA |

## CORNER ASSEMBLY BARBED WIRE

| | |
|---|---|
| STA. 16+00 RT | 1 EA |
| STA. 27+08 RT | 1 EA |

## FENCE TERMINAL

| | |
|---|---|
| STA. 27+08 RT | 1 EA |

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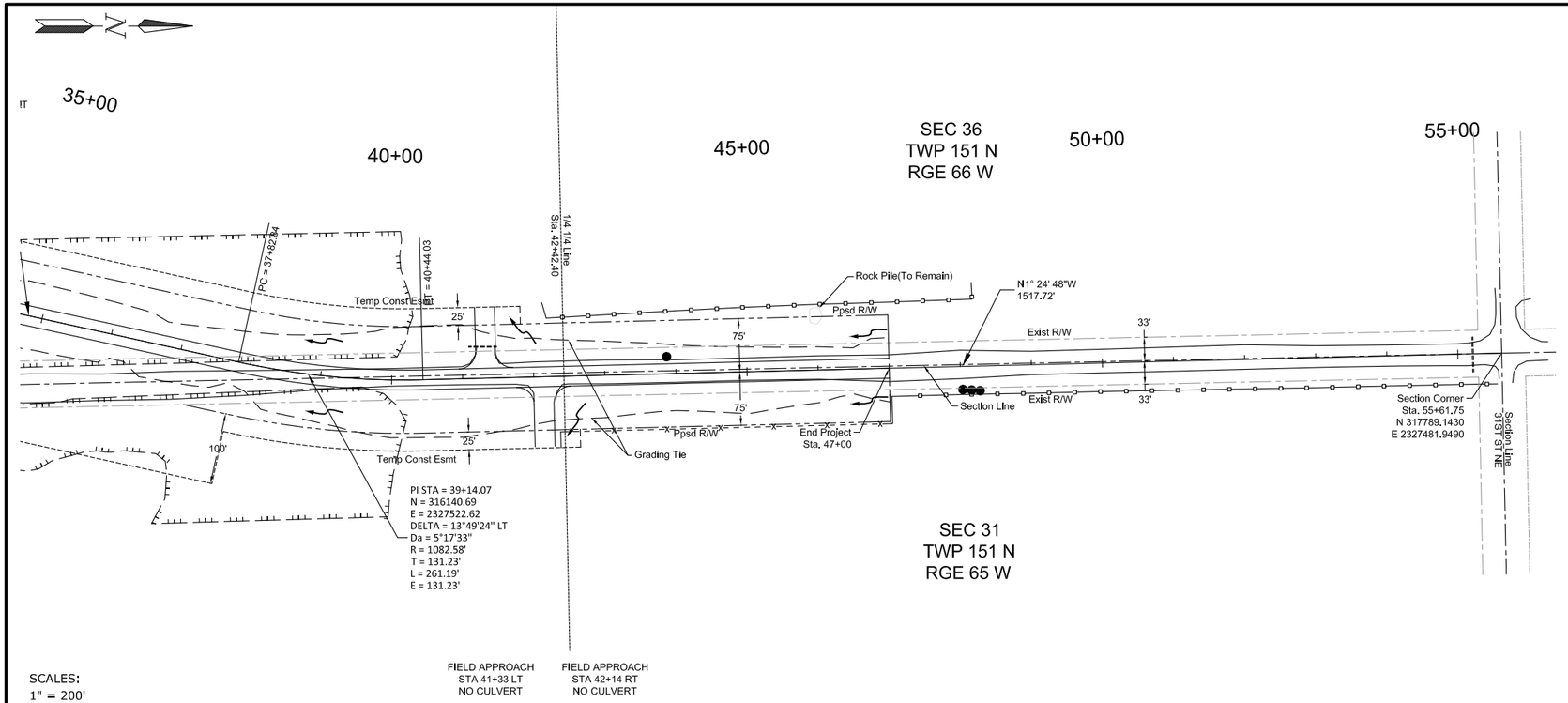
# Plan & Profile

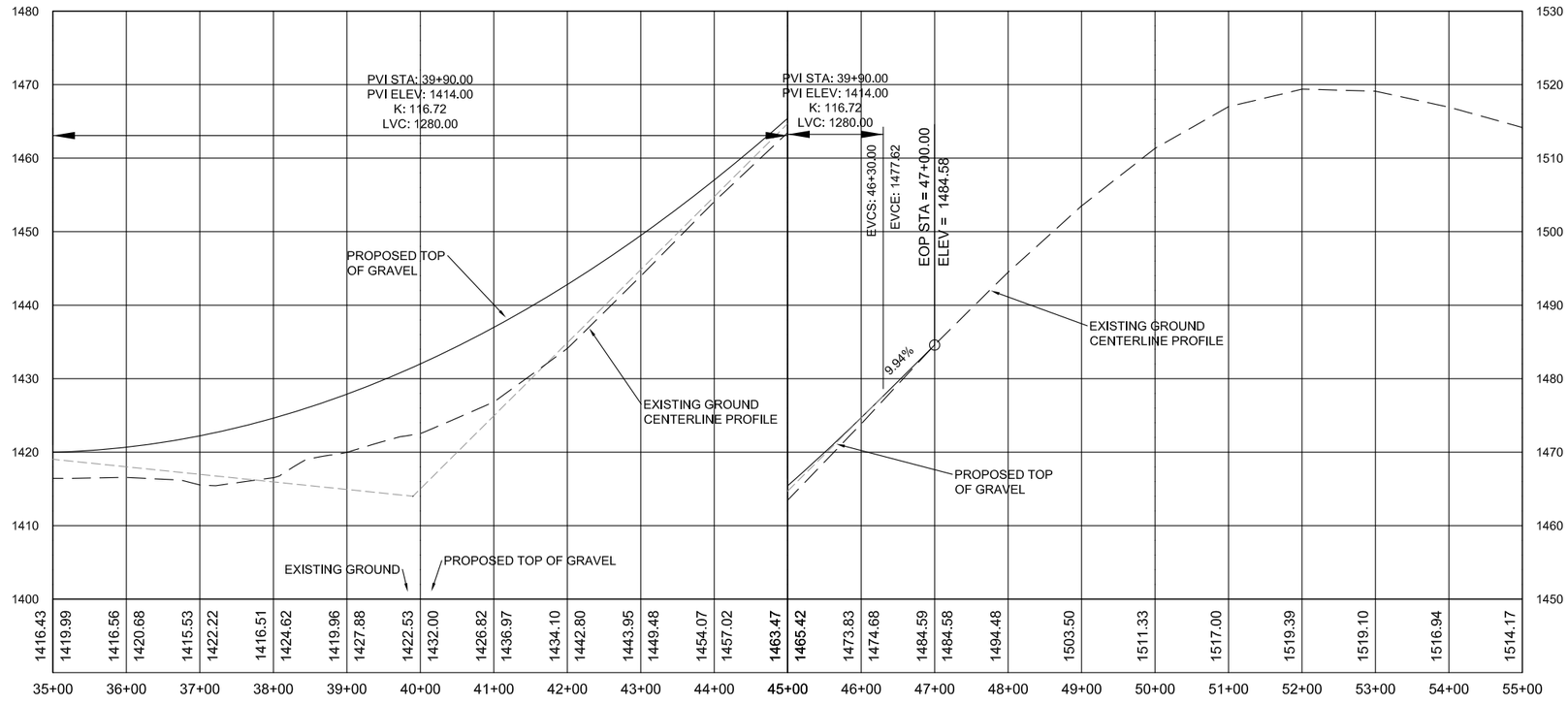
STA. 15+00 TO 35+00

0 100 200 300
SCALE IN FEET

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 60 | 2 |




SCALES:
1" = 200'




## *FENCE TEMPORARY INSTALL & REMOVE*

*STA. 42+35 TO 47+00 RT* — *505 LF*

## *FENCE BARBED WIRE 4 STRAND-STEEL POST*

*STA. 42+35 TO 47+00 RT* — *505 LF*

## *CORNER ASSEMBLY BARBED WIRE*

*STA. 42+35 RT* — *1 EA*
*STA. 47+00 RT* — *1 EA*

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# Plan & Profile

STA. 35+00 TO 55+00

0 100 200 300
SCALE IN FEET

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 75 | 1 |

## Wetland Impact Table

| Wetland Number | Location | Wetland Type | Wetland Feature | USACE Jurisdictional Wetlands* | Wetland Impacts (Acres) | | USFWS Easement Impacts (Acres) | | WETLAND MITIGATION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Mitigation Required | | | Location | Onsite Mitigation (Acres) | Offsite Mitigation (Acres) |
| | | | | | Temp. | Perm. | Temp. | Perm. | EO 11990 | USACE | USFWS | | | |
| 1a | Sec. 36, T151N,R66W | Ditch | artificial | Y | 0.000 | 0.000 | 0.00 | 0.00 | N | N | N | N/A | 0.00 | 0.000 |
| 1b | Sec. 36, T151N,R66W | Riverine | natural | Y | 0.000 | 0.000 | 0.00 | 0.00 | N | N | N | N/A | 0.00 | 0.000 |
| 1c | Sec. 31, T151N, R65W | Riverine | natural | Y | 0.000 | 0.097 | 0.00 | 0.00 | Y | N | N | DU credits | 0.00 | 0.097 |
| 1d | Sec. 31, T151N, R65W | Riverine | natural | Y | 0.000 | 0.129 | 0.00 | 0.00 | Y | Y | N | DU credits | 0.00 | 0.129 |
| 1e | Sec. 36, T151N,R66W | Riverine | natural | Y | 0.000 | 0.000 | 0.00 | 0.00 | N | N | N | N/A | 0.00 | 0.000 |
| 1f | Sec. 36, T151N,R66W | Ditch | artificial | Y | 0.000 | 0.112 | 0.00 | 0.00 | N | Y | N | DU credits | 0.00 | 0.112 |
| 1g | Sec. 31, T151N, R65W | Riverine | natural | Y | 0.000 | 0.134 | 0.00 | 0.00 | Y | Y | N | DU credits | 0.00 | 0.134 |
| 1h | Sec. 31, T151N, R65W | Ditch | artificial | Y | 0.000 | 0.158 | 0.00 | 0.00 | N | Y | N | DU credits | 0.00 | 0.158 |
| 1i | Sec. 36, T151N,R66W | Basin/Flood plain | natural | Y | 0.000 | 0.918 | 0.00 | 0.00 | Y | Y | N | DU credits | 0.00 | 0.918 |
| 1k | Sec. 31, T151N, R65W | Ditch | artificial | Y | 0.00 | 0.00 | 0.00 | 0.00 | N | N | N | N/A | 0.00 | 0.000 |
| 1l | Sec. 31, T151N, R65W | Basin/Flood plain | natural | Y | 0.00 | 0.23 | 0.00 | 0.00 | Y | Y | N | DU credits | 0.00 | 0.229 |
| | | | | | **0.00** | **1.78** | **0.00** | **0.00** | | | | | **0.00** | **1.78** |

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 75 | 2 |

## Other Waters Impact Table

| Other Waters | | | | | | | | | | | Other Water Mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size | | | Impacts to Other Waters | | | | Mitigation Required | | | | |
| | | | | | | | Acre(s) | | Linear Feet | | | | | | |
| Number | Location | Name | Tributary To | Acre(s) | Linear Feet | Feature | Temp. | Perm. | Temp. | Perm. | EO 11990 | USACE | USFWS | Mitigation Location; ratio | Method |
| 1 | Sec. 36, T151N, R66W | Sheyenne River | Red River | >1.0 | >500 | Perennial River | 0.00 | 0.24 | 0.00 | 130.00 | N | N | N | N/A | N/A |
| 1j | Sec. 31, T151N, R65W | N/A | Sheyenne River | 0.07 | 328 | Temporary Ditch | 0.00 | 0.00 | 0.00 | 0.00 | N | N | N | N/A | N/A |
| | | | **TOTALS** | **>1.0** | **>500** | | **0.00** | **0.24** | **0.00** | | | | | | |

[1] A wetland Jurisdictional Determination was issued by the USACE on08/16/2017, NWO-2015-2141-BIS.

[2] 11990 Mitigation requirements - All impacts to natural wetlands (natural/jurisdictional and natural/non-jurisdictional), regardless of size, as well as impacts greater than 0.10 acre to wetlands require mitigation. USACE Mitigation requirements - All jurisdictional impacts greater than 0.10 acre to each resource (cumulative. eg 1a, 1b, 1c, etc.) requires mitigaon. Other Water impacts greater than 300 linear feet requires mitigation.

[3] All artificial/non-jurisdictional, deep water (impacts greater than 6.6 feet), Other Waters less than 300 linear feet (determined by the USACE on a case by case), and temporary impacts do not require mitigation.

### Impact Summary Table

| Permanent Impact Summary | | Temporary Impacts and additional information | |
|---|---|---|---|
| Wetland Type | Total (Acres) | Wetland Type | Total (Acres/LF) |
| Natural/JD | 0.09 | Temporary JD | 0 |
| Natural/Non-JD | 0 | Non-JD Temporary | 0 |
| Artificial/JD | 0 | Permanent JD >0.10 | 1.68 |
| Artificial /Non-JD | 0 | Permanent OW | 0.24 |
| Total | 0.09 | Temporary OW | 0 |

### Mitigation Summary Table

| | Location | Onsite Acre(s) | 11990 Bank Acre(s) | USACE/11990 Bank Acre(s) | USFWS Bank Acre(s) |
|---|---|---|---|---|---|
| USACE Only | DU Credits | N/A | N/A | 1.68 | N/A |
| EO 11990 Only | DU Credits | N/A | N/A | 0.097 | N/A |
| USACE/11990 | N/A | N/A | N/A | N/A | N/A |
| USFWS | N/A | N/A | N/A | N/A | N/A |
| | Total | 0 | 0 | 1.777 | 0 |

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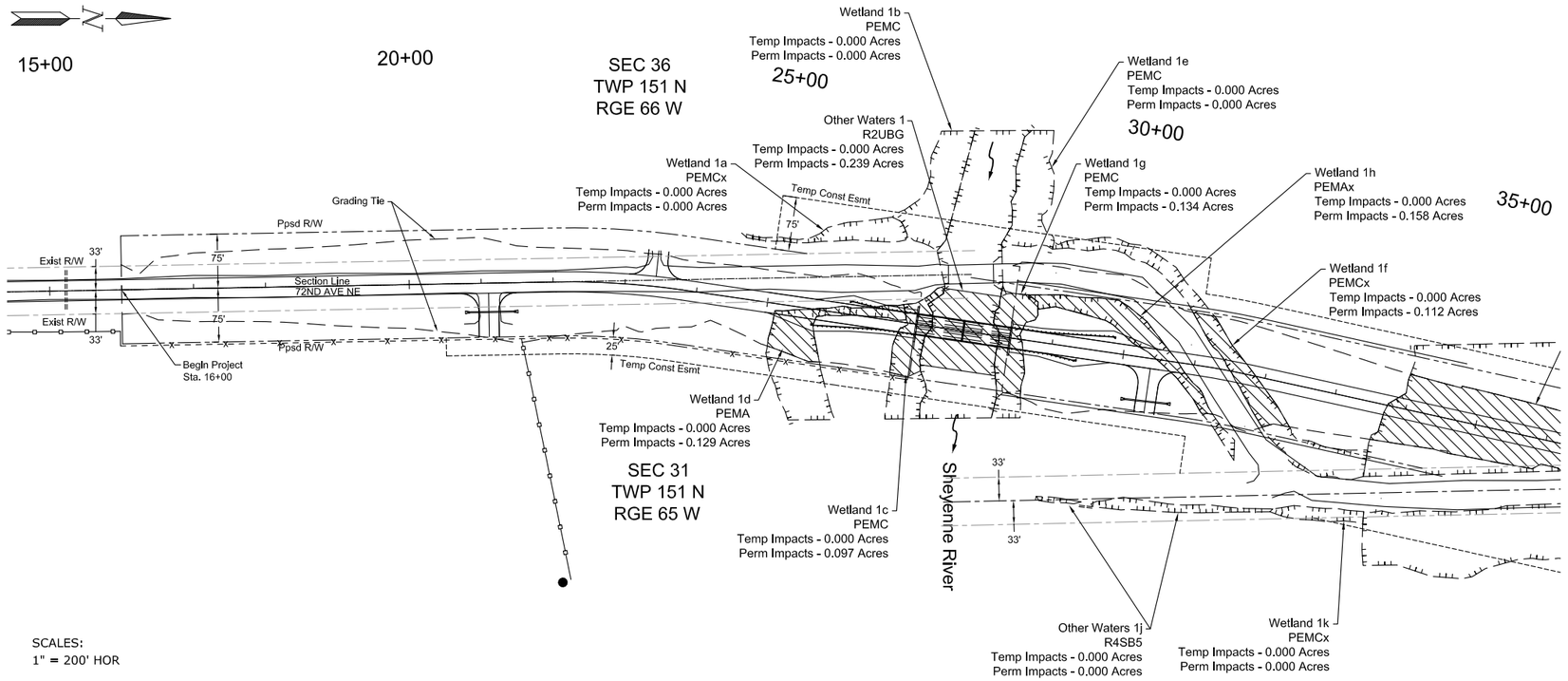
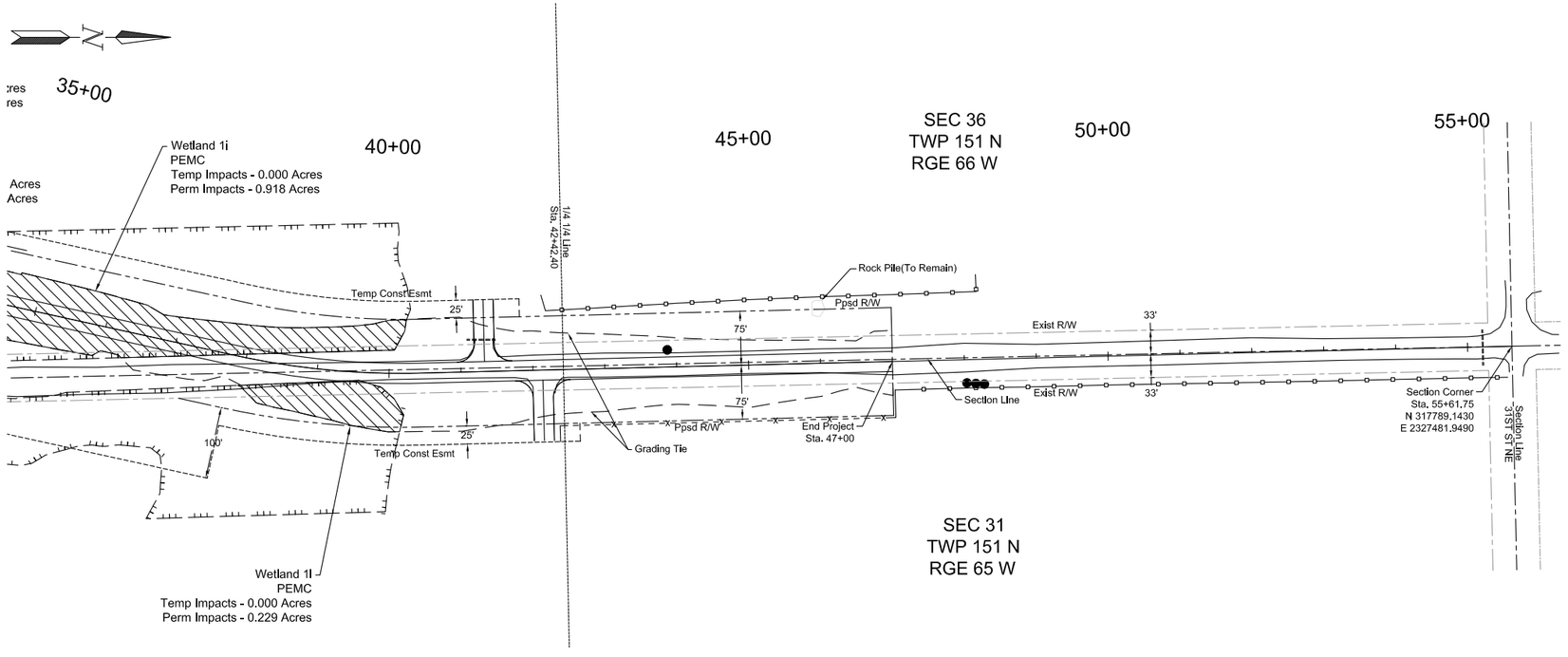
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 75 | 3 |




- Permanent Wetland Impacts

SCALES:
1" = 200' HOR

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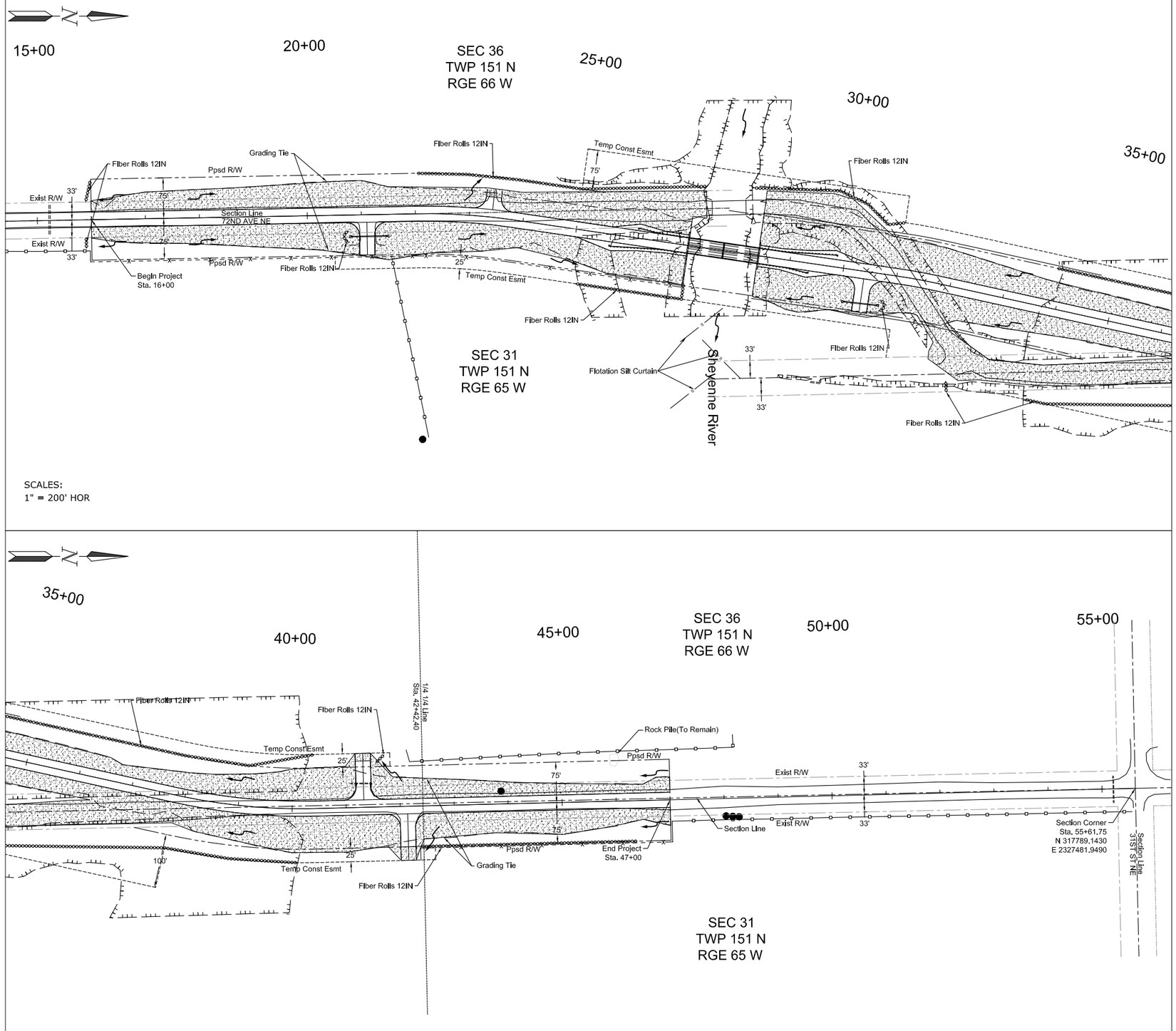
# Wetland Impacts

STA. 15+00 TO 55+00

0 100 200 300
SCALE IN FEET




| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 76 | 1 |

**FLOTATION SILT CURTAIN** — S

| | |
|---|---|
| STA. 27+75 RT | 100 LF |
| STA. 27+75 RT | 100 LF |
| STA. 27+75 RT | 100 LF |

**REMOVE FLOTATION SILT CURTAIN** — S

| | |
|---|---|
| STA. 27+75 RT | 100 LF |
| STA. 27+75 RT | 100 LF |
| STA. 27+75 RT | 100 LF |

**FIBER ROLLS 12IN**

| | |
|---|---|
| STA. 15+90 LT & RT | 60 LF |
| STA. 20+80 RT | 20 LF |
| STA. 22+00 TO 27+40 LT | 540 LF |
| STA. 25+10 TO 27+10 RT | 230 LF |
| STA. 28+00 TO 31+00 LT | 300 LF |
| STA. 30+90 RT | 20 LF |
| STA. 32+30 RT | 20 LF |
| STA. 33+90 TO 40+10 RT | 660 LF |
| STA. 33+90 TO 40+50 LT | 640 LF |
| STA. 41+60 LT | 20 LF |
| STA. 42+40 TO 46+40 RT | 400 LF |

**REMOVE FIBER ROLLS 12IN**

| | |
|---|---|
| STA. 15+90 LT & RT | 60 LF |
| STA. 20+80 RT | 20 LF |
| STA. 22+00 TO 27+40 LT | 540 LF |
| STA. 25+10 TO 27+10 RT | 230 LF |
| STA. 28+00 TO 31+00 LT | 300 LF |
| STA. 30+90 RT | 20 LF |
| STA. 32+30 RT | 20 LF |
| STA. 33+90 TO 40+10 RT | 660 LF |
| STA. 33+90 TO 40+50 LT | 640 LF |
| STA. 41+60 LT | 20 LF |
| STA. 42+40 TO 46+40 RT | 400 LF |

**TEMPORARY COVER CROP**

| | |
|---|---|
| STA. 16+00 TO 47+00 LT | 4.0 ACRE |
| STA. 16+00 TO 47+00 RT | 4.5 ACRE |

**STRAW MULCH**

| | |
|---|---|
| STA. 16+00 TO 47+00 LT | 4.0 ACRE |
| STA. 16+00 TO 47+00 RT | 4.5 ACRE |

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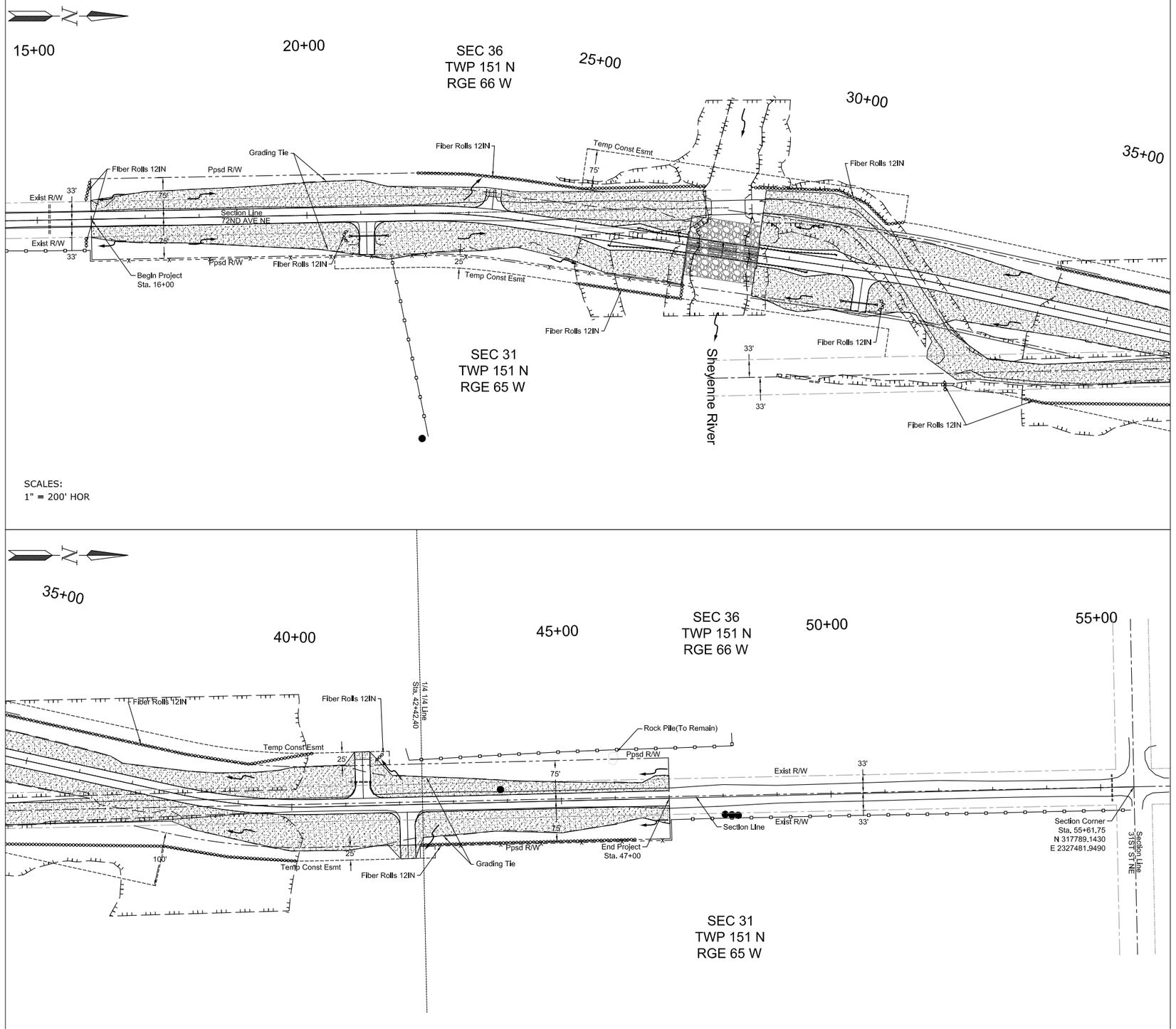
# Temporary Erosion Control

STA. 15+00 TO 55+00

0 100 200 300
SCALE IN FEET




SCALES:
1" = 200' HOR

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 77 | 1 |

## GEOSYNTHETIC MATERIAL - TYPE RR

| | |
|---|---|
| STA. 27+10 TO 28+40 - 110' WIDE | 1,589 SY |

## RIPRAP GRADE II

| | |
|---|---|
| STA. 27+10 TO 28+40 - 110' WIDE | 1,059 CY |

## FIBER ROLLS 12IN

| | |
|---|---|
| STA. 15+90 LT & RT | 60 LF |
| STA. 20+80 RT | 20 LF |
| STA. 22+00 TO 27+40 LT | 540 LF |
| STA. 25+10 TO 27+10 RT | 230 LF |
| STA. 28+00 TO 31+00 LT | 300 LF |
| STA. 30+90 RT | 20 LF |
| STA. 32+30 RT | 20 LF |
| STA. 33+90 TO 40+10 RT | 660 LF |
| STA. 33+90 TO 40+50 LT | 640 LF |
| STA. 41+60 LT | 20 LF |
| STA. 42+40 TO 46+40 RT | 400 LF |

## SEEDING CLASS II

| | |
|---|---|
| STA. 16+00 TO 47+00 LT | 4.0 ACRE |
| STA. 16+00 TO 47+00 RT | 4.5 ACRE |

## STRAW MULCH

| | |
|---|---|
| STA. 16+00 TO 47+00 LT | 4.5 ACRE |
| STA. 16+00 TO 47+00 RT | 5.0 ACRE |

## WETLAND SEED

| | |
|---|---|
| STA. 16+00 TO 47+00 LT | 0.5 ACRE |
| STA. 16+00 TO 47+00 RT | 0.5 ACRE |

*Notes:*

1. *Wetland Seed quantity included for wetland areas disturbed by Contractor temporarily by Contractor's operations. May be eliminated if Engineer determines it is not needed.*

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors

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# Permanent Erosion Control

STA. 15+00 TO 55+00

0 100 200 300
SCALE IN FEET

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 81 | 1 |

## HORIZONTAL ALIGNMENT

| PNT | STATION | NORTHING | EASTING |
|---|---|---|---|
| 4 | 0+00 | 312253.57 | 2327275.15 |
| BOP | 16+00 | 313853.31 | 2327246.20 |
| PI | 22+92.53 | 314545.92 | 2327233.66 |
| PI | 31+40.25 | 315384.95 | 2327356.32 |
| PI | 39+13.43 | 316140.69 | 2324522.62 |
| EOP | 47+00 | 316927.66 | 2327503.20 |
| 3 | 55+61.75 | 317789.14 | 2327481.95 |

## CURVE DATA

| ARC DEFINITION | |
|---|---|
| Curve #1 | |
| PI = 22+92.73 Simple Curve | |
| Delta = 9° 21' 14" (RT) | |
| Da = 5° 17' 33.00" | |
| R = 1,082.58' | |
| T = 88.56' | |
| L = 176.74' | |
| | |
| Curve #2 | |
| PI = 31+40.27 Simple Curve | |
| Delta = 4° 05' 35" (RT) | |
| Da = 5° 17' 33.00" | |
| R = 1,082.58' | |
| T = 38.69' | |
| L = 77.34' | |
| | |
| Curve #3 | |
| PI = 39+14.07 Simple Curve | |
| Delta = 13° 49' 24" (LT) | |
| Da = 5° 17' 33.00" | |
| R = 1,082.58' | |
| T = 131.23' | |
| L = 261.19' | |

## US PUBLIC LAND SURVEY DATA

| DESC. | SEC-TWP-RGE | NORTHING | EASTING |
|---|---|---|---|
| NW SEC COR | 31-151-65 | 317789.14 | 2327481.95 |
| SW SEC COR | 31-151-65 | 312253.57 | 2327275.15 |
| NW SEC COR | 30-151-65 | 323086.84 | 2327377.44 |
| SW SEC COR | 6-151-65 | 306974.26 | 2327385.39 |
| S QTR COR | 36-151-65 | 312223.86 | 2324642.72 |
| SW SEC COR | 36-151-65 | 312196.06 | 2321992.92 |
| S QTR COR | 31-151-65 | 312302.03 | 2329878.24 |
| SE SEC COR | 31-151-65 | 312350.79 | 2332518.43 |

## SURVEY CONTROL POINTS

| PNT | NORTHING | EASTING | ELEV | STATION | OFFSET |
|---|---|---|---|---|---|
| CP1 | 315125.73 | 2327470.77 | 1417.48 | 29+00.34 | 150.75 RT |
| CP2 | 315119.74 | 2327209.23 | 1421.89 | 28+56.58 | 107.18 LT |

NOTES: ALL CP CONTROL POINTS ARE #5 REBAR

Date Survey Completed 11/17/16

☐ Assumed Coordinates

☒ All coordinates on this sheet are ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(CORS), NORTH Zone Use Combination factor (cf) = 0.9998610 to convert Ground Distances to State Plane Distances. NGS OPUS Solution was used to establish state plane coordinates.

All coordinates and measurements on this document derived from the Int. Foot definition.

INITIALIZING BENCH MARK CORS SYSTEM

☒ NAVD-88
☐ NGVD-29

☒ ENGLISH UNITS
☐ METRIC UNITS

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# Survey Coordinate and Curve Data

REVISED: 00/00/0000

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

DRAWN BY: JAB | CHECKED BY: MRR | DATE: 09/01/2017

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 100 | 1 |

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|---|---|---|---|---|---|
| D3-36 | 36"x6" | STREET NAME SIGN (Sign and installation only) | | 6 | |
| **G20-1-60** | **60"x24"** | **ROAD WORK NEXT __ MILES** | **2** | **34** | **68** |
| G20-1b-60 | 60"x24" | WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only) | | 26 | |
| **G20-2-48** | **48"x24"** | **END ROAD WORK** | **2** | **19** | **38** |
| G20-4-36 | 36"x18" | PILOT CAR FOLLOW ME (Mounted to back of pilot car) | | 18 | |
| G20-10-108 | 108"x48" | CONTRACTOR SIGN | | 64 | |
| G20-50a-72 | 72"x36" | ROAD WORK NEXT __ MILES RT & LT ARROWS | | 37 | |
| G20-52a-72 | 72"x24" | ROAD WORK NEXT __ MILES RT or LT ARROW | | 30 | |
| G20-55-96 | 96"x48" | SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT | | 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 ARROW RIGHT or LEFT | | 23 | |
| M5-1-21 | 21"x15" | ARROW AHD AND RT or LT(Mounted on route marker post) | | 7 | |
| M5-2-21 | 21"x15" | ARROW AHD UP & RT or LT (Mounted on route marker post) | | 7 | |
| M6-1-21 | 21"x15" | ARROW RT or LT (Mounted on route marker post) | | 7 | |
| M6-2-21 | 21"x15" | ARROW UP & RT or LT (Mounted on route marker post) | | 7 | |
| M6-3-21 | 21"x15" | ARROW AHD (Mounted on route marker post) | | 7 | |
| R1-1-48 | 48"x48" | STOP | | 32 | |
| R1-1a-18 | 18"x18" | STOP and SLOW PADDLE Back to Back | | 5 | |
| R1-2-60 | 60"x60" | YIELD | | 29 | |
| R2-1-48 | 48"x60" | SPEED LIMIT __ | | 39 | |
| R2-1a-24 | 24"x18" | MINIMUM FEE $80 (Mounted on Speed Limit post) | | 10 | |
| R3-7-48 | 48"x48" | LEFT or RIGHT LANE MUST TURN LEFT or RIGHT | | 35 | |
| R4-1-48 | 48"x60" | DO NOT PASS | | 39 | |
| R4-7-48 | 48"x60" | KEEP RIGHT SYMBOL | | 39 | |
| R5-1-48 | 48"x48" | DO NOT ENTER | | 35 | |
| R6-1-36 | 36"x12" | ONE WAY RIGHT or LEFT | | 13 | |
| R7-1-12 | 12"x18" | NO PARKING | | 11 | |
| R10-6-24 | 24"x36" | STOP HERE ON RED | | 16 | |
| R11-2-48 | 48"x30" | ROAD CLOSED | | 28 | |
| R11-2a-48 | 48"x30" | STREET CLOSED | | 28 | |
| R11-3a-60 | 60"x30" | ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY | | 31 | |
| R11-3c-60 | 60"x30" | STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY | | 31 | |
| R11-4a-60 | 60"x30" | STREET CLOSED TO THRU TRAFFIC | | 31 | |
| W1-3-48 | 48"x48" | RIGHT or LEFT SHARP REVERSE CURVE ARROW | | 35 | |
| W1-4-48 | 48"x48" | RIGHT or LEFT REVERSE CURVE ARROW | | 35 | |
| W1-4b-48 | 48"x48" | DOUBLE RIGHT or LEFT REVERSE CURVE ARROW | | 35 | |
| W1-6-48 | 48"x24" | LARGE ARROW | | 26 | |
| W3-1-48 | 48"x48" | STOP AHEAD SYMBOL | | 35 | |
| W3-3-48 | 48"x48" | SIGNAL AHEAD SYMBOL | | 35 | |
| W3-4-48 | 48"x48" | BE PREPARED TO STOP | | 35 | |
| W3-5-48 | 48"x48" | SPEED REDUCTION AHEAD | | 35 | |
| W4-2-48 | 48"x48" | RIGHT or LEFT LANE TRANSITION SYMBOL | | 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 SYMBOL | | 35 | |
| W8-1-48 | 48"x48" | BUMP | | 35 | |
| W8-3-48 | 48"x48" | PAVEMENT ENDS | | 35 | |
| W8-7-48 | 48"x48" | LOOSE GRAVEL | | 35 | |
| W8-9a-48 | 48"x48" | SHOULDER DROP-OFF | | 35 | |
| W8-11-48 | 48"x48" | UNEVEN LANES | | 35 | |
| W8-12-48 | 48"x48" | NO CENTER STRIPE | | 35 | |
| W8-53-48 | 48"x48" | TRUCKS ENTERING HIGHWAY | | 35 | |
| W8-54-48 | 48"x48" | TRUCKS ENTERING AHEAD or __ FT. | | 35 | |
| W8-55-48 | 48"x48" | TRUCKS CROSSING AHEAD or __ FT. | | 35 | |
| W8-56-48 | 48"x48" | TRUCKS EXITING HIGHWAY | | 35 | |
| W9-3a-48 | 48"x48" | CENTER LANE CLOSED SYMBOL | | 35 | |
| W12-2-48 | 48"x48" | LOW CLEARANCE SYMBOL | | 35 | |
| W13-1-24 | 24"x24" | __ MPH ADVISORY SPEED PLATE (Mounted on warning sign post) | | 11 | |
| W13-4-48 | 48"x60" | RAMP ARROW | | 39 | |
| W14-3-48 | 48"x36" | NO PASSING ZONE | | 23 | |
| W20-1-48 | 48"x48" | ROAD WORK AHEAD or _FT or _ MILE | | 35 | |
| W20-2-48 | 48"x48" | DETOUR AHEAD or __ FT | | 35 | |
| W20-3-48 | 48"x48" | ROAD or STREET CLOSED AHEAD or __ FT. | | 35 | |
| W20-4-48 | 48"x48" | ONE LANE ROAD AHEAD or __ FT. | | 35 | |
| W20-5-48 | 48"x48" | RIGHT or LEFT LANE CLOSED AHEAD or __ FT. | | 35 | |
| W20-7a-48 | 48"x48" | FLAGGING SYMBOL | | 35 | |
| W20-7k-24 | 24"x18" | __ FEET (Mounted on warning sign post) | | 10 | |
| W20-8-48 | 48"x48" | STREET CLOSED | | 35 | |
| W20-51-48 | 48"x48" | EQUIPMENT WORKING | | 35 | |
| W20-52-54 | 54"x12" | NEXT __ MILES (Mounted on warning sign post) | | 12 | |
| W21-1a-48 | 48"x48" | WORKERS SYMBOL | | 35 | |
| W21-2-48 | 48"x48" | FRESH OIL | | 35 | |
| W21-3-48 | 48"x48" | ROAD MACHINERY AHEAD or __ FT | | 35 | |

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|---|---|---|---|---|---|
| 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. | | 35 | |
| W21-6a-48 | 48"x48" | SURVEY CREW AHEAD | | 35 | |
| W21-50-48 | 48"x48" | BRIDGE PAINTING AHEAD or __ FT. | | 35 | |
| W21-51-48 | 48"x48" | MATERIAL ON ROADWAY | | 35 | |
| W22-8-48 | 48"x48" | FRESH OIL LOOSE ROCK | | 35 | |
| | 24"x24" | TAKE TURNS (6" D letters) (Mounted on stop sign post) | | 11 | |

**SPECIAL SIGNS**

| SPEC & CODE | | | |
|---|---|---|---|
| **704-1000** | **TRAFFIC CONTROL SIGNS** | **TOTAL UNITS** | **106** |

| SPEC & CODE | DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|
| 704-0100 | FLAGGING | MHR | |
| 704-1041 | ATTENUATION DEVICE-TYPE B-55 | EACH | |
| 704-1043 | ATTENUATION DEVICE-TYPE B-65 | EACH | |
| 704-1044 | ATTENUATION DEVICE-TYPE B-70 | EACH | |
| 704-1050 | TYPE I BARRICADES | EACH | |
| 704-1051 | TYPE II BARRICADES | EACH | |
| **704-1052** | **TYPE III BARRICADES** | **EACH** | **4** |
| **704-1060** | **DELINEATOR DRUMS** | **EACH** | **50** |
| 704-1065 | TRAFFIC CONES | EACH | |
| 704-1067 | TUBULAR MARKERS | EACH | |
| 704-1070 | DELINEATOR | EACH | |
| 704-1072 | FLEXIBLE DELINEATORS | 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 | |
| 704-1088 | SEQUENCING ARROW PANEL - TYPE C - CROSSOVER | EACH | |
| 704-1095 | TYPE B FLASHERS | 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 | |
| 762-0430 | SHORT TERM 4IN LINE - TYPE NR | LF | |
| 772-2110 | FLASHING BEACON - POST MOUNTED | EACH | |

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

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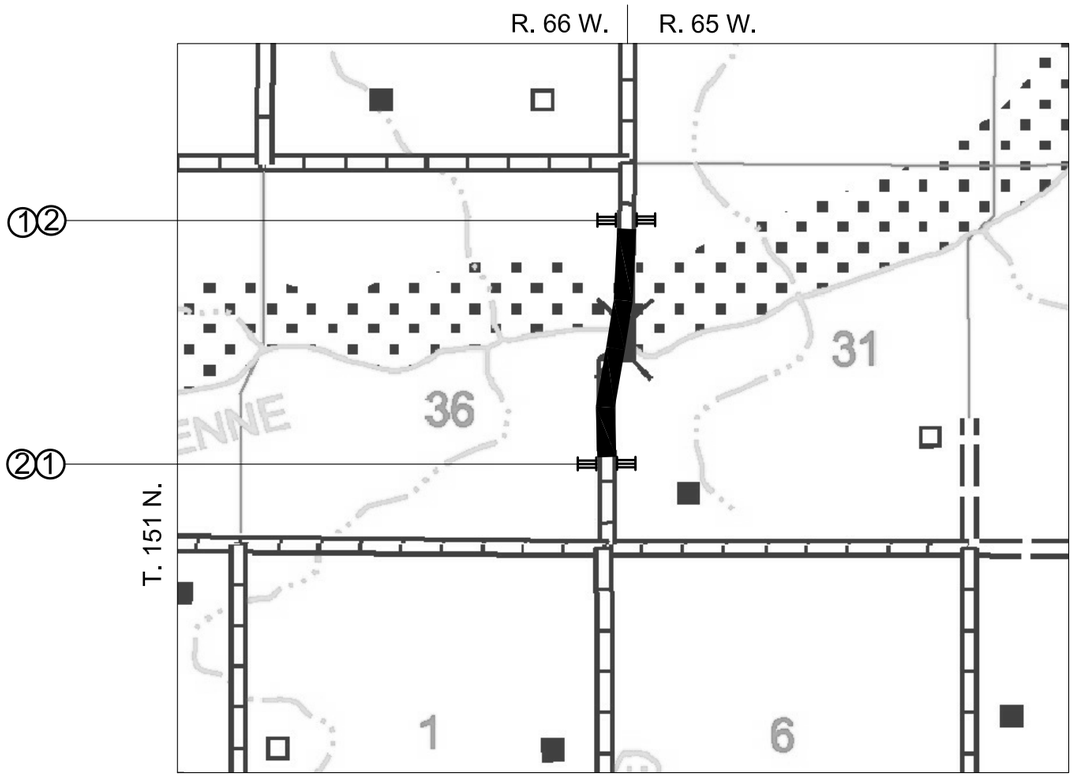
Traffic Control Devices List

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 100 | 2 |




Traffic Control Layout

## LEGEND:

① ROAD WORK NEXT 0.6 MILES

G20-1-60
BARRICADE POST MOUNTING

② END ROAD WORK

G20-2-48
BARRICADE POST MOUNTING

N

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Traffic Control Layout

REVISED: 00/00/0000

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

| DRAWN BY: JAB | CHECKED BY: MRR | DATE: 09/08/2017 |
|---|---|---|



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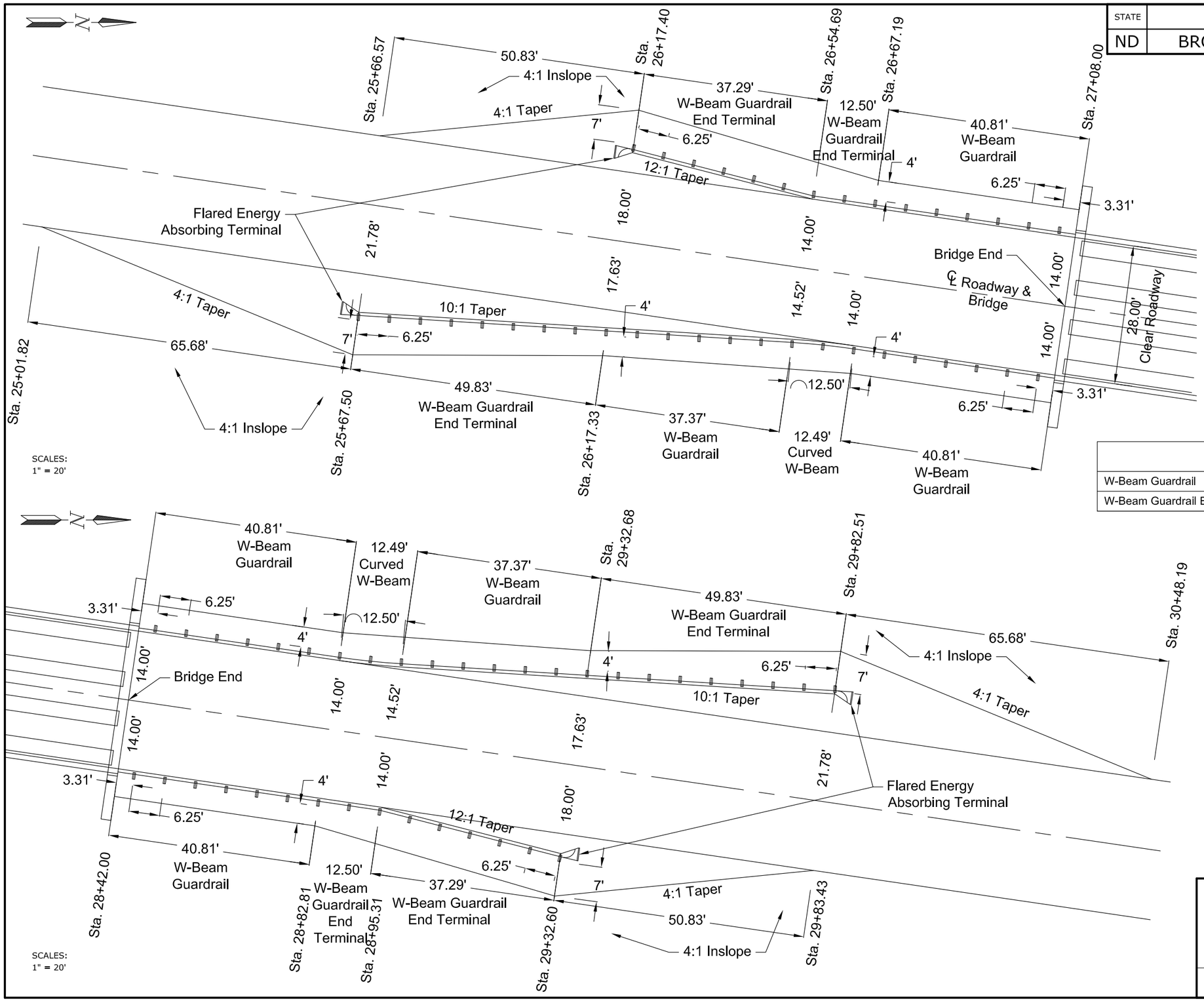
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 130 | 1 |




| QUANTITIES | |
|---|---|
| W-Beam Guardrail | 263.24 LF |
| W-Beam Guardrail End Terminal | 4 EA |

Note:
All dimensions are from centerline to the front face of block.

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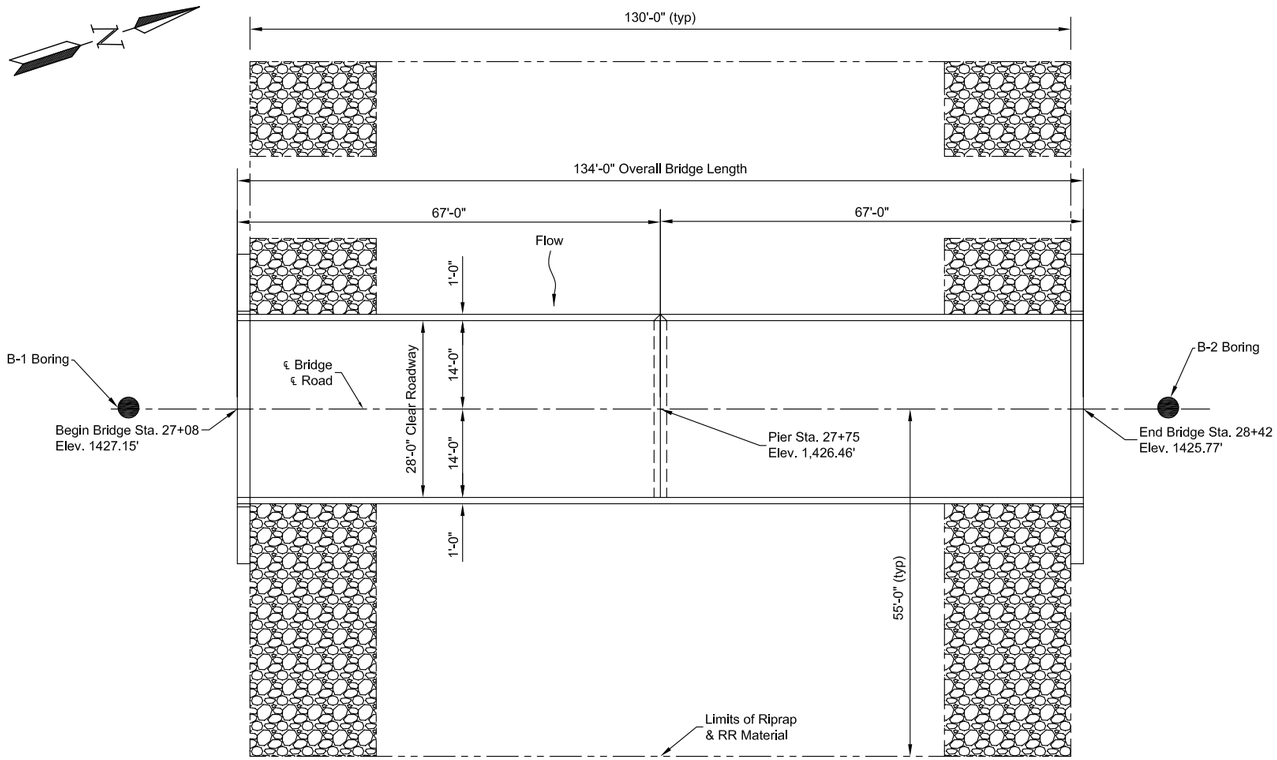
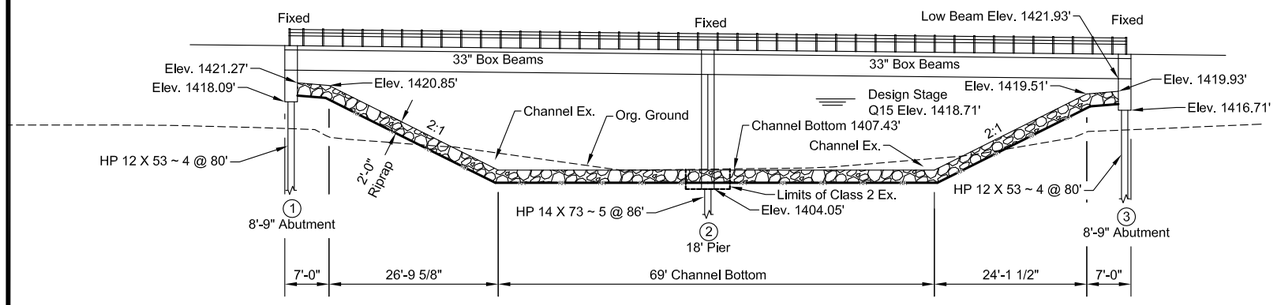
# Guardrail Layout

0 100 200 300
SCALE IN FEET

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 1 |




Plan




Elevation

## Design Strengths:

f 'c = 3,000 psi ~ Class AE-3 Concrete
f 'c = 4,000 psi ~ Class AAE-3 Concrete
f ' c = 6,000 psi ~ Prestessed Girder Concrete
Fy = 60,000 psi ~ Reinforcing Steel
f's = 270 ksi ~ Low Relaxation Prestressing Strands

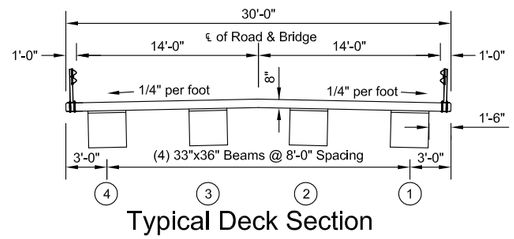
Load & Resistance Factor Design
HL-93 Loading
F.W.S. 15 psf

## STRUCTURAL QUANTITIES ONLY

| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|---|
| 202 | 0105 | REMOVAL OF STRUCTURE | L SUM | 1 |
| 210 | 0111 | CLASS II EXCAVATION | L SUM | 1 |
| 210 | 0127 | CHANNEL EXCAVATION | L SUM | 1 |
| 210 | 0201 | FOUNDATION PREPARATION | EA | 1 |
| 256 | 0200 | RIPRAP GRADE II | CY | 1,059 |
| 602 | 0130 | CLASS AAE-3 CONCRETE | CY | 125.7 |
| 602 | 1130 | CLASS AE-3 CONCRETE | CY | 79.1 |
| 602 | 1250 | PENETRATING WATER REPELLENT TREATMENT | SY | 447.0 |
| 604 | 9620 | PRESTRESSED BOX BEAM-33IN | LF | 520 |
| 612 | 0115 | REINFORCING STEEL-GRADE 60 | LBS | 8,601 |
| 612 | 0116 | REINFORCING STEEL-GRADE 60-EPOXY COATED | LBS | 25,621 |
| 616 | 0364 | STRUCTURAL STEEL M270-GRADE 36 | LBS | 565 |
| 622 | 0014 | STEEL H-PILING POINTS 12 X 53 | EA | 8 |
| 622 | 0016 | STEEL H-PILE TIPS 14 X 73 | EA | 5 |
| 622 | 0040 | STEEL PILING HP 12 X 53 | LF | 640 |
| 622 | 0060 | STEEL PILING HP 14 x 73 | LF | 430 |
| 624 | 0151 | RAILING | LF | 268 |
| 626 | 0120 | PIER COFFERDAM | EA | 1 |
| 709 | 0155 | GEOSYNTHETIC MATERIAL TYPE RR | SY | 1,589 |

## Hydraulic Design Data

| | |
|---|---|
| Drainage Area | 1,540 Sq. Mi. |
| Stream Gradient | 0.00025 ft/ft |
| Design Frequency | 15-Year |
| Design Discharge | 3,700 cfs |
| Design Stage (upstream) | 1,418.71 ft. |
| Design Velocity Under Bridge | 4.51 fps |
| Design Depth of Flow | 11.28 ft. |
| Waterway Provided Below Design Stage | 851 Sq. Ft. |
| Area Below Clearance Elevation | 528 Sq. Ft. |
| 100 Year Frequency Discharge | 8,840 cfs |
| 100 Year Frequency Stage | 1,421.29 ft. |




Typical Deck Section

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## Bridge Layout

REVISED: 00/00/0000

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

| DRAWN BY: MRR | CHECKED BY: JWM | DATE:11/16/2017 |
|---|---|---|



03-137-36.0-01

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 2 |

# NOTES

***100-P01 SCOPE OF WORK:*** This project consists building a 2-span prestressed concrete spread box beam bridge with an overall length of 134'-0" and a clear roadway width of 28'-0".

***100-P02 GENERAL:*** The cost of furnishing and placing preformed expansion joint filter, concrete inserts, rebar couplers, deck drains, connection plates, silicone sealant, and other miscellaneous items shall be included in the price bid for Class AE-3 and AAE-3 Concrete.

***202-P01 REMOVAL OF STRUCTURE:*** The existing structure is a 2-span timber bridge, 63'-0" long with a clear roadway width of 24'-0". The timber substructures are supported on timber piling. The lump sum bid item, "Removal of Structure" shall include all work required to remove the bridge. All material shall become the property of the Contractor.

***210-P01 EXCAVATION:*** The excavation at the piers shall be included in the lump sum bid item, "Class 2 Excavation." The excavation for the riprap and the excavation to shape the channel shall be included in the lump sum bid item, "Channel Excavation." All material from the Class 2 Excavation and Channel Excavation is not approved for other uses shall be removed and disposed.

***210-P02 FOUNDATION PREPARATION:*** Be advised that flowing water is present in the Sheyenne River and the water depth will vary based on the flow. Take these conditions into consideration when bidding this project. No additional compensation or revisions to the completion date will be made due to fluctuations in the water level.

***602-P01 CLASS AE-3 CONCRETE:*** Structural concrete for the abutments and pier shall be Class AE-3.

***602-P02 CLASS AAE-3 CONCRETE:*** Structural concrete for the deck, endwalls and diaphragms shall be Class AAE-3.

***602-P03 CLASS AAE-3 CONCRETE:*** Beams and girders have slight variations in the anticipated camber. To build the deck to the designated thickness will require slight adjustments in deck elevation and/or riser dimensions. These adjustments result in minor concrete quantity discrepancies. The Contractor shall consider this quantity discrepancy when he bids the unit price for Class AAE-3 Concrete. Plan quantity will be paid for Class AAE-3 concrete.

***602-P04 CLASS AAE-3 CONCRETE:*** Deflection of the deck shoring shall be computed using the total dead load plus the weight of the finishing machine. The Contractor shall field verify the girder cambers and maintain the minimum deck thickness and risers as shown on the drawings.

***602-P05 DIAPHRAGMS AND ENDWALLS:*** The pier diaphragm, intermediate diaphragm and endwall concrete shall be placed at the same time as the deck concrete.

***602-P06 PENETRATING WATER REPLELLENT TREATMENT:*** Apply penetrating water repellent to the driving surface of the bridge deck after curing period ends.

***612-P01 REINFORCING STEEL:*** Dimensions for bent bars are given out to out and to tangent intersections unless noted otherwise. Dimensions for bent bars are given out to out and to tangent intersections unless noted otherwise. Bars shall be bent according to ACI Specifications around ACI Standard Pins. An "X" preceding a bar designation indicates an epoxy coated bar.

***616-P01 STRUCTURAL STEEL:*** Structural steel shall be AASHTO M 270, Grade 36T2.

***622-P01 PILING:*** The piles for this structure shall be driven with a steam, air, or diesel hammer with a rated energy and ram weight not less than 81,021 foot-pound-tons, as computed by the formula: W(E-19,404) + 0.835E, where W is the weight of the ram in tons and E is the rated hammer energy. In no case shall the ram weight be less than 4,000 pounds.

The Contractor shall furnish the Engineer with the information concerning the performance of the pile hammer to be used a minimum of one of five (5) working days or seven (7) calendar days prior to use.

The Contractor shall furnish Certification that the pile hammer is developing the energy stated in the pile hammer data sheets or Certification of the reduction in performance due to wear or other factors which will affect the pile hammer performance.

***622-P02 PILE RE-STRIKE:*** Driving shall be suspended on any pile that does not achieve the required bearing capacity within the estimated length. The Contractor shall perform a restrike on each pile that did not previously achieve the required bearing capacity, at least 24 hours after completing the initial drive. A re-strike is considered 10 hammer blows for which an accurate energy and penetration can be observed. If the required bearing is not achieved during the re-strike, the pile shall be driven until the required bearing is achieved. No additional re-strikes will be required. All costs associated with performing the re-strike and subsequent pile driving shall be included in the unit price bid for Steel Piling HP 12X53 and Steel Piling HP 14X73.

***624-P01 RAILINGS:*** Bridge Railings shall be furnished and installed as shown in the details for Type T631 railing. The unit price bid shall be considered full compensation for furnishing all equipment, labor and materials necessary. The pay limits shall be as shown on the drawings. All railing and connection hardware for the W-Beam Guard Rail shall be considered in the price bid for "Railing". It shall be the Contractor's responsibility to verify that the plate/bolt assemblies are installed at the proper location and elevation to assure that the bolts are of proper length and projection.

***626-P01 PIER COFFERDAM:*** The Contractor shall be aware that flowing water is present in the Sheyenne River and the water depth will vary based on the flow. The Contractor is responsible to design, construct, dewater, maintain, and remove the cofferdams. All labor, equipment, and material needed for this work at each pier shall be included in the bid item "Pier Cofferdam", 1 EA.

**SHOP DRAWINGS**: The Contractor shall submit the following shop drawing to the Engineer for review:

1. Prestressed Box Beam-33IN
2. Ice Nose
3. T631 Traffic Rail

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NOTES

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 3 |

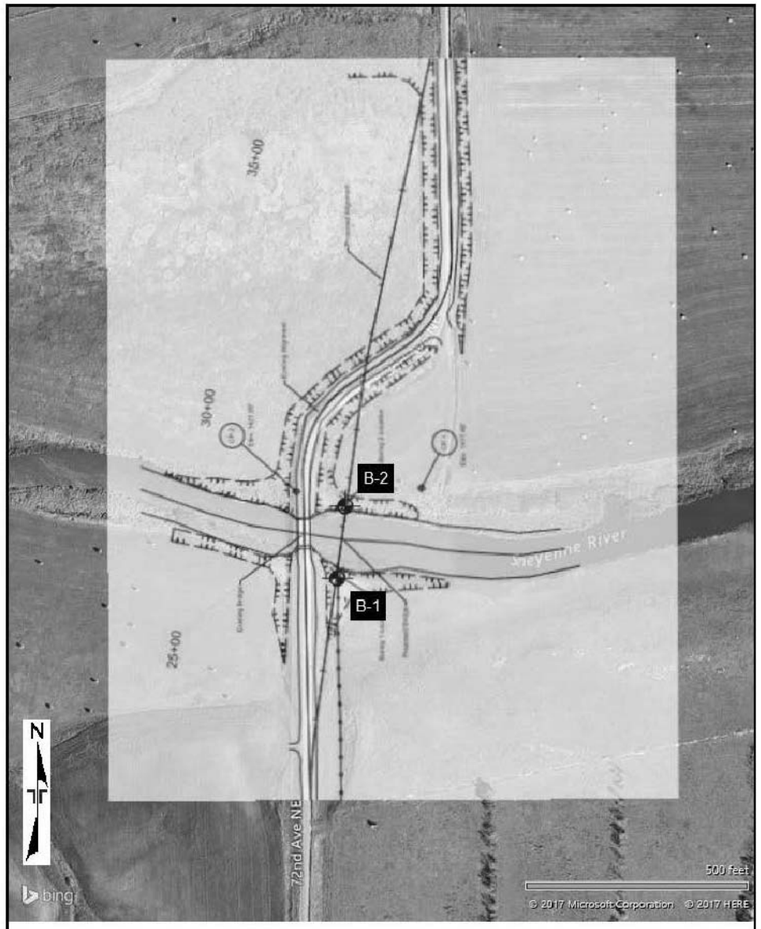


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

| | |
|---|---|
| Project Manager: JJM | Project No. M5175006 |
| Drawn by: JJM | Scale: AS SHOWN |
| Checked by: LMF | File Name: |
| Approved by: LMF | Date: 3/21/2017 |

Terracon
1555 N 42nd Street, Unit B
Grand Forks, ND 58203-0309

EXPLORATION PLAN

Proposed Bridge Replacement
72nd Avenue Northeast
Fort Totten, North Dakota

## BORING LOG NO. B-1

Page 1 of 3

**PROJECT:** Proposed Bridge Replacement

**CLIENT:** Wold Engineering
Bismarck, North Dakota

**SITE:** 72nd Avenue NE
Fort Totten, North Dakota

LOCATION See Exploration Plan
Latitude: 47.8539086521176° Longitude: -99.0398007796033°
Surface Elev.: 1414.3 (Ft.)

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (Ft.) | FIELD TEST RESULTS | LABORATORY TORVANE/HP (psf) | UNCONFINED COMPRESSIVE STRENGTH (psf) | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 1413.5 | | | | | | | | | | | |
| **TOPSOIL - ORGANIC CLAY (OL)**, black, frozen | | | | | | | | | | | | |
| **FAT CLAY (CH)**, dark grayish brown, frozen to 2" then medium stiff | | | | | | | | | | | | |
| 4.0 | 1410.5 | | | | | | | | | | | |
| **FAT CLAY (CH)**, dark grayish brown, soft, few lenses of sand | | | | | 1 | 2-2-3 N=5 | 2500 (HP) | | 33 | | | |
| 6.0 | 1408.5 | | | | | | | | | | | |
| **FAT CLAY (CH)**, dark grayish brown, soft | | 5 | | | 1.2 | 1-1-2 N=3 | 1500 (HP) | | 37 | | | |
| 9.0 | 1405.5 | | | | | | | | | | | |
| **FAT CLAY (CH)**, dark grayish brown, medium stiff | | | | | 1.2 | 2-1-3 N=4 | 1000 (HP) | 3430 | 31 | 92 | 59-23-36 | |
| 12.0 | 1402.5 | 10 | | | | | | | | | | |
| **CLAYEY SAND (SC)**, dark gray, loose | | | | | 1 | 3-2-4 N=6 | 2500 (HP) | 3720 | 28 | 93 | | 90 |
| | | | | | 1.3 | 2-2-5 N=7 | | | 22 | | | |
| | | 15 | ▽ | | 0.8 | 2-3-5 N=8 | 1500 (HP) | | 31 | | | 42 |
| 19.0 | 1395.5 | | | | | | | | | | | |
| **SILTY SAND (SM)**, fine grained, dark gray, loose | | 20 | | | 1.2 | 3-3-4 N=7 | | | 25 | | | |
| 24.0 | 1390.5 | | | | | | | | | | | |
| **FAT CLAY (CH)**, dark grayish brown, soft, lenses of silt | | 25 | | | 1 | 1-1-1 N=2 | | | 38 | | | |
| 29.0 | 1385.5 | | | | | | | | | | | |
| **POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, dark gray, loose | | 30 | | | 1.5 | 4-4-5 N=9 | | | | | | |
| 34.0 | 1380.5 | | | | | | | | | | | |
| **POORLY GRADED SAND (SP)**, medium grained, grayish brown, medium dense | | 35 | | | 1.5 | 5-5-5 N=10 | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual. Hammer Type: Automatic

Advancement Method:
3 1/4" Hollow Stem Auger to 49.5' then Mud Rotary Techniques to 79.5'

Abandonment Method:
Borings backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
7' - Thin wall tube taken at adjacent borehole
9.5' - Thin wall tube taken at adjacent borehole

**WATER LEVEL OBSERVATIONS**
▽ *While drilling*
*Water level influenced by drilling fluid*

Terracon
1555 N 42nd St Unit B
Grand Forks, ND

Boring Started: 2/28/2017 | Boring Completed: 3/6/2017
Drill Rig: D-90 | Driller: CS
Project No.: M5175006

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## Soil Borings

REVISED: 00/00/0000

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

| DRAWN BY: MRR | CHECKED BY: JWM | DATE: 09/08/2017 |
|---|---|---|



03-137-36.0-03

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 4 |

## BORING LOG NO. B-1

Page 2 of 3

**PROJECT:** Proposed Bridge Replacement

**CLIENT:** Wold Engineering
Bismarck, North Dakota

**SITE:** 72nd Avenue NE
Fort Totten, North Dakota

LOCATION See Exploration Plan
Latitude: 47.8539086521176° Longitude: -99.0398007796033°
Surface Elev.: 1414.3 (Ft.)

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (Ft.) | FIELD TEST RESULTS | LABORATORY TORVANE/HP (psf) | UNCONFINED COMPRESSIVE STRENGTH (psf) | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44.0 | 1370.5 | 40 | | | 1.2 | 6-6-10 N=16 | | | | | | |
| 49.0 | 1365.5 | 45 | | | 1.5 | 4-3-4 N=7 | | | | | | |
| 54.0 | 1360.5 | 50 | | | 1.3 | 3-4-4 N=8 | | | 1 | | | 9 |
| 59.0 | 1355.5 | 55 | | | 1.2 | 6-6-7 N=13 | | | | | | |
| 64.0 | 1350.5 | 60 | | | 1.3 | 14-14-15 N=29 | | | | | | |
| | | 65 | | | 0.4 | 100/5" | | | | | | |
| | | 70 | | | 0.3 | 100/4" | | | | | | |

**POORLY GRADED SAND (SP)**, medium grained, grayish brown, medium dense *(continued)*

**POORLY GRADED SAND (SP)**, fine grained, grayish brown, loose

**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, dark grayish brown, loose

**SILT WITH SAND (ML)**, grayish brown, medium dense

**POORLY GRADED SAND (SP)**, trace gravel, coarse to medium grained, dark gray, medium dense

**WEATHERED SHALE**, very dark gray, highly weathered, weak rock

Stratification lines are approximate. In-situ, the transition may be gradual. Hammer Type: Automatic

Advancement Method:
3 1/4" Hollow Stem Auger to 49.5' then Mud Rotary Techniques to 79.5'

Abandonment Method:
Borings backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**
While drilling
Water level influenced by drilling fluid

Terracon
1555 N 42nd St Unit B
Grand Forks, ND

Boring Started: 2/28/2017 Boring Completed: 3/6/2017
Drill Rig: D-90 Driller: CS
Project No.: M5175006

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL M5175006.GPJ TERRACON_DATATEMPLATE.GDT 5/3/17

## BORING LOG NO. B-1

Page 3 of 3

**PROJECT:** Proposed Bridge Replacement

**CLIENT:** Wold Engineering
Bismarck, North Dakota

**SITE:** 72nd Avenue NE
Fort Totten, North Dakota

LOCATION See Exploration Plan
Latitude: 47.8539086521176° Longitude: -99.0398007796033°
Surface Elev.: 1414.3 (Ft.)

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (Ft.) | FIELD TEST RESULTS | LABORATORY TORVANE/HP (psf) | UNCONFINED COMPRESSIVE STRENGTH (psf) | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 79.7 | 1334.5 | 75 | | | 0.5 | 100/6" | | | | | | |
| | | | | | 0.2 | 100/2" | | | | | | |

**WEATHERED SHALE**, very dark gray, highly weathered, weak rock *(continued)*

***Boring Terminated at 79.7 Feet***

Stratification lines are approximate. In-situ, the transition may be gradual. Hammer Type: Automatic

Advancement Method:
3 1/4" Hollow Stem Auger to 49.5' then Mud Rotary Techniques to 79.5'

Abandonment Method:
Borings backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**
While drilling
Water level influenced by drilling fluid

Terracon
1555 N 42nd St Unit B
Grand Forks, ND

Boring Started: 2/28/2017 Boring Completed: 3/6/2017
Drill Rig: D-90 Driller: CS
Project No.: M5175006

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL M5175006.GPJ TERRACON_DATATEMPLATE.GDT 5/3/17

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Soil Borings

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Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

DRAWN BY: MRR | CHECKED BY: JWM | DATE: 09/08/2017



03-137-36.0-04

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 5 |

## BORING LOG NO. B-2

Page 1 of 3

**PROJECT:** Proposed Bridge Replacement

**CLIENT:** Wold Engineering
Bismarck, North Dakota

**SITE:** 72nd Avenue NE
Fort Totten, North Dakota

LOCATION See Exploration Plan
Latitude: 47.85451° Longitude: -99.03974°
Surface Elev.: 1414.3 (Ft.)

| DEPTH | ELEVATION (Ft.) | Description | DEPTH (ft.) | FIELD TEST RESULTS | LABORATORY TORVANE/HP (psf) | UNCONFINED COMPRESSIVE STRENGTH (psf) | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | 1413 | **TOPSOIL - ORGANIC CLAY (OL)**, black, frozen | | | | | | | | |
| | | **FAT CLAY (CH)**, dark grayish brown, frozen to 2' then medium stiff | | 3-4-3 N=7 | | | 34 | | | |
| | | | 5 | 2-3-4 N=7 | 2000 (HP) | | 32 | | | |
| | | | | 2-3-3 N=6 | 2500 (HP) | | 31 | | | |
| | | | 10 | 2-2-2 N=4 | 3500 (HP) | | 32 | | | |
| 12.0 | 1402.5 | | | | | | | | | |
| | | **CLAYEY SAND (SC)**, very dark gray, very loose to loose to very loose | | 2-1-2 N=3 | 3500 (HP) | | 24 | | | |
| | | | 15 | 1-2-2 N=4 | | | 24 | | | |
| | | | 20 | 1-1-1 N=2 | | | | | | |
| 24.0 | 1390.5 | | | | | | | | | |
| | | **SILTY SAND (SM)**, fine grained, very dark gray to grayish brown, very loose to medium dense | 25 | 1-1-2 N=3 | | | 1 | | | 40 |
| | | | 30 | 5-7-10 N=17 | | | | | | |
| | | | 35 | 6-7-11 N=18 | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3 1/4" Hollow Stem Auger to 4.5' then Mud Rotary Techniques to 79.5'

Abandonment Method:
Borings backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**
*Water level influenced by drilling fluid*

Terracon
1555 N 42nd St Unit B
Grand Forks, ND

Boring Started: 2/28/2017 | Boring Completed: 3/6/2017
Drill Rig: D-90 | Driller: CS
Project No.: M5175006

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## BORING LOG NO. B-2

Page 2 of 3

**PROJECT:** Proposed Bridge Replacement

**CLIENT:** Wold Engineering
Bismarck, North Dakota

**SITE:** 72nd Avenue NE
Fort Totten, North Dakota

LOCATION See Exploration Plan
Latitude: 47.85451° Longitude: -99.03974°
Surface Elev.: 1414.3 (Ft.)

| DEPTH | ELEVATION (Ft.) | Description | DEPTH (ft.) | FIELD TEST RESULTS | LABORATORY TORVANE/HP (psf) | UNCONFINED COMPRESSIVE STRENGTH (psf) | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|---|
| 39.0 | 1375.5 | **SILTY SAND (SM)**, fine grained, very dark gray to grayish brown, very loose to medium dense *(continued)* | | | | | | | | |
| | | **POORLY GRADED SAND WITH GRAVEL (SP)**, medium grained, grayish brown, dense | 40 | 12-18-14 N=32 | | | | | | |
| 44.0 | 1370.5 | | | | | | | | | |
| | | **POORLY GRADED GRAVEL WITH SAND (GP)**, coarse grained, gray, dense | 45 | 20-22-18 N=40 | | | 0 | | | 3 |
| 49.0 | 1365.5 | | | | | | | | | |
| | | **SILTY SAND (SM)**, fine grained, dark gray, medium dense | 50 | 8-7-7 N=14 | | | | | | |
| 54.0 | 1360.5 | | | | | | | | | |
| | | **SILT WITH SAND (ML)**, grayish brown, medium dense | 55 | 8-8-7 N=15 | | | | | | |
| 59.0 | 1355.5 | | | | | | | | | |
| | | **POORLY GRADED SAND (SP)**, medium grained, gray, very dense, shale fragments | 60 | 16-21-80 N=101 | | | | | | |
| 64.0 | 1350.5 | | | | | | | | | |
| | | **WEATHERED SHALE**, very dark gray, highly weathered, weak rock | 65 | 100/2" | | | | | | |
| | | | 70 | 100/6" | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3 1/4" Hollow Stem Auger to 4.5' then Mud Rotary Techniques to 79.5'

Abandonment Method:
Borings backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**
*Water level influenced by drilling fluid*

Terracon
1555 N 42nd St Unit B
Grand Forks, ND

Boring Started: 2/28/2017 | Boring Completed: 3/6/2017
Drill Rig: D-90 | Driller: CS
Project No.: M5175006

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Wold Engineering, P.C.
Consulting Engineers & Land Surveyors
BOTTINEAU ~ BISMARCK ~ MINOT

DRAWN BY: MRR | CHECKED BY: JWM | DATE: 08/25/2017

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 6 |

## BORING LOG NO. B-2

Page 3 of 3

**PROJECT:** Proposed Bridge Replacement

**CLIENT:** Wold Engineering
Bismarck, North Dakota

**SITE:** 72nd Avenue NE
Fort Totten, North Dakota

LOCATION See Exploration Plan

Latitude: 47.85451° Longitude: -99.03974°

Surface Elev.: 1414.3 (Ft.)

| DEPTH | ELEVATION (Ft.) | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (Ft.) | FIELD TEST RESULTS | LABORATORY TORVANE/HP (psf) | UNCONFINED COMPRESSIVE STRENGTH (psf) | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 75 | | | | 100/4" | | | | | | |
| 80.0 | 1334.5 | 80 | | | | 100/6" | | | | | | |

**WEATHERED SHALE**, very dark gray, highly weathered, weak rock *(continued)*

***Boring Terminated at 80 Feet***

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3 1/4" Hollow Stem Auger to 4.5' then Mud Rotary Techniques to 79.5'

Abandonment Method:
Borings backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Water level influenced by drilling fluid*

Terracon
1555 N 42nd St Unit B
Grand Forks, ND

Boring Started: 2/28/2017 | Boring Completed: 3/6/2017

Drill Rig: D-90 | Driller: CS

Project No.: M5175006

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL M5175006.GPJ TERRACON_DATATEMPLATE.GDT 5/3/17

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Soil Borings

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Wold Engineering, P.C.
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BOTTINEAU ~ BISMARCK ~ MINOT

DRAWN BY: MRR | CHECKED BY: JWM | DATE: 09/08/2017

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 7 |

| Screed Elev. at ℄ D.L. Def. Inclu. | Dead Load Deflection Only | * ℄ Girder 1 | ℄ Girder 2 | ℄ Girder 3 | ℄ Girder 4 |
|---|---|---|---|---|---|
| 1,427.15 | 0.000' | 1,426.90 | 1,427.07 | 1,427.07 | 1,426.90 |
| 1,427.13 | 0.000' | 1,426.88 | 1,427.05 | 1,427.05 | 1,426.88 |
| 1,427.09 | 0.027' | 1,426.84 | 1,427.01 | 1,427.01 | 1,426.84 |
| 1,427.05 | 0.051' | 1,426.80 | 1,426.97 | 1,426.97 | 1,426.80 |
| 1,427.00 | 0.069' | 1,426.75 | 1,426.92 | 1,426.92 | 1,426.75 |
| 1,426.95 | 0.081' | 1,426.70 | 1,426.86 | 1,426.86 | 1,426.70 |
| 1,426.89 | 0.085' | 1,426.64 | 1,426.80 | 1,426.80 | 1,426.64 |
| 1,426.81 | 0.081' | 1,426.56 | 1,426.73 | 1,426.73 | 1,426.56 |
| 1,426.74 | 0.069' | 1,426.49 | 1,426.65 | 1,426.65 | 1,426.49 |
| 1,426.65 | 0.051' | 1,426.40 | 1,426.57 | 1,426.57 | 1,426.40 |
| 1,426.56 | 0.027' | 1,426.31 | 1,426.48 | 1,426.48 | 1,426.31 |
| 1,426.47 | 0.000' | 1,426.22 | 1,426.39 | 1,426.39 | 1,426.22 |
| 1,426.46 | 0.000' | 1,426.21 | 1,426.38 | 1,426.38 | 1,426.21 |
| 1,426.45 | 0.000' | 1,426.20 | 1,426.37 | 1,426.37 | 1,426.20 |
| 1,426.42 | 0.027' | 1,426.17 | 1,426.33 | 1,426.33 | 1,426.17 |
| 1,426.37 | 0.051' | 1,426.12 | 1,426.29 | 1,426.29 | 1,426.12 |
| 1,426.33 | 0.069' | 1,426.08 | 1,426.24 | 1,426.24 | 1,426.08 |
| 1,426.27 | 0.081' | 1,426.02 | 1,426.19 | 1,426.19 | 1,426.02 |
| 1,426.21 | 0.085' | 1,425.96 | 1,426.13 | 1,426.13 | 1,425.96 |
| 1,426.14 | 0.081' | 1,425.89 | 1,426.05 | 1,426.05 | 1,425.89 |
| 1,426.06 | 0.069' | 1,425.81 | 1,425.98 | 1,425.98 | 1,425.81 |
| 1,425.97 | 0.051' | 1,425.72 | 1,425.89 | 1,425.89 | 1,425.72 |
| 1,425.88 | 0.027' | 1,425.63 | 1,425.80 | 1,425.80 | 1,425.63 |
| 1,425.79 | 0.000' | 1,425.54 | 1,425.71 | 1,425.71 | 1,425.54 |
| 1,425.77 | 0.000' | 1,425.52 | 1,425.69 | 1,425.69 | 1,425.52 |




# SCREED ELEVATIONS

Elev. are to Top of Finished Roadway

* Girder No. 1 is Located 12'-0" Rt.

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## Screed Elevations

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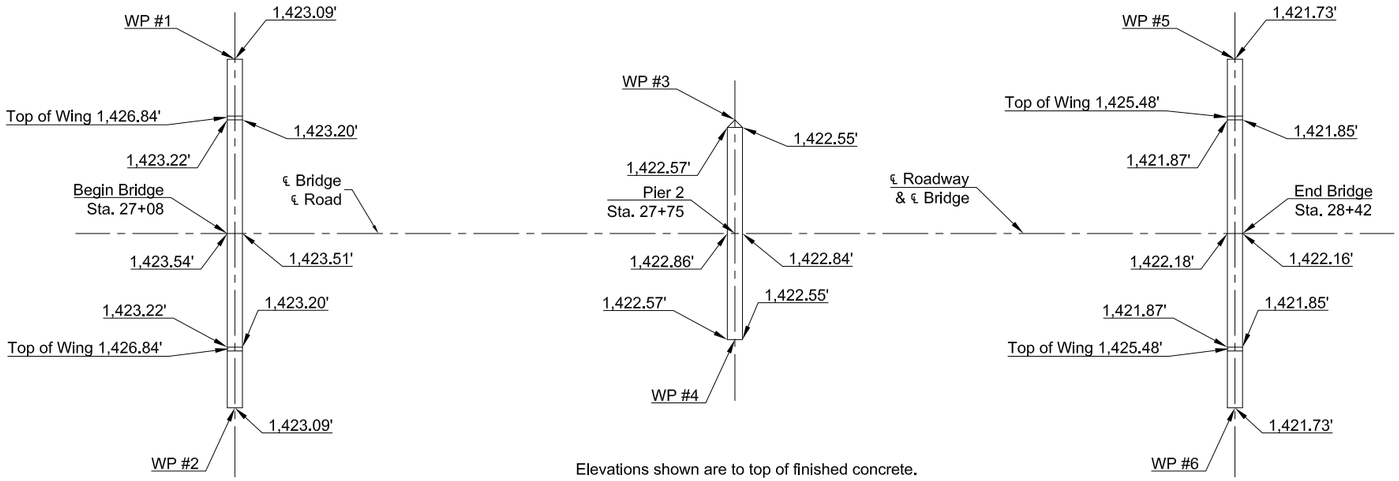
| DRAWN BY: JAB | CHECKED BY: MRR | DATE: 09/08/2017 |
|---|---|---|



3-137-36.0-07

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 8 |




Elevations shown are to top of finished concrete.

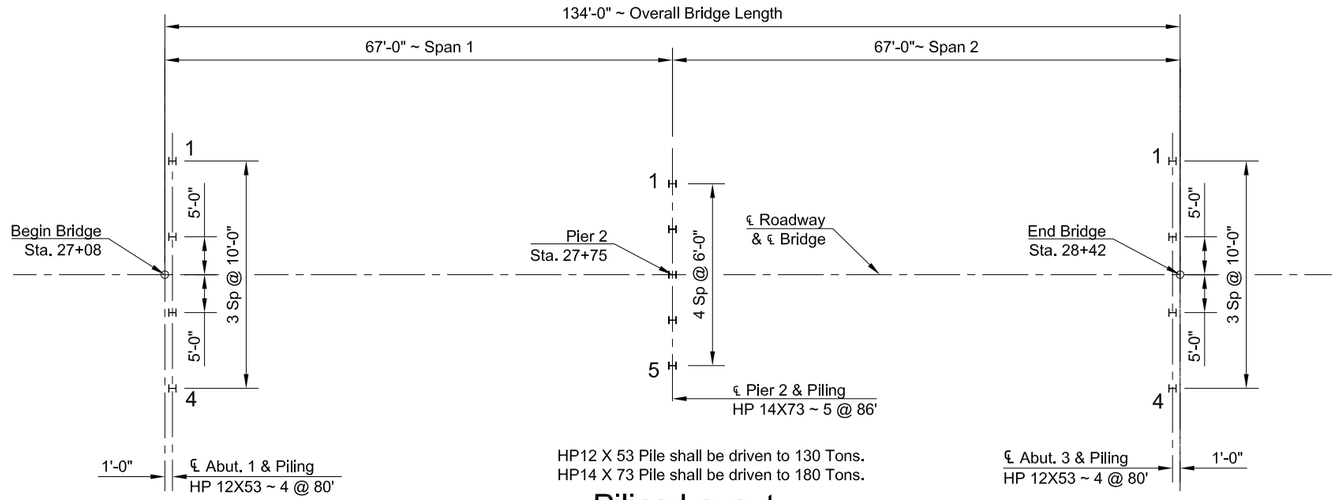
## Bearing Elevations

**Pile Coordinates**

| Pile | | Station | Offset | Northing | Easting |
|---|---|---|---|---|---|
| Abut 1 | 1 | 27+09.00 | -15 | 314,960.376 | 2,327,279.089 |
| | 2 | 27+09.00 | -5 | 314,958.929 | 2,327,288.984 |
| | 3 | 27+09.00 | 5 | 314,957.483 | 2,327,298.879 |
| | 4 | 27+09.00 | 15 | 314,956.036 | 2,327,308.773 |
| Pier 2 | 1 | 27+75.00 | -12 | 315,025.248 | 2,327,291.604 |
| | 2 | 27+75.00 | -6 | 315,024.380 | 2,327,297.541 |
| | 3 | 27+75.00 | 0 | 315,023.512 | 2,327,303.478 |
| | 4 | 27+75.00 | 6 | 315,022.644 | 2,327,309.415 |
| | 5 | 27+75.00 | 12 | 315,021.776 | 2,327,315.352 |
| Abut 3 | 1 | 28+41.00 | -15 | 315,090.988 | 2,327,298.183 |
| | 2 | 28+41.00 | -5 | 315,089.541 | 2,327,308.078 |
| | 3 | 28+41.00 | 5 | 315,088.095 | 2,327,317.972 |
| | 4 | 28+41.00 | 15 | 315,086.648 | 2,327,327.867 |

**Bridge Coordinates & Working Points**

| Working Point # | Station | Offset | Northing | Easting |
|---|---|---|---|---|
| Begin Bridge | 27+08.00 | 0.000 | 314,957.217 | 2,327,293.786 |
| End Bridge | 28+42.00 | 0.000 | 315,089.807 | 2,327,313.170 |
| 1 | 27+09.00 | -23.000 | 314,961.533 | 2,327,271.173 |
| 2 | 27+09.00 | 23.000 | 314,954.879 | 2,327,316.689 |
| 3 | 27+75.00 | -14.000 | 315,025.537 | 2,327,289.625 |
| 4 | 27+75.00 | 14.000 | 315,021.487 | 2,327,317.331 |
| 5 | 28+41.00 | -23.000 | 315,092.145 | 2,327,290.267 |
| 6 | 28+41.00 | 23.000 | 315,085.491 | 2,327,335.783 |




HP12 X 53 Pile shall be driven to 130 Tons.
HP14 X 73 Pile shall be driven to 180 Tons.

## Piling Layout

**Note:**
For double acting or single acting diesel hamers, the safe bearing value of piles shall be determined by the following formula:

$$P = \frac{4.5E}{S+0.2} \times \frac{W + 0.2M}{W + M}$$

Where:
P = Safe bearing value, in pounds.
W = Weight of striking parts (ram), in pounds.
M = Weight of parts being driven, in pounds, includes pile weight, anvil (if any), driving cap, etc.
E = Energy per blow, in foot-pounds.
S = Average penetration of pile in inches per blow for last ten blows.

For single acting hammers, calculate E by multiplying observed stroke (ft) and W (lbs).

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# Bearing Elevation & Piling Layout

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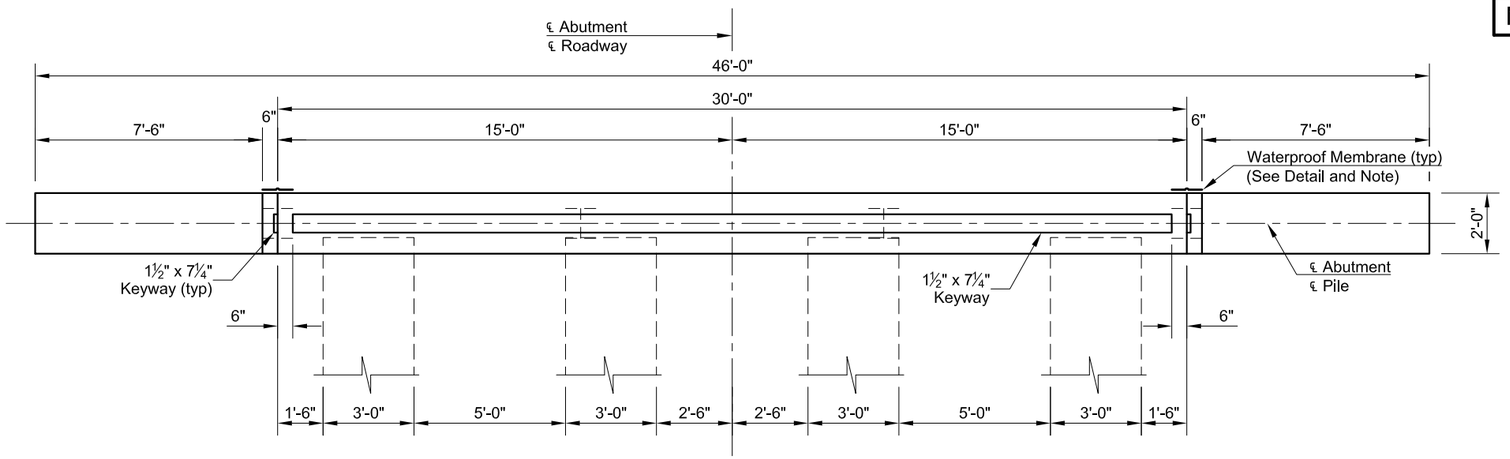
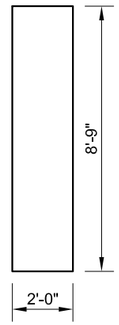
|---|---|---|

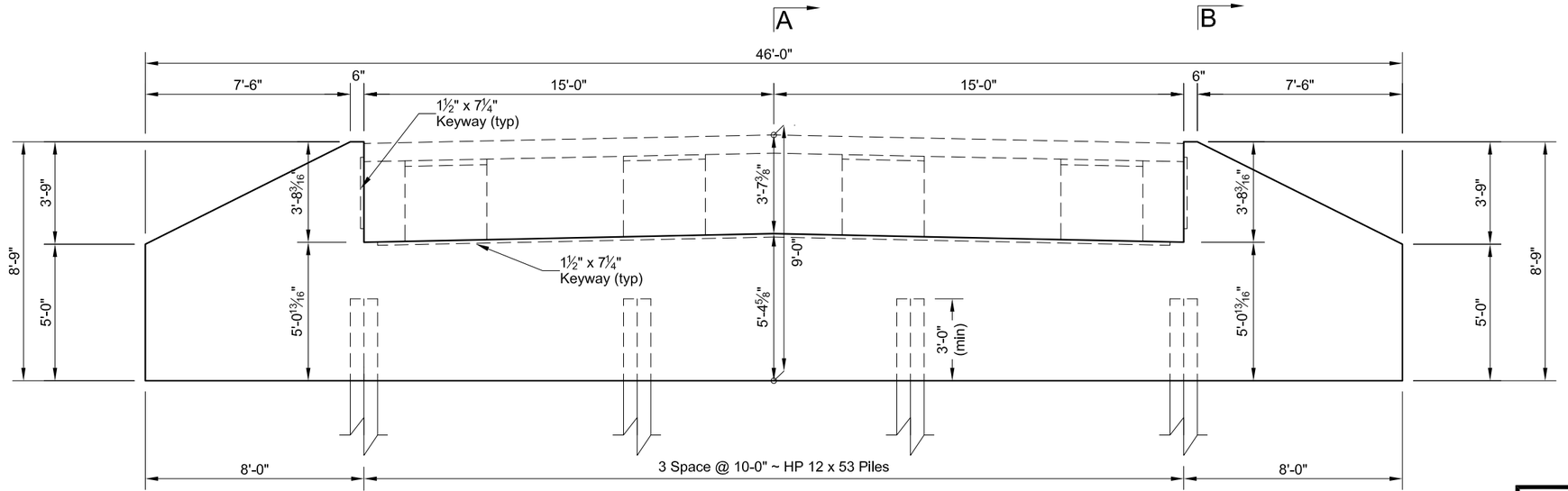
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 9 |



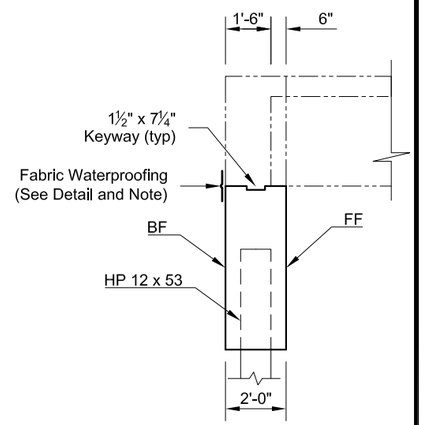

Plan



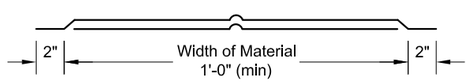

B-B




Elevation




A-A




Waterproof membrane shall meet Section 602 of the NDDOT Specidications.
All material and work shall be included in the pay item "Class AE-3 Concrete."

Waterproof Membrane Detail

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# Abutment Details
(Showing Dimension)

QUANTITIES

See Dwg. 3-137-36.0-10 .

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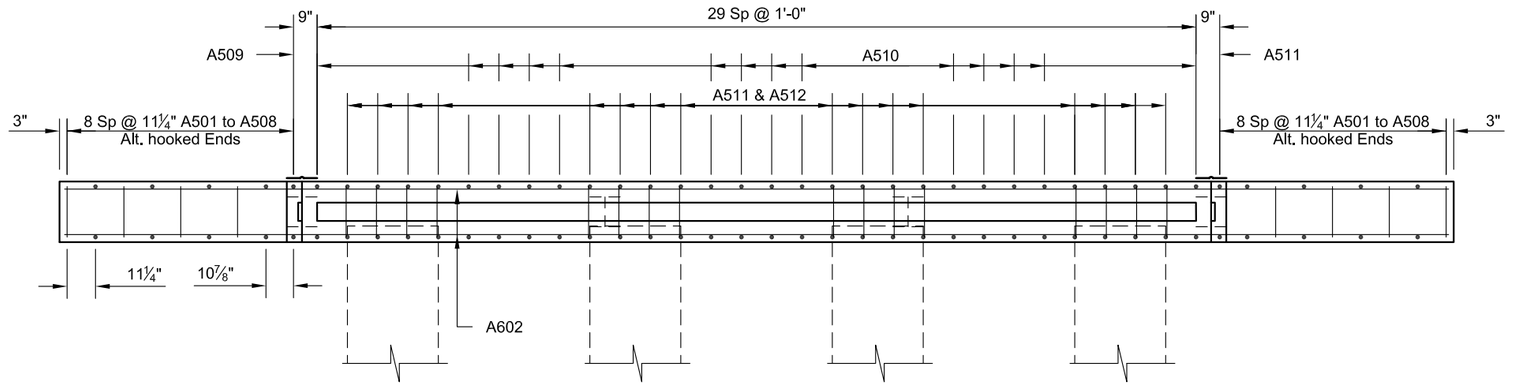
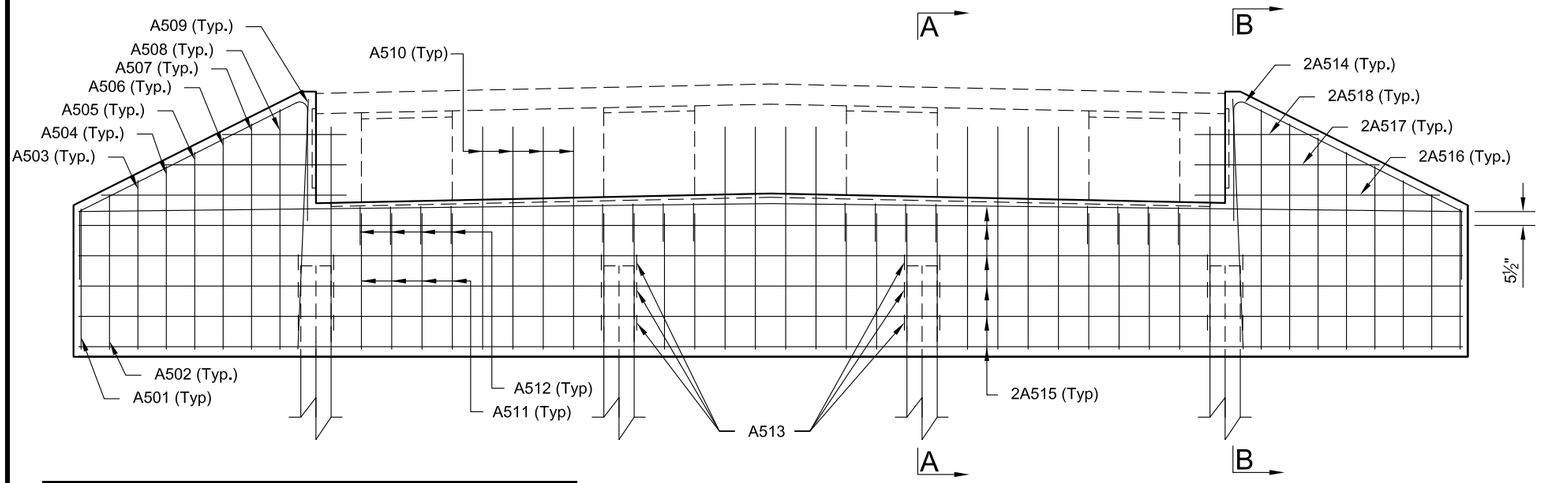
3-137-36.0-09

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 10 |




Plan

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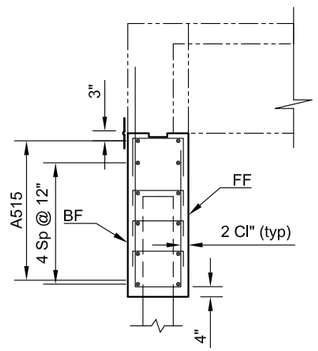
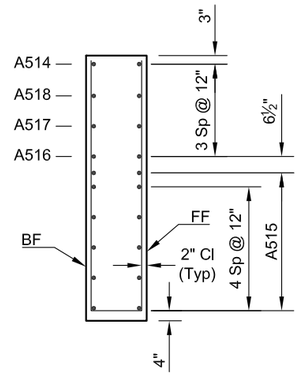


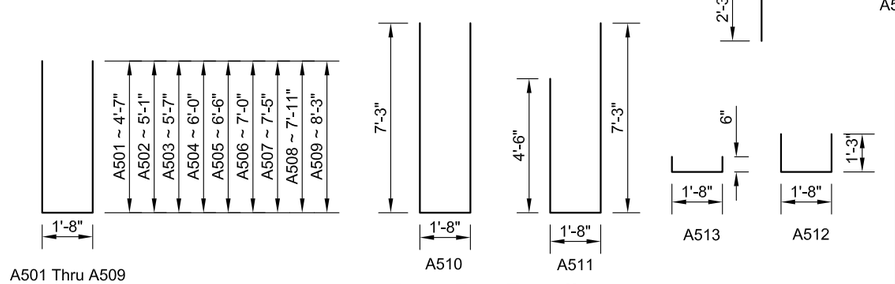

A-A



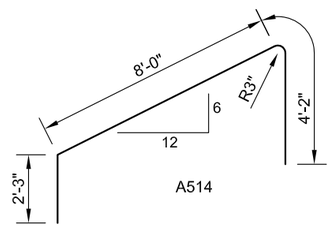

B-B

Elevation

| BAR LIST (One Abutment Only) | | | | | | |
|---|---|---|---|---|---|---|
| MARK | NO. | SIZE | LENGTH | SHAPE | TOTAL WEIGHT | LOCATION |
| A501 | 2 | 5 | 10'-10" | BENT | 23 lbs. | Vertical Abutment Wing |
| A502 | 2 | 5 | 11'-10" | BENT | 25 lbs. | Vertical Abutment Wing |
| A503 | 2 | 5 | 12'-10" | BENT | 27 lbs. | Vertical Abutment Wing |
| A504 | 2 | 5 | 13'-8" | BENT | 29 lbs. | Vertical Abutment Wing |
| A505 | 2 | 5 | 14'-8" | BENT | 31 lbs. | Vertical Abutment Wing |
| A506 | 2 | 5 | 15'-8" | BENT | 33 lbs. | Vertical Abutment Wing |
| A507 | 2 | 5 | 16'-6" | BENT | 34 lbs. | Vertical Abutment Wing |
| A508 | 2 | 5 | 17'-6" | BENT | 37 lbs. | Vertical Abutment Wing |
| A509 | 2 | 5 | 18'-2" | BENT | 38 lbs. | Vertical Abutment Wing |
| A510 | 14 | 5 | 16'-2" | BENT | 236 lbs. | Vertical Abutment Bet. Beams |
| A511 | 16 | 5 | 13'-5" | BENT | 224 lbs. | Vertical Abutment Under Beam |
| A512 | 16 | 5 | 4'-2" | BENT | 70 lbs. | Vertical Abutment Under Beam |
| A513 | 24 | 5 | 2'-8" | BENT | 67 lbs. | Vertical Pile |
| A514 | 4 | 5 | 14'-5" | BENT | 60 lbs. | Vertical Top of Wing |
| A515 | 12 | 5 | 29'-6" | STR. | 369 lbs. | Horizontal |
| A516 | 4 | 5 | 8'-1" | STR. | 17 lbs. | Horizontal Wing |
| A517 | 4 | 5 | 6'-1" | STR. | 25 lbs. | Horizontal Wing |
| A518 | 4 | 5 | 4'-1" | STR. | 34 lbs. | Horizontal Wing |
| TOTAL WEIGHT = 1,379 lbs. | | | | | | |




Bent Bar Details




B.F. = Back Face
E.F. = Each Face
F.F. = Front Face

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# Abutment Details
(Showing Rebar)

| QUANTITIES | |
|---|---|
| Class AE - 3 | 19.9 CY |
| Reinforcing Steel-Grade 60 | 1,379 lbs. |

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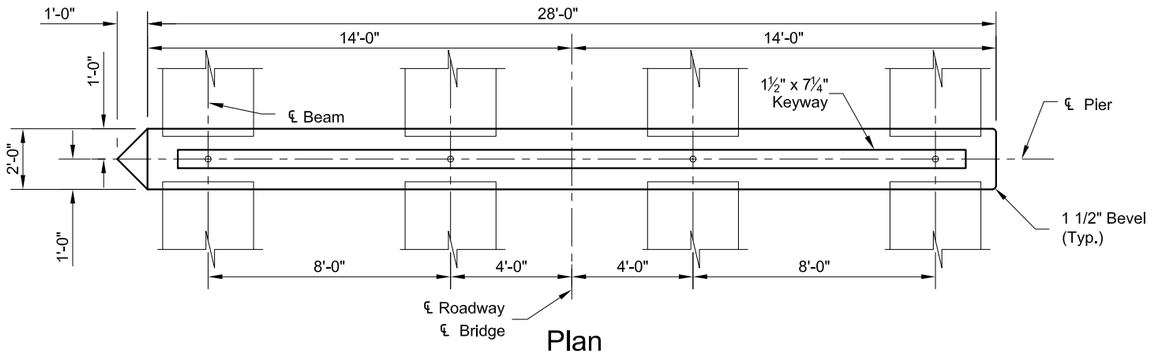
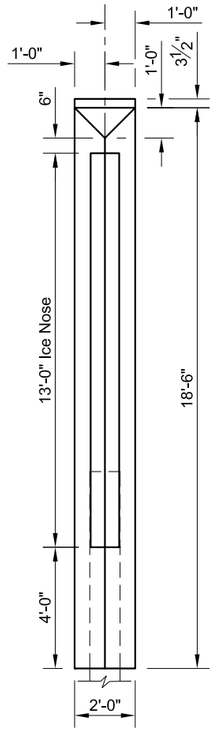
3-137-36.0-10

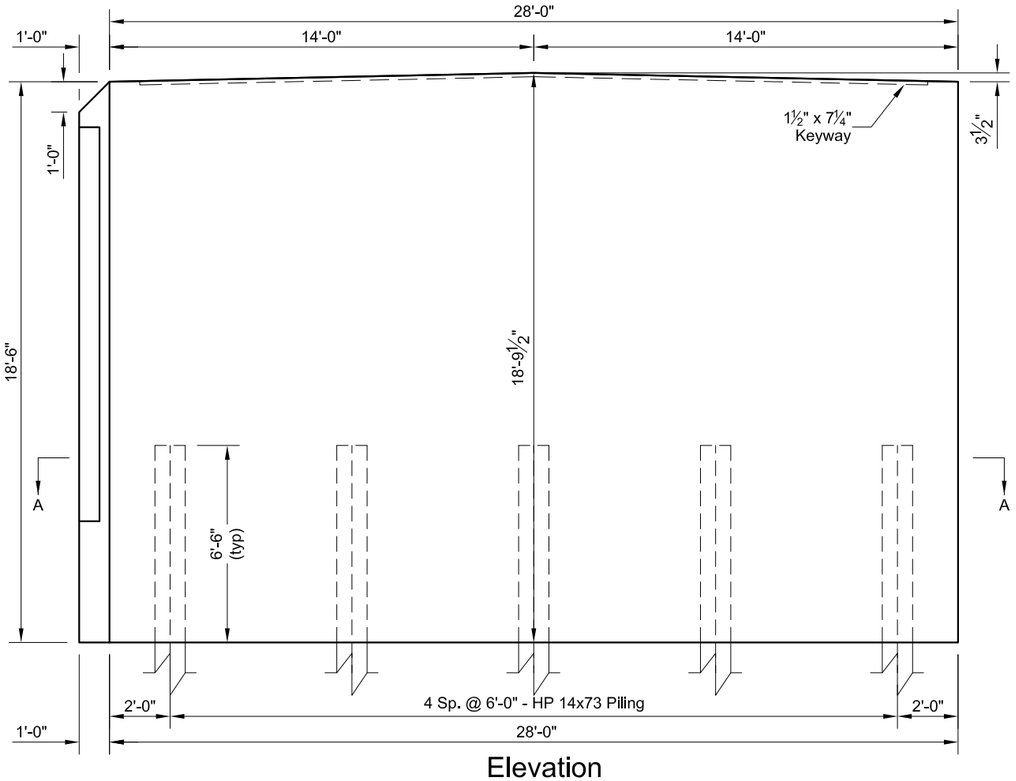
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 11 |



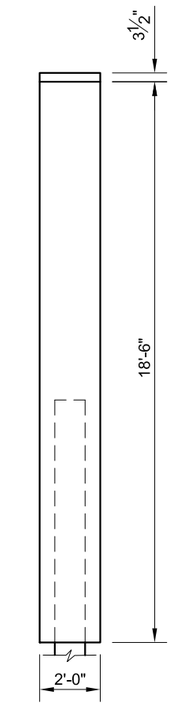

Plan



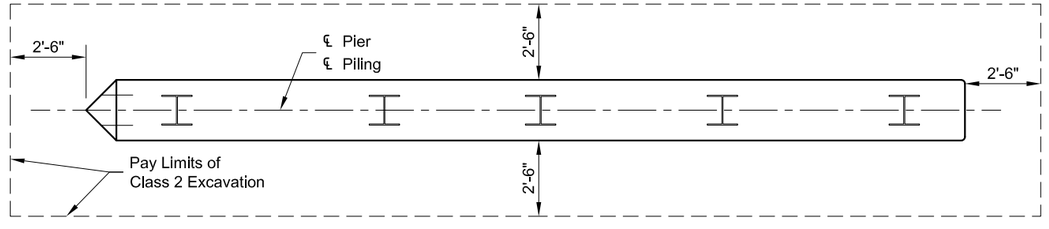

End View
(upstream)



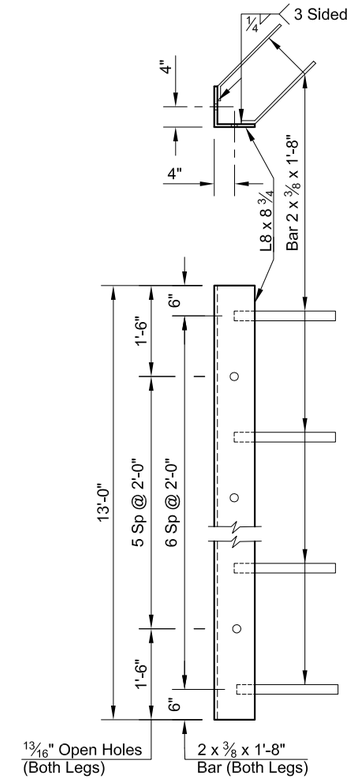

Elevation




End View
(downstream)




A-A




Galvanize in accordance with AASHTO M 111 after fabrication.

Ice Nose Detail

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# Pier Details
(Showing Dimensions)

QUANTITIES (Per Pier)

See Dwg. 3-137-36.0-12 .

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REVISED: 09/15/2017

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BOTTINEAU ~ BISMARCK ~ MINOT

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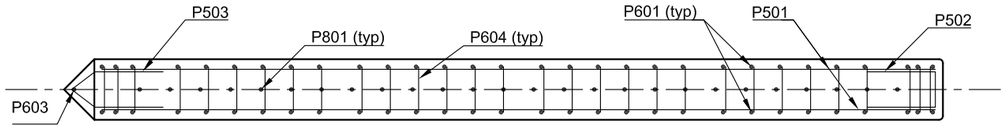
|---|---|---|

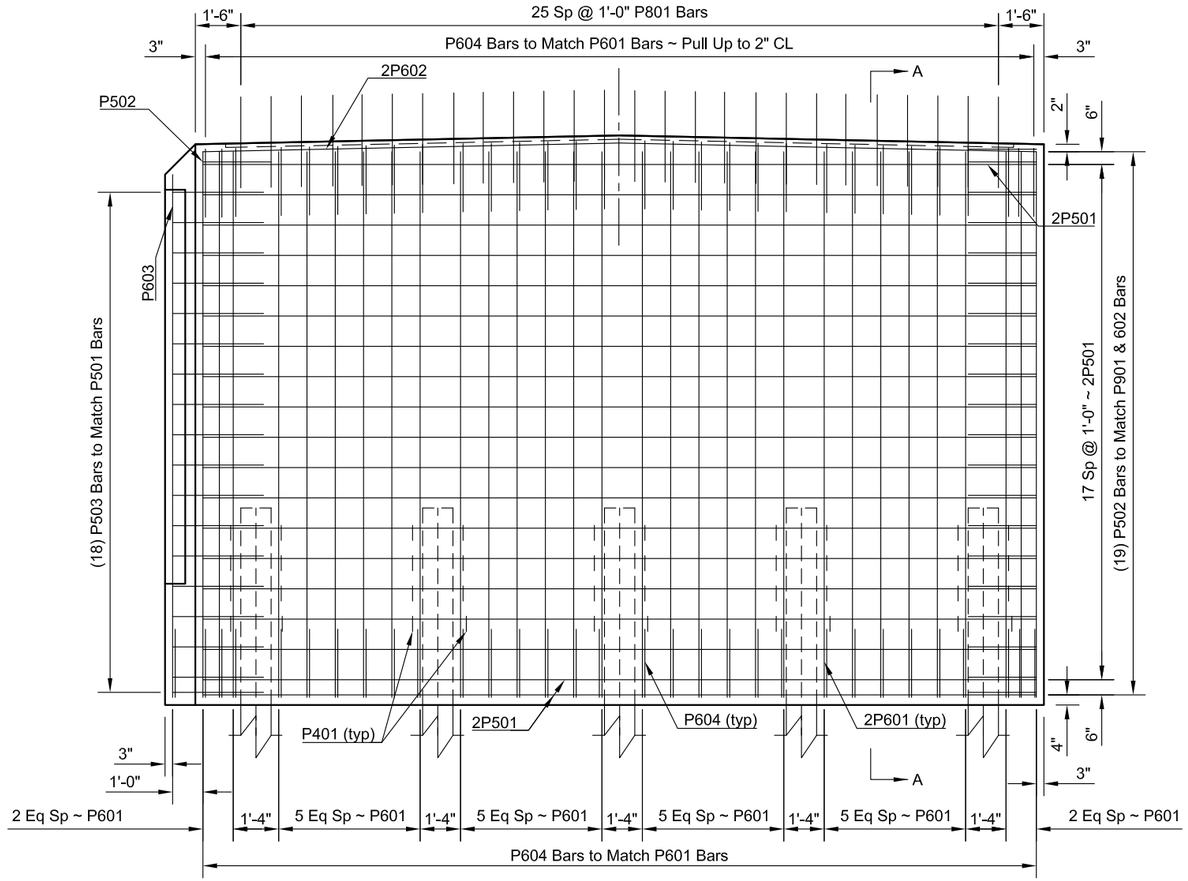
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 12 |



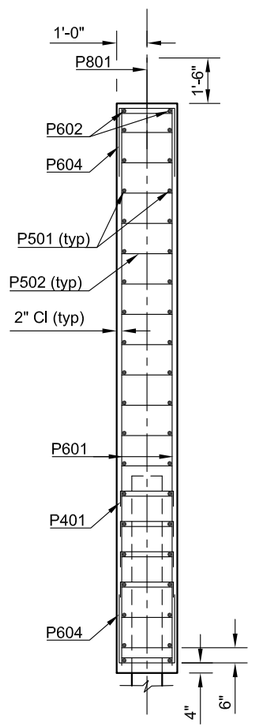

Plan

**BAR LIST (One Pier Only)**

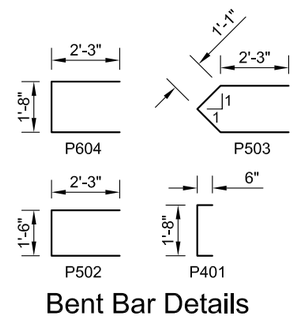
| MARK | NO. | SIZE | LENGTH | SHAPE | TOTAL WEIGHT | LOCATION |
|---|---|---|---|---|---|---|
| P 401 | 40 | 4 | 2'-8" | BENT | 71 lbs. | Vertical Pile |
| P 501 | 38 | 5 | 27'-6" | STR. | 1090 lbs. | Horizontal |
| P 502 | 20 | 5 | 6'-0" | BENT | 125 lbs. | Pier End Horizontal |
| P 503 | 18 | 5 | 6'-8" | BENT | 125 lbs. | Ice Nose Horizontal |
| P 601 | 60 | 6 | 17'-11" | STR. | 1615 lbs. | Vertical |
| P 602 | 2 | 6 | 27'-6" | STR. | 83 lbs. | Horizontal Pier Under Beam |
| P 603 | 1 | 6 | 17'-0" | STR. | 26 lbs. | Vertical Ice Nose |
| P 604 | 60 | 6 | 6'-2" | BENT | 556 lbs. | Vertical |
| P 801 | 26 | 8 | 3'-0" | STR. | 208 lbs. | Vertical Diaphragm |
| **TOTAL WEIGHT = 3,899 lbs.** | | | | | | |




Elevation




A-A




Bent Bar Details

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# Pier Details
(Showing Rebar)

| QUANTITIES (Per Pier) | |
|---|---|
| Class AE-3 Concrete | 39.3 CY |
| Reinforcing Steel-Grade 60 | 3,899 lbs |
| Structural Steel | 565 lbs |

REVISED: 00/00/0000


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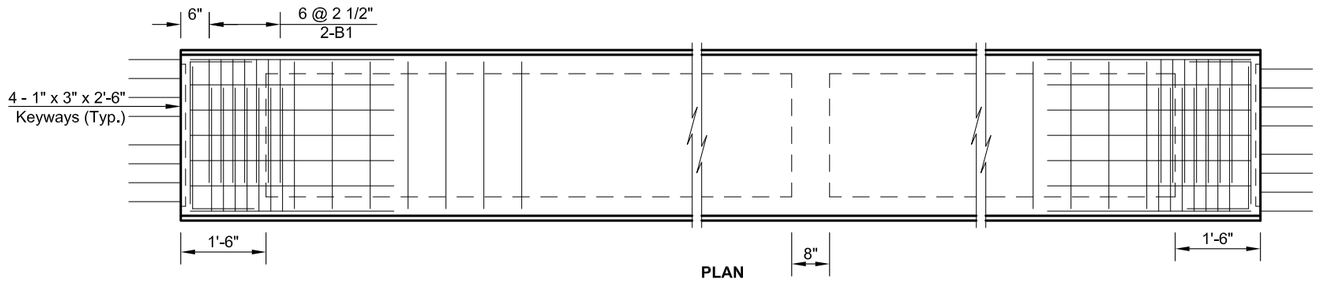
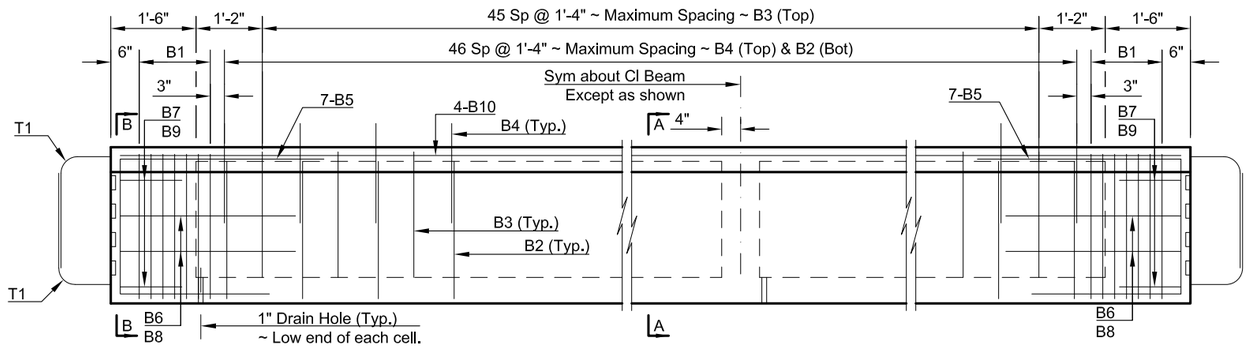
DRAWN BY: MRR | CHECKED BY: JWM | DATE: 09/08/2017

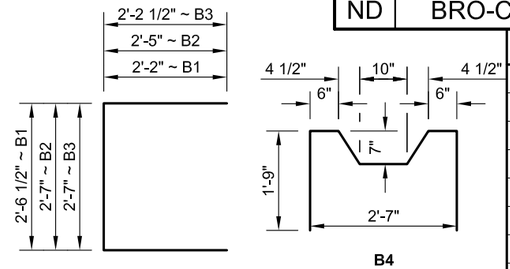
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 13 |




PLAN



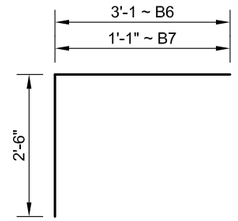

ELEVATION

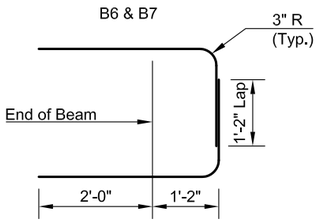



B1, B2 & B3

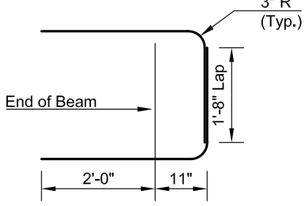



B4




(AT ABUTMENTS)




(AT PIERS)

T1

**NOTES:**

At least 14 days prior to the forming and pouring of any beams, the Contractor shall submit shop drawings to the Engineer for review. The shop drawings shall include the total initial prestress force and the losses in the prestress due to elastic shortening, shrinking or creeping of concrete and the relaxation of steel stress as determined by the Contractor for his method of stressing.

Shop drawings shall show strand layout, pull down locations, tensioning forces, elongation and any proposed changes in reinforcing steel.

The final prestress force (remaining after all losses have been accounted for) and its corresponding center of gravity, shall be selected from those on a curve determined by the three values shown.

The beams shall be poured in all steel forms.

Holes and inserts to accommodate the diaphragm bars shall be provided in the beams at locations as shown.

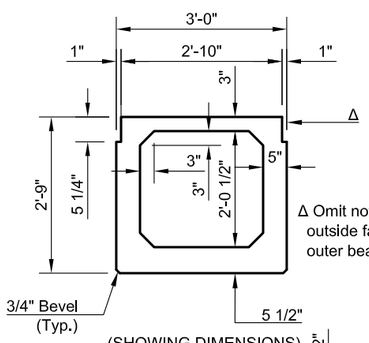
Minor changes to the shape of the beam and to reinforcing steel may be made to accommodate the forms of various contractors and their construction methods with the approval of the Engineer.

The tops of the beams shall be rough floated and broomed transversely for bond.

Provide handling hooks or devices as required by the Contractor. Hooks or devices provided will be subject to approval by the Engineer and shall be installed within 4'-0" of the end of beam.

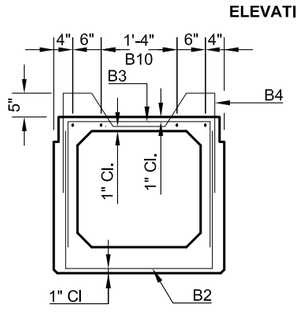
## BAR LIST ~ ONE BEAM

| MARK | SIZE | NO. | LENGTH | SHAPE |
|---|---|---|---|---|
| B1 | 4 | 28 | 6'-11" | BENT |
| * B2 | 4 | 47 | 7'-5" | BENT |
| * B3 | 4 | 46 | 7'-0" | BENT |
| B4 | 4 | 47 | 6'-9" | BENT |
| B5 | 5 | 14 | 8'-7" | BENT |
| B6 | 4 | 4 | 5'-7" | BENT |
| B7 | 4 | 4 | 3'-7" | BENT |
| B8 | 4 | 4 | 5'-7" | BENT |
| B9 | 4 | 4 | 3'-7" | BENT |
| B10 | 4 | 8 | 64'-6" | STR |
| ** T1 | 4 | 32 | 4'-9" | STR |



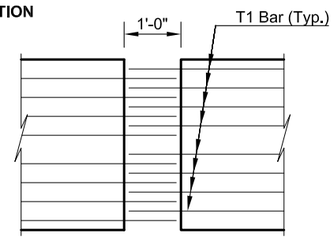

(SHOWING DIMENSIONS)

A-A

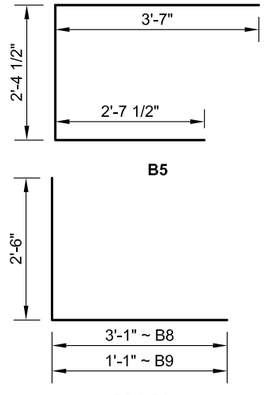



(SHOWING REINFORCING)

A-A




BEAM END PLAN AT PIER

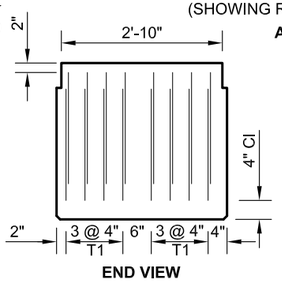



B5

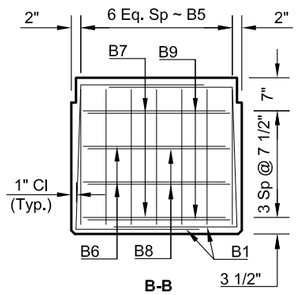
B8 & B9

(DIMENSIONS SHOWN ARE OUT TO OUT)

**BENT BAR DETAILS**




END VIEW




B-B

* Welded Wire Reinforcing with minimum circumferential steel area of 0.15 sq in per ft may be substituted for B2 and B3 bars.

** Field bend as shown (Grade 40).

Weight of Beam (Tons) = 0.3006*(Length of Beam (ft)) + 0.2221*(# of Diaphragms) + 0.9994*(1 + Tangent of Skew Angle)

## PRESTRESSING DATA

| C.G. | FINAL FORCE | DETENSION STRENGTH | ACCEPTANCE STRENGTH | WEIGHT (TONS) | BEAM LENGTH |
|---|---|---|---|---|---|
| 5.0" | 695.1 k | 5,500 psi (min) | 6,000 psi (min) | 20.8 | 65'-0" |
| 5.25" | 700.8 k | | | | |
| 5.5" | 706.5 k | | | | |

## BEAM SECTION DATA

| |
|---|
| WT = 601.2 LBS/FT + 2443 LBS |
| CROSS SECTIONAL AREA = 558.5 IN^2 |
| C.G. (FROM BOTTOM) = 14.85 IN |
| I = 73,708 IN^4 |
| Sç = 4,964 IN^3 |

| QUANTITIES | (ONE BEAM) |
|---|---|
| BEAM LENGTH | 65 LF |

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# Pre-tensioned 33"x36" Prestressed Spread Box Beam

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03-137-36.0-13

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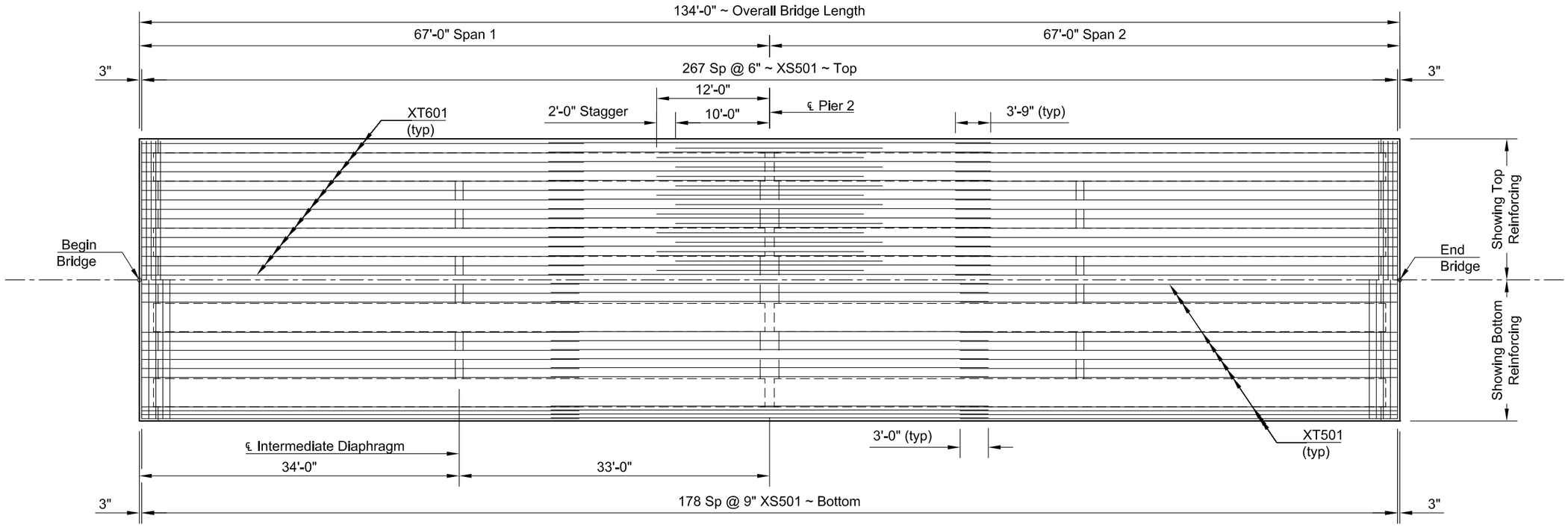
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 170 | 14 |




Plan

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# Slab Layout

QUANTITIES

See Dwg. 3-137-36.0-17 .

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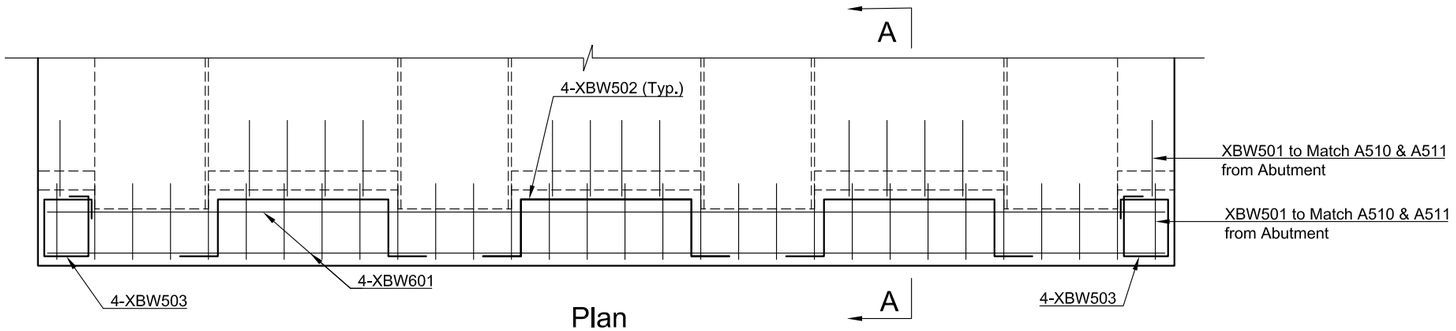
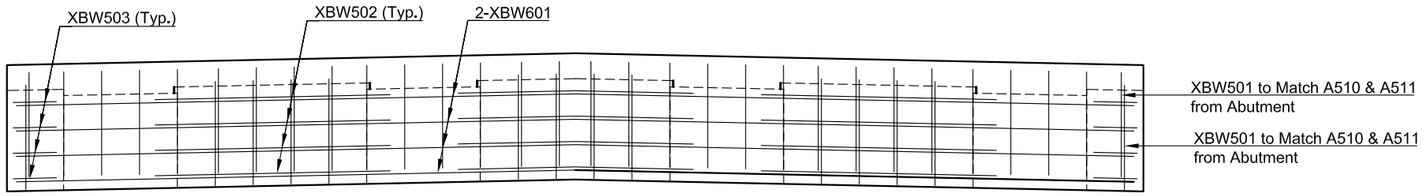
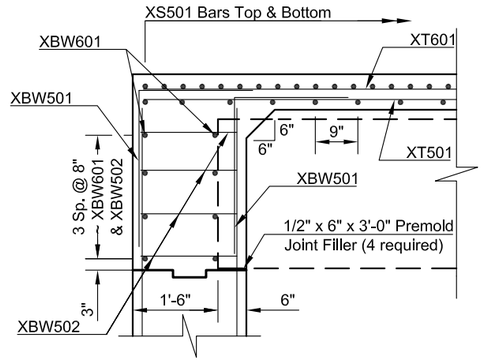


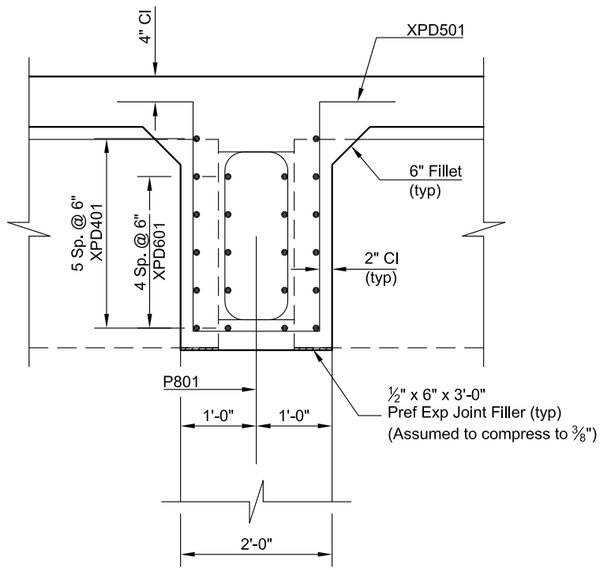

Plan
(Endwall)



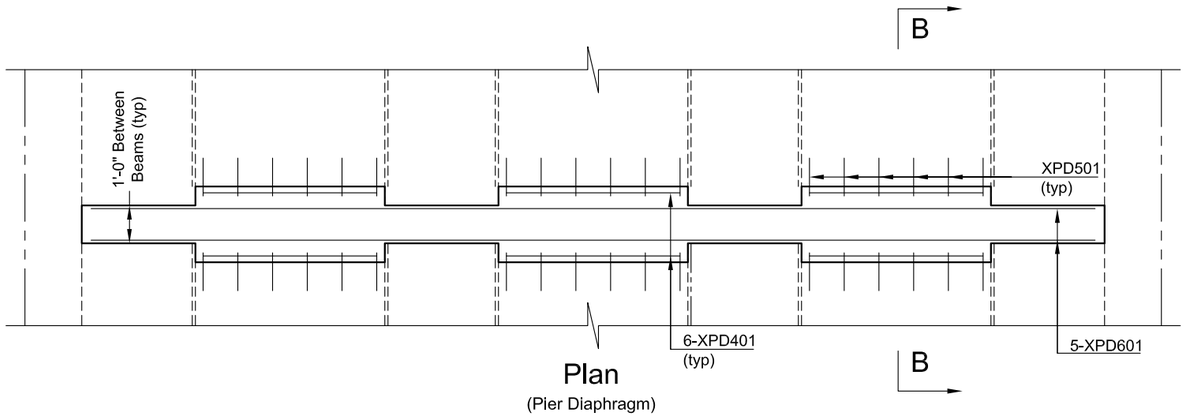

Elevation
(Endwall)



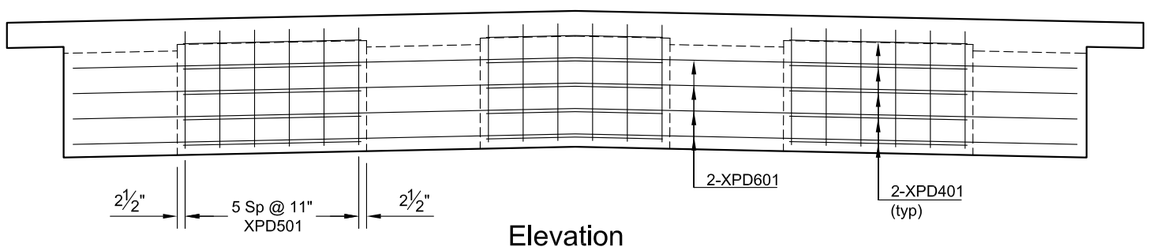

A-A




B-B




Plan
(Pier Diaphragm)




Elevation
(Pier Diaphragm)

# Endwall & Pier Diaphragm Details

QUANTITIES

See Dwg. 3-137-36.0-17 .

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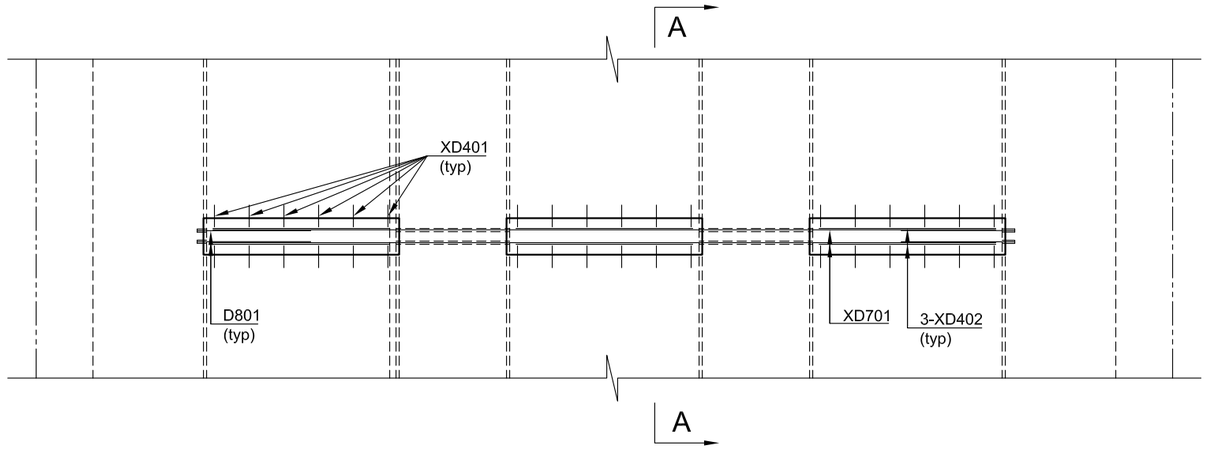
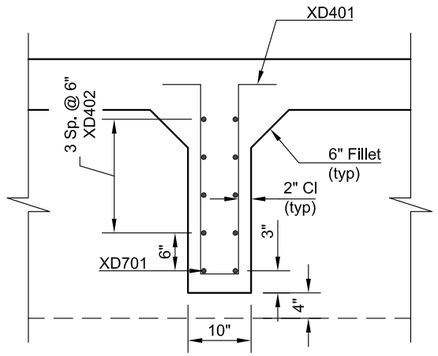
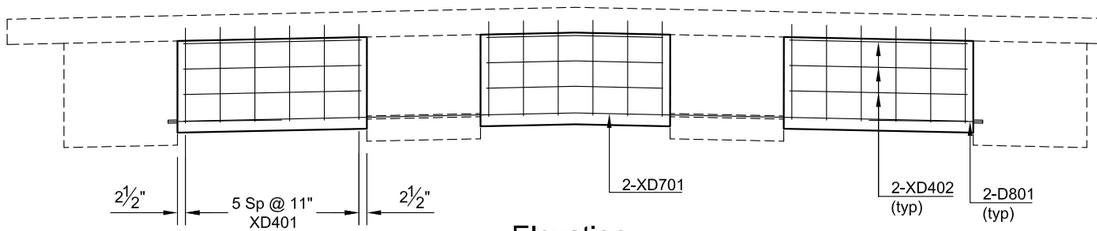


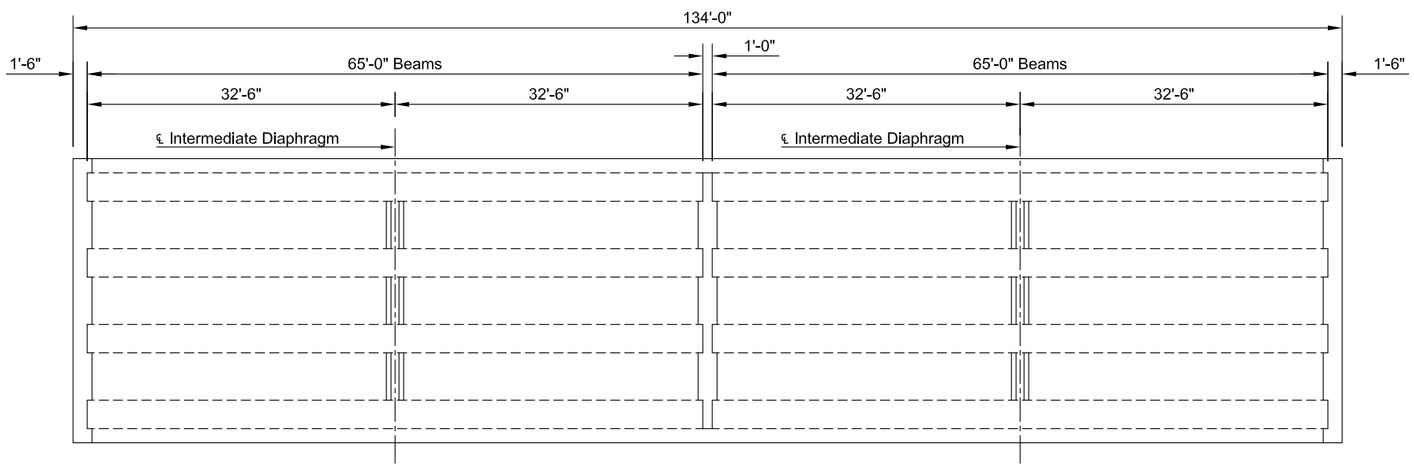

Plan




A-A




Elevation




Plan Layout

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# Intermediate Diaphragm Details

QUANTITIES

See Dwg. 3-137-36.0-17 .

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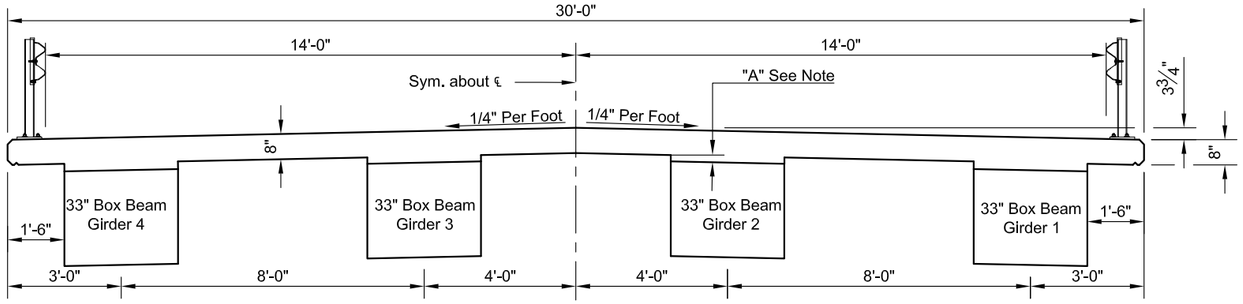
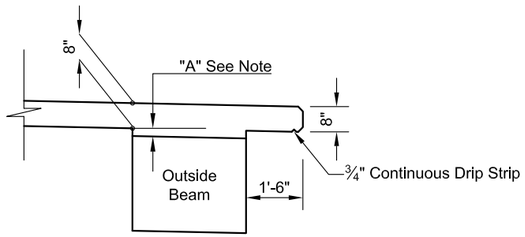
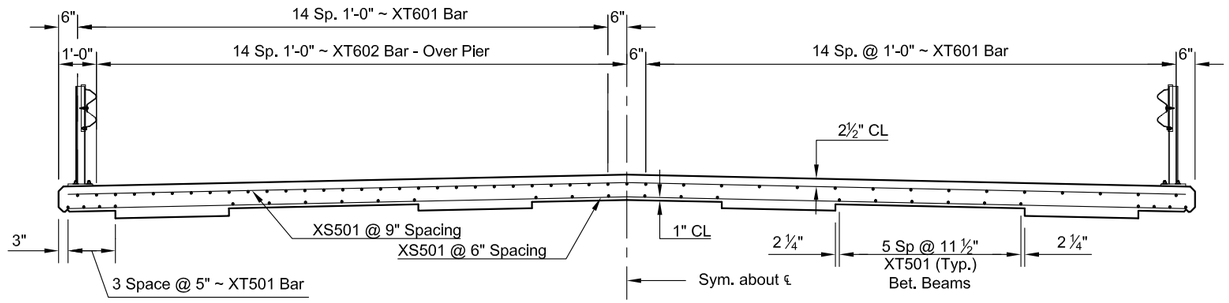



## Slab Section
(Showing Dimensions)

**RISER NOTE:**
Riser Dimension "A" = 2" @ Abutments & Piers
Riser Will Vary For All Other Points




## (Rebar Over Supports)

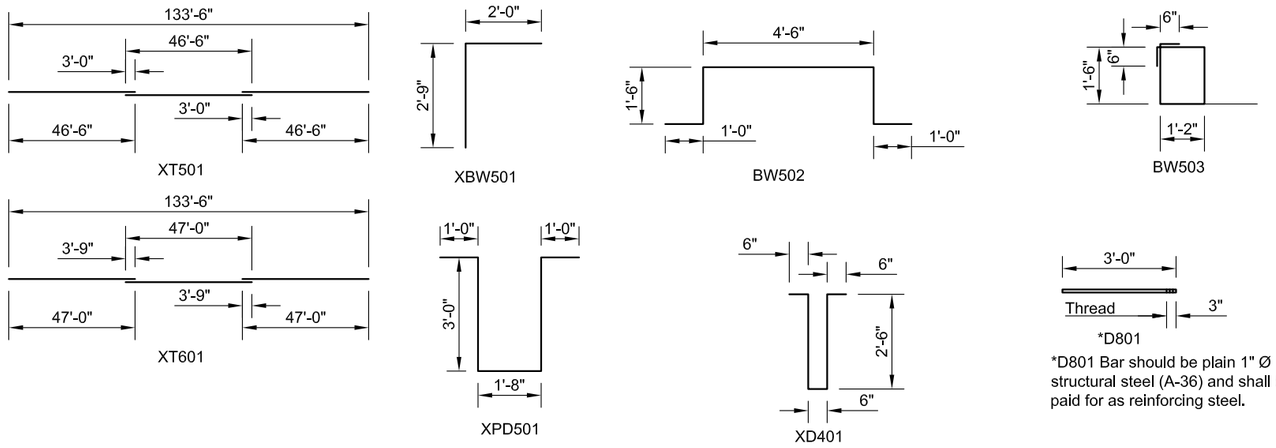
## (Rebar at Abutment)

**BAR LIST (Both End Wall, Pier Diaphragm & Both Intermediate Diaphragm)**

| | MARK | NO. | SIZE | LENGTH | SHAPE | TOTAL WEIGHT | LOCATION |
|---|---|---|---|---|---|---|---|
| Epoxy | XS 501 | 447 | 5 | 29'-6" | STR. | 13,754 lbs. | Transverse Top & Bottom |
| | XT 501 | 26 | 5 | 139'-6" | STR. | 3,783 lbs. | Longitudinal Bottom |
| | XT 601 | 30 | 6 | 141'-0" | STR. | 6,353 lbs. | Longitudinal Top |
| | XT 602 | 29 | 6 | 22'-0" | STR. | 958 lbs. | Longitudinal Top |
| | XBW 501 | 88 | 5 | 4'-9" | BENT | 436 lbs. | Both End Wall |
| | XD 401 | 36 | 4 | 6'-6" | BENT | 156 lbs. | Intermediate Diaphragm |
| | XPD 501 | 18 | 5 | 9'-8" | BENT | 181 lbs. | Pier Diaphragm |
| | **TOTAL WEIGHT =** | | | | | **25,621 lbs.** | |
| Regular | D 402 | 48 | 4 | 4'-8" | STR. | 150 lbs. | Intermediate Diaphragm |
| | D 701 | 4 | 7 | 20'-8" | STR. | 169 lbs. | Intermediate Diaphragm |
| | D 801 | 8 | 1" ϕ | 3'-0" | *See Detail | 64 lbs. | Intermediate Diaphragm |
| | BW 502 | 24 | 5 | 9'-6" | BENT | 238 lbs. | Both End Wall |
| | BW 503 | 16 | 5 | 6'-4" | BENT | 106 lbs. | Both End Wall |
| | BW 601 | 16 | 6 | 29'-6" | STR. | 709 lbs. | Both End Wall |
| | PD 401 | 36 | 4 | 4'-7" | STR. | 110 lbs. | Pier Diaphragm |
| | PD 601 | 10 | 6 | 26'-6" | STR. | 398 lbs. | Pier Diaphragm |
| | **TOTAL WEIGHT =** | | | | | **1,944 lbs.** | |

## Deck Quantities

| | |
|---|---|
| Slab | 105.1 CY |
| Abutment Backwalls (each) | 6.3 CY |
| Pier Diaphragm | 5.4 CY |
| Intermediate Diaphragms (each) | 1.3 CY |




*D801 Bar should be plain 1" Ø structural steel (A-36) and shall be paid for as reinforcing steel.

## Reinforcing Details

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# Slab Section & Superstructure Reinforcing Bar List & Details

| QUANTITIES | |
|---|---|
| Class AAE-3 | 125.7 CY |
| Reinforcing Steel-Grade 60 | 1,944 lbs. |
| Reinforcing Steel-Grade 60-Epoxy Coated | 25,621 lbs. |

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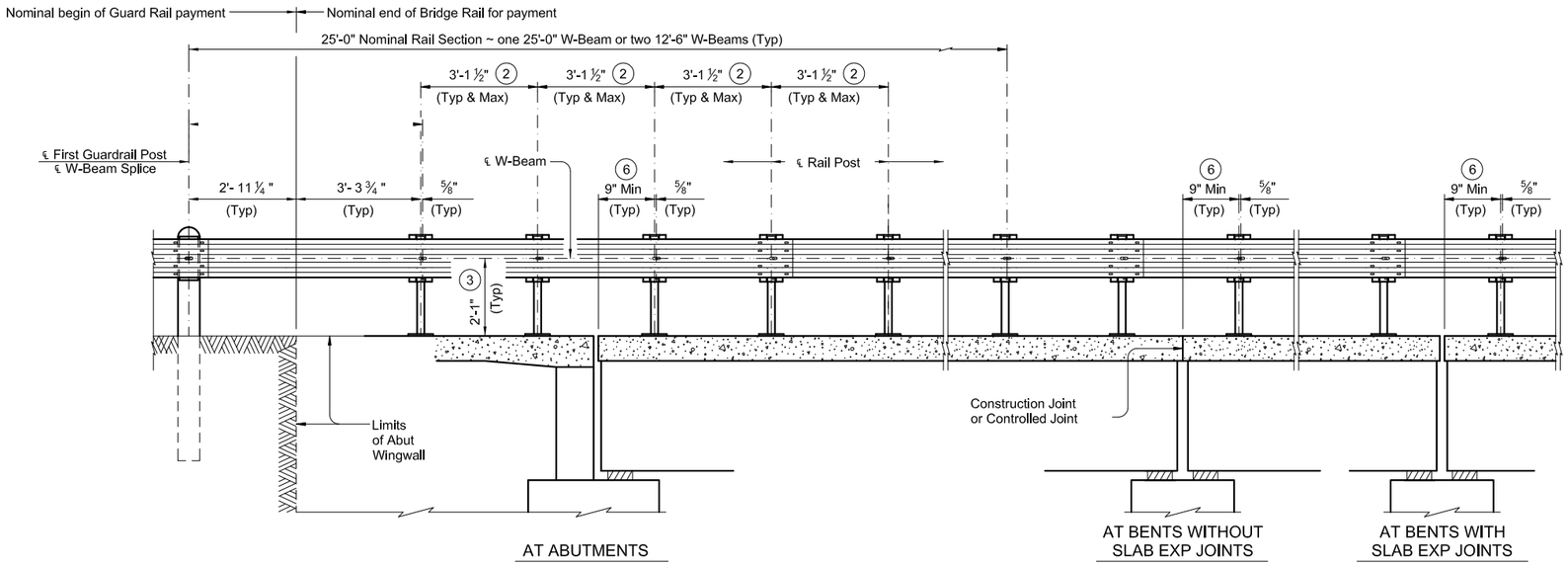
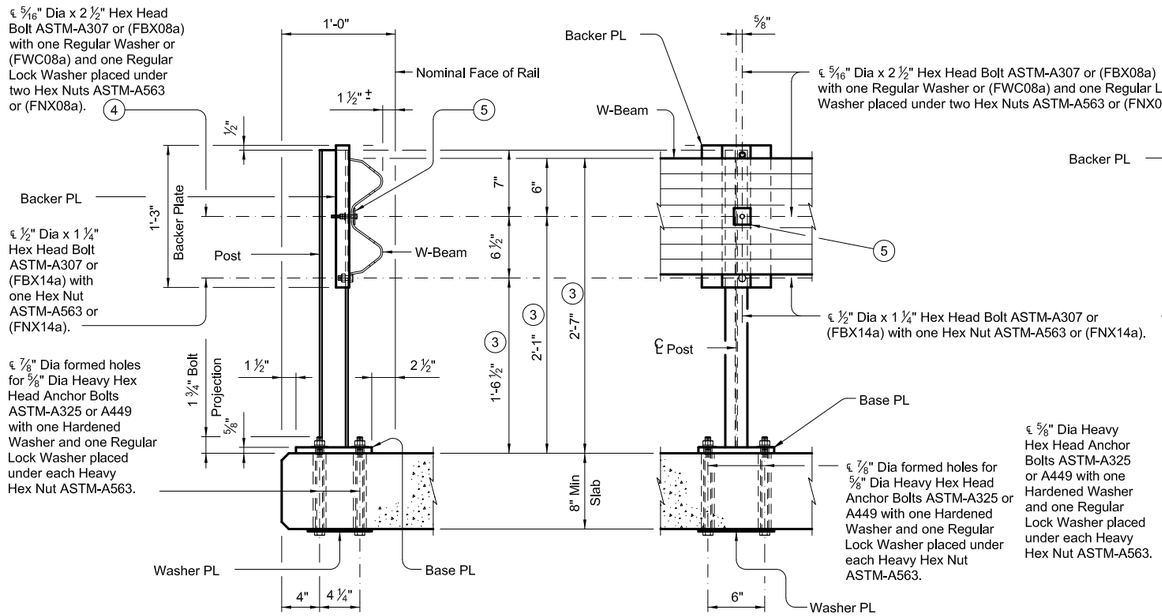
| ND | BRO-CNOC-0003(050) | 170 | 18 |



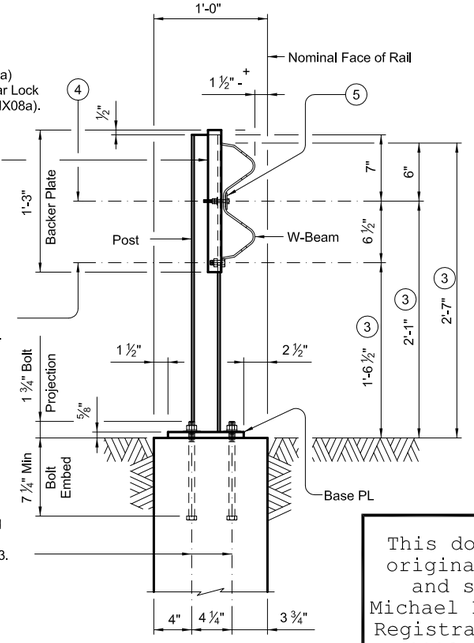

## ROADWAY ELEVATION OF RAIL




RAIL SECTION

TRAFFIC SIDE RAIL VIEW

## RAIL DETAILS ON BRIDGE SLAB




℄ ⅝" Dia Heavy Hex Head Anchor Bolts ASTM-A325 or A449 with one Hardened Washer and one Regular Lock Washer placed under each Heavy Hex Nut ASTM-A563.

## RAIL SECTION ON ABUTMENT WINGWALL

(1) 9" Min, 5'-9" Max

(2) Maintain 3'-1 ½" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary.

(3) Increase 2" for structures with overlay.

(4) Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.

(5) PL ⅛ x 1 ¾ x 1¾ with ⅜ Dia Hole centered in PL, ASTM-A36. Square Guardrail Washer (FWR01).

(6) The post nearest to a slab joint or end of structure may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new ¾" Dia hole on the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.

| Quantities | |
|---|---|
| Railing | 268 LF |

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# T631 Bridge Rail Details

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3-137-36.0-18

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
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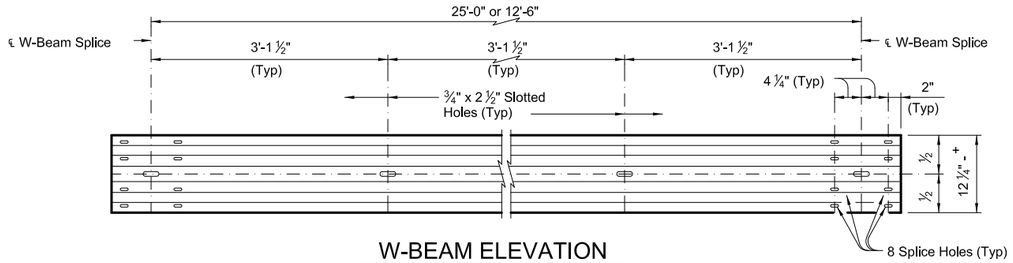
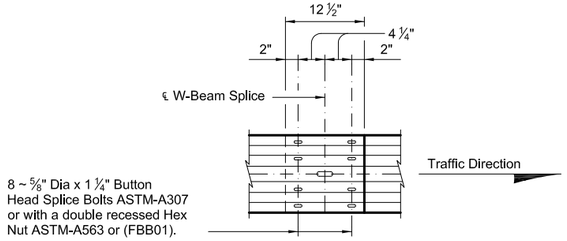



W-BEAM ELEVATION




W-BEAM SPLICE ELEVATION

## CONSTRUCTION NOTES:

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

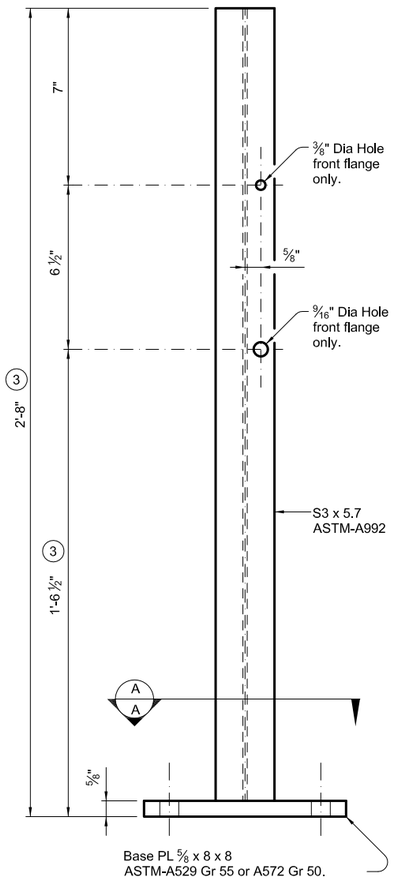
Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding prior to galvanizing. Shop drawings are required for this rail.

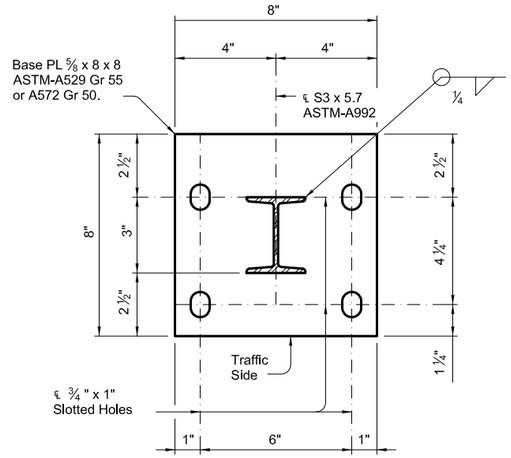
## MATERIAL NOTES:

Galvanize all steel components. Anchor bolts for base plate must be ⅝" Dia ASTM-A325 or A449 bolts with one hardened washer and one regular lock washer placed under each heavy hex nut. Nuts must conform to A563 requirements.

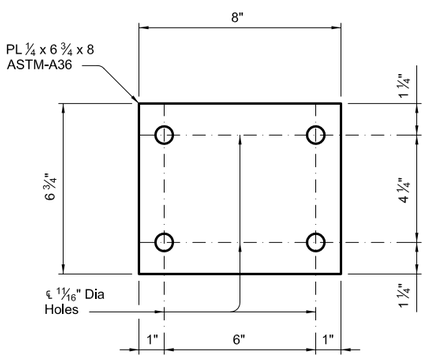
W-beam must meet the requirements of Section 862 of the Standard Specifications except as modified in the plans. The Contractor may furnish rail elements of 25'-0", or 12'-6" (Nominal) lengths. W-Beam must have slotted holes at 3'-1 ½".




POST ELEVATION



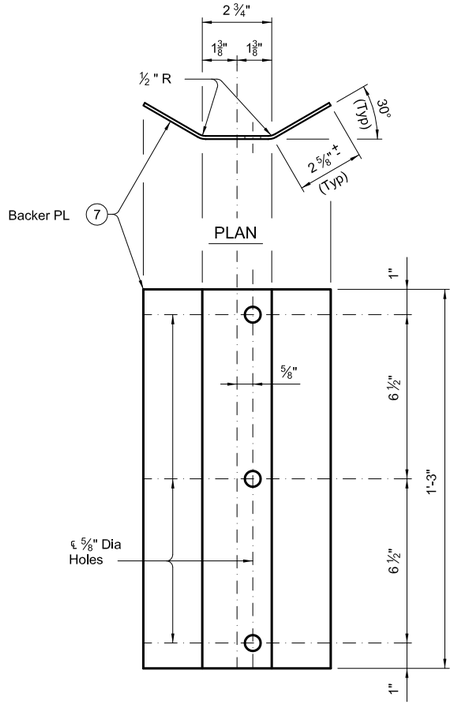

SECTION A-A




WASHER PLATE DETAIL

3 Increase 2" for structures with overlay.

7 Backer PL ⅛ x 8 x 1'-3" ASTM-A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable).




ELEVATION

BACKER PLATE

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Quantities

See Dwg. 3-137-36.0-18

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# T631 Bridge Rail Details

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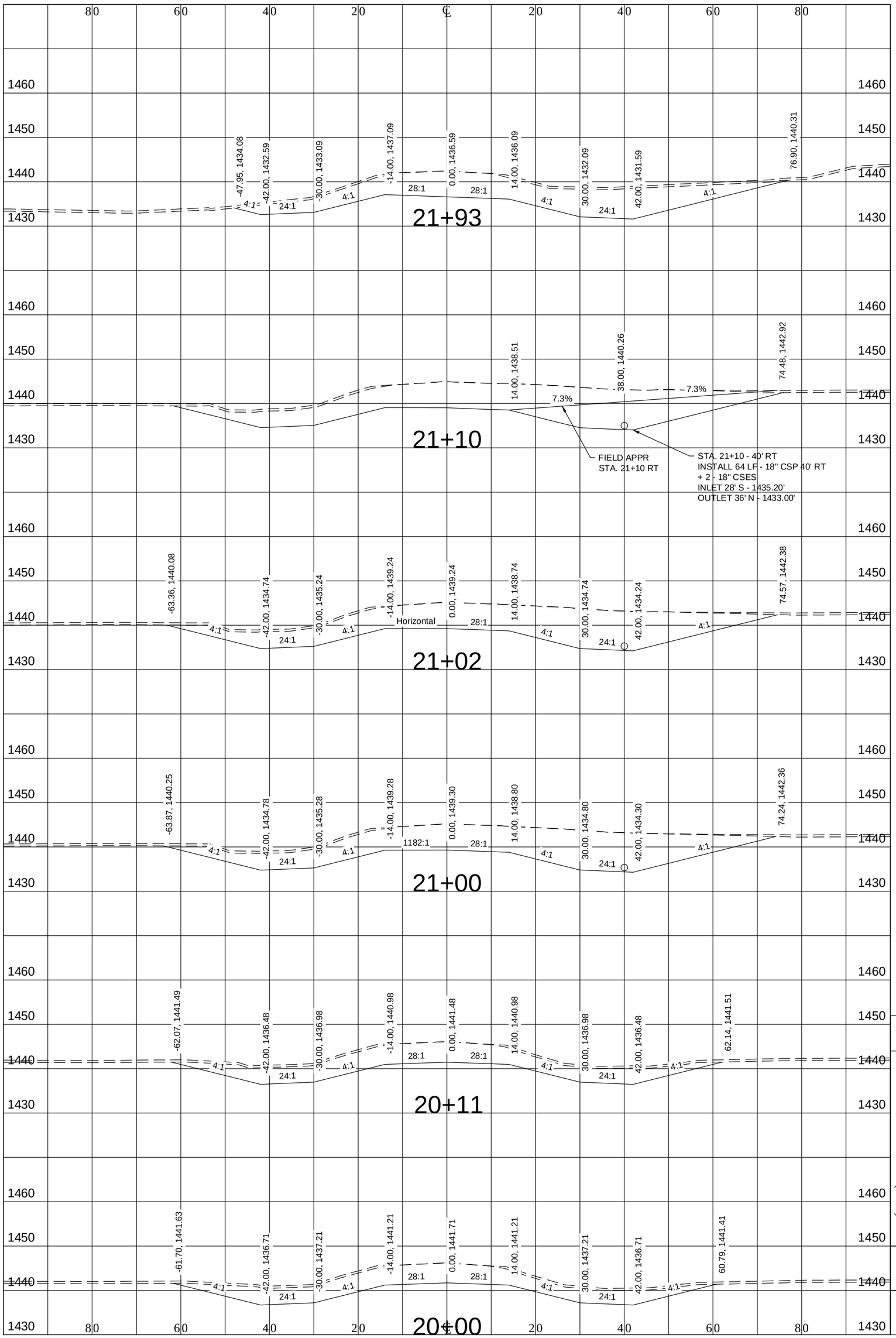


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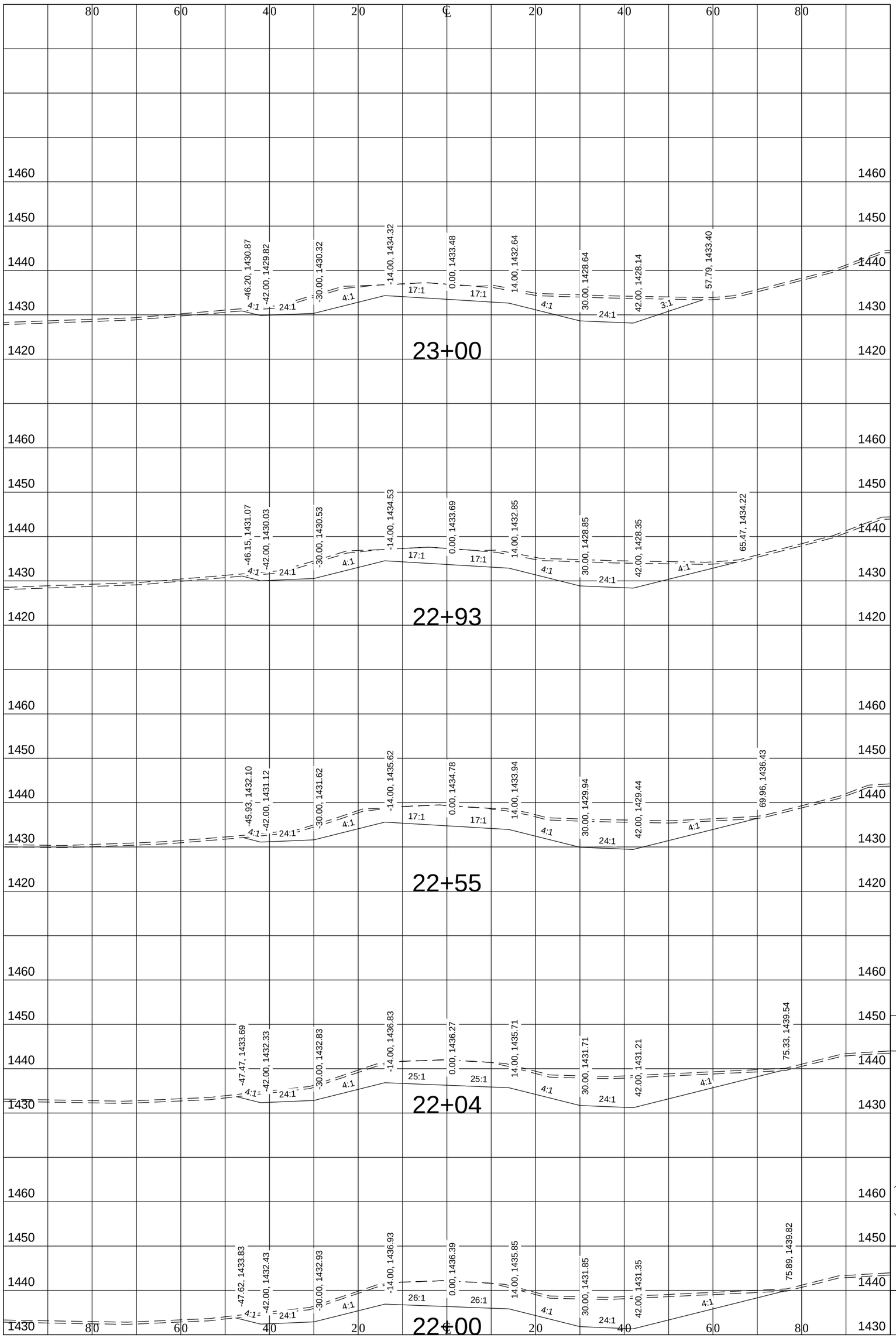


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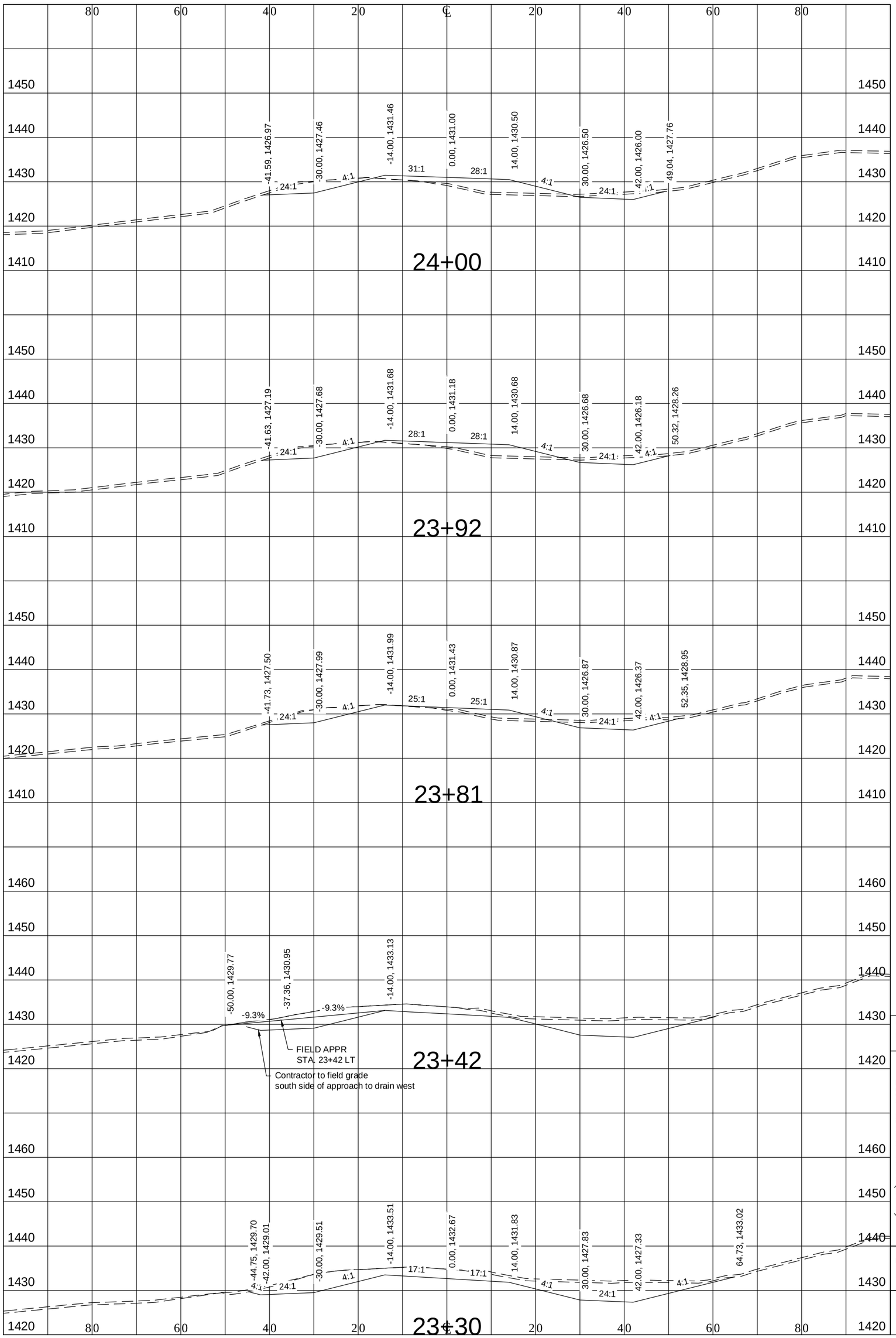


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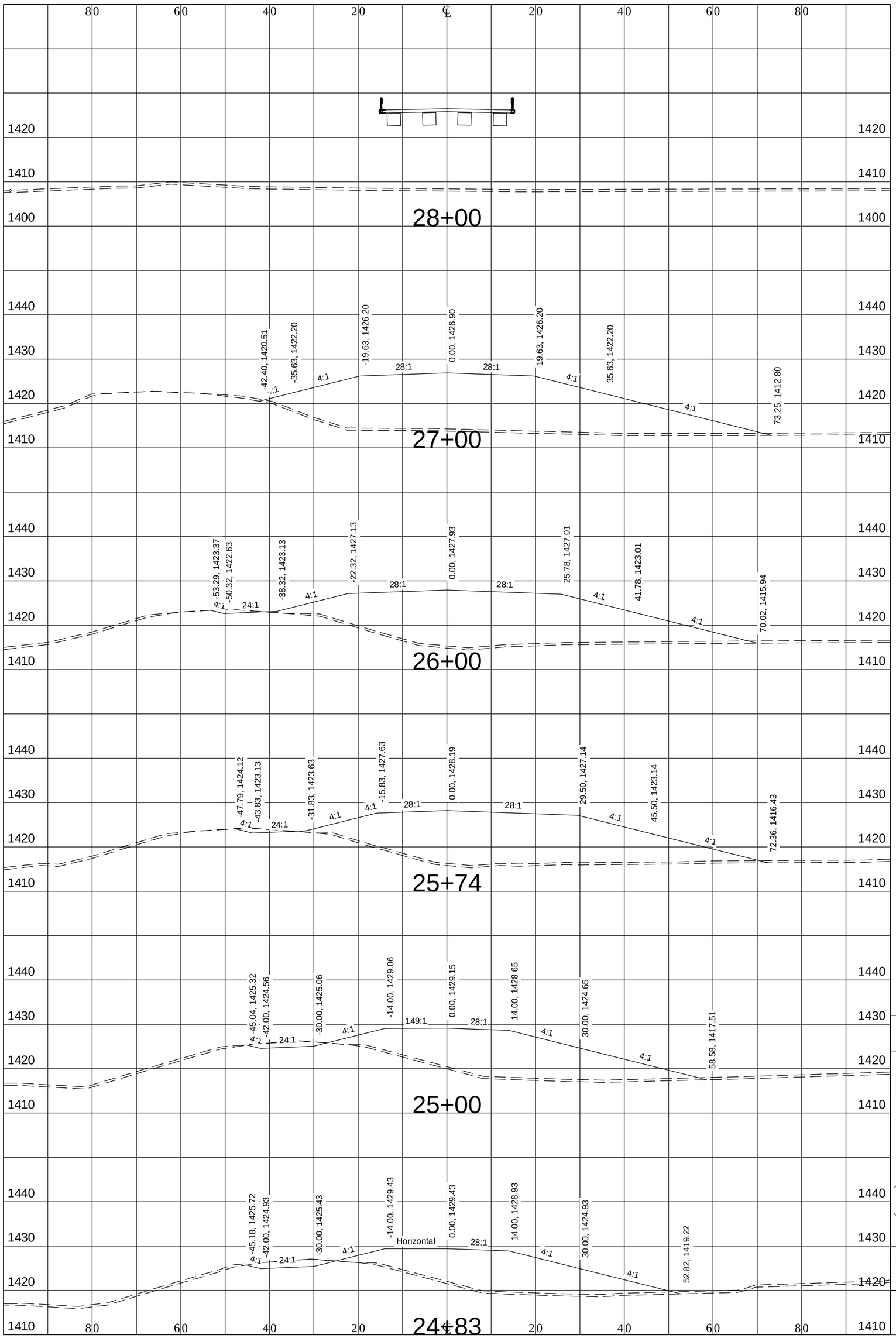


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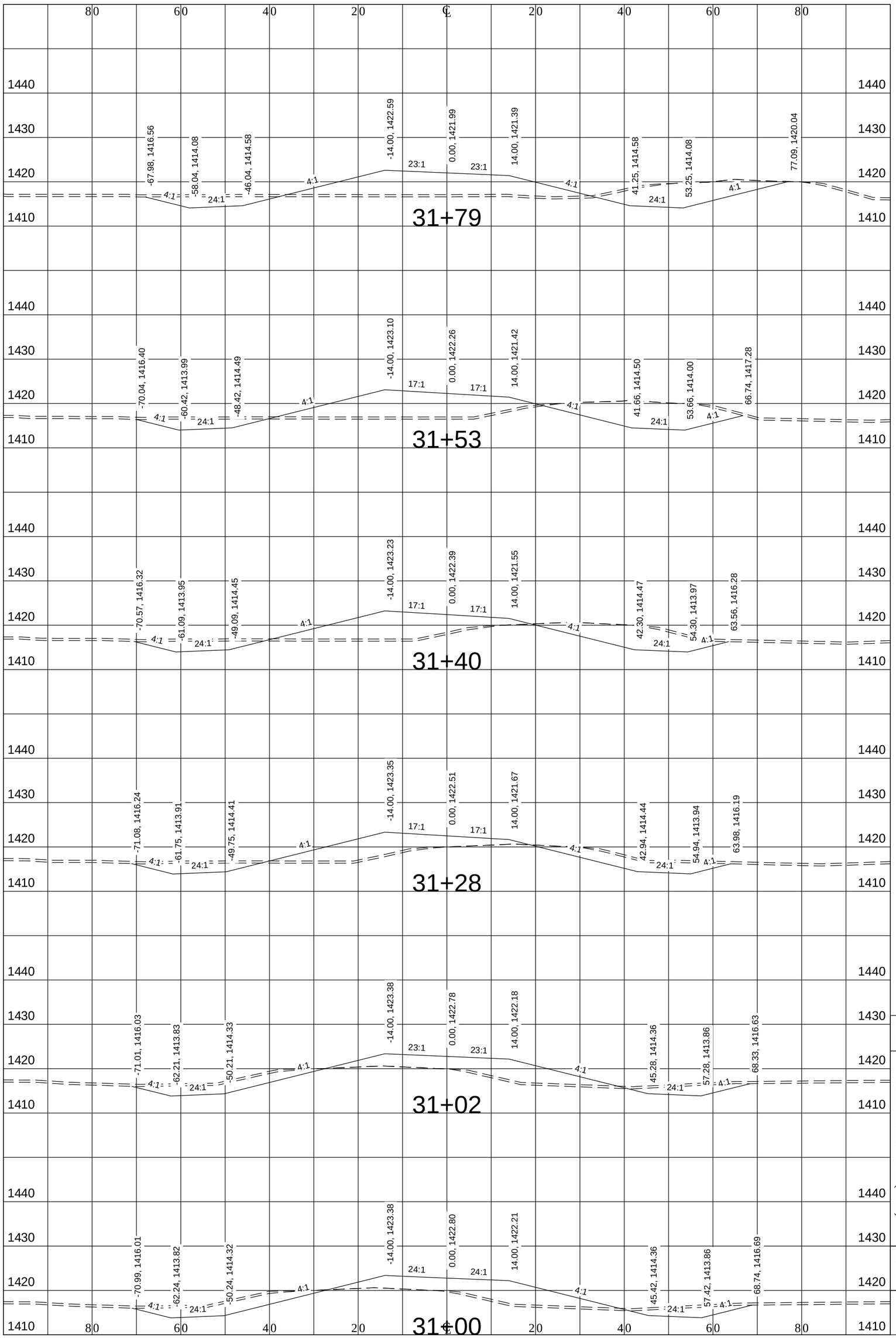


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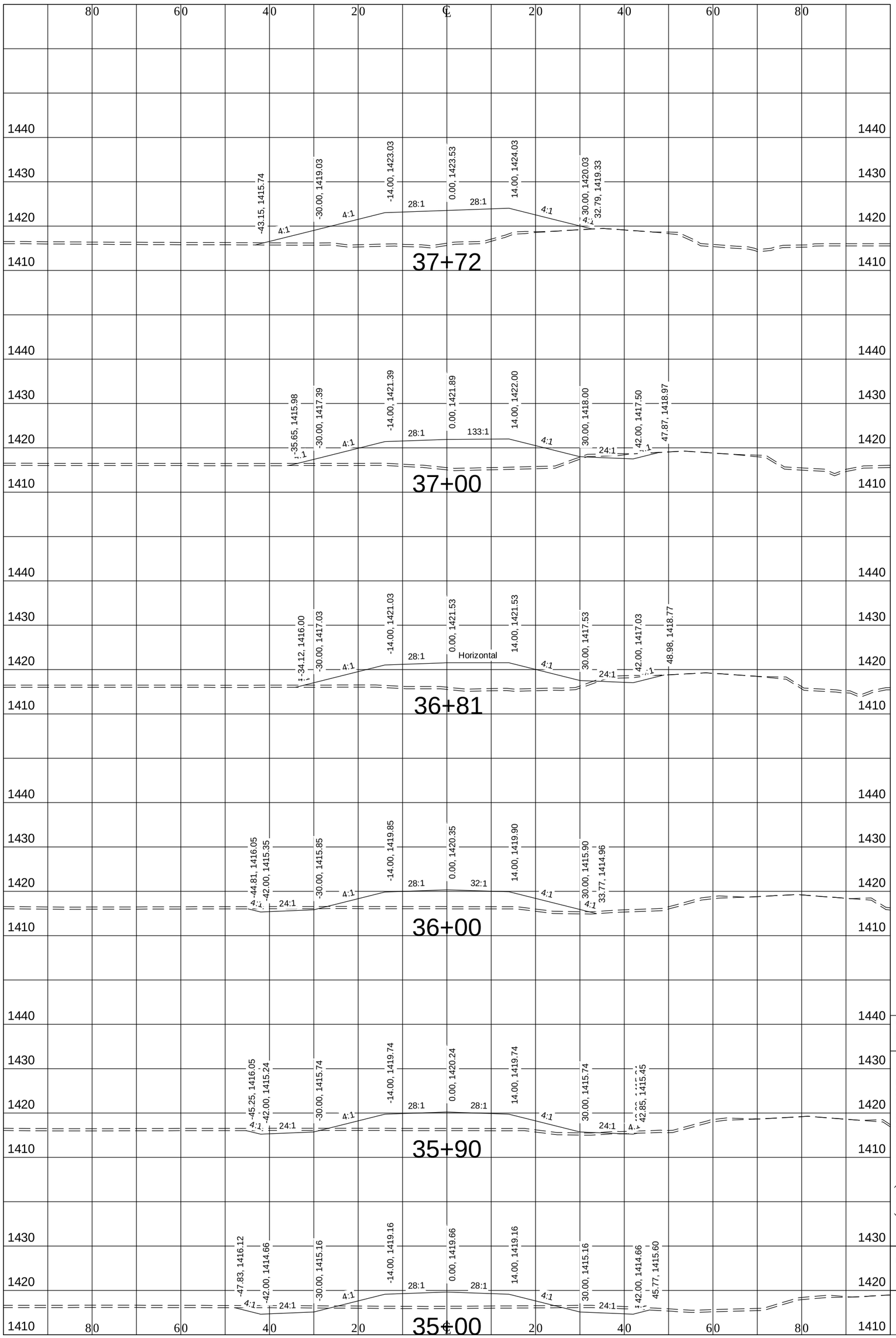
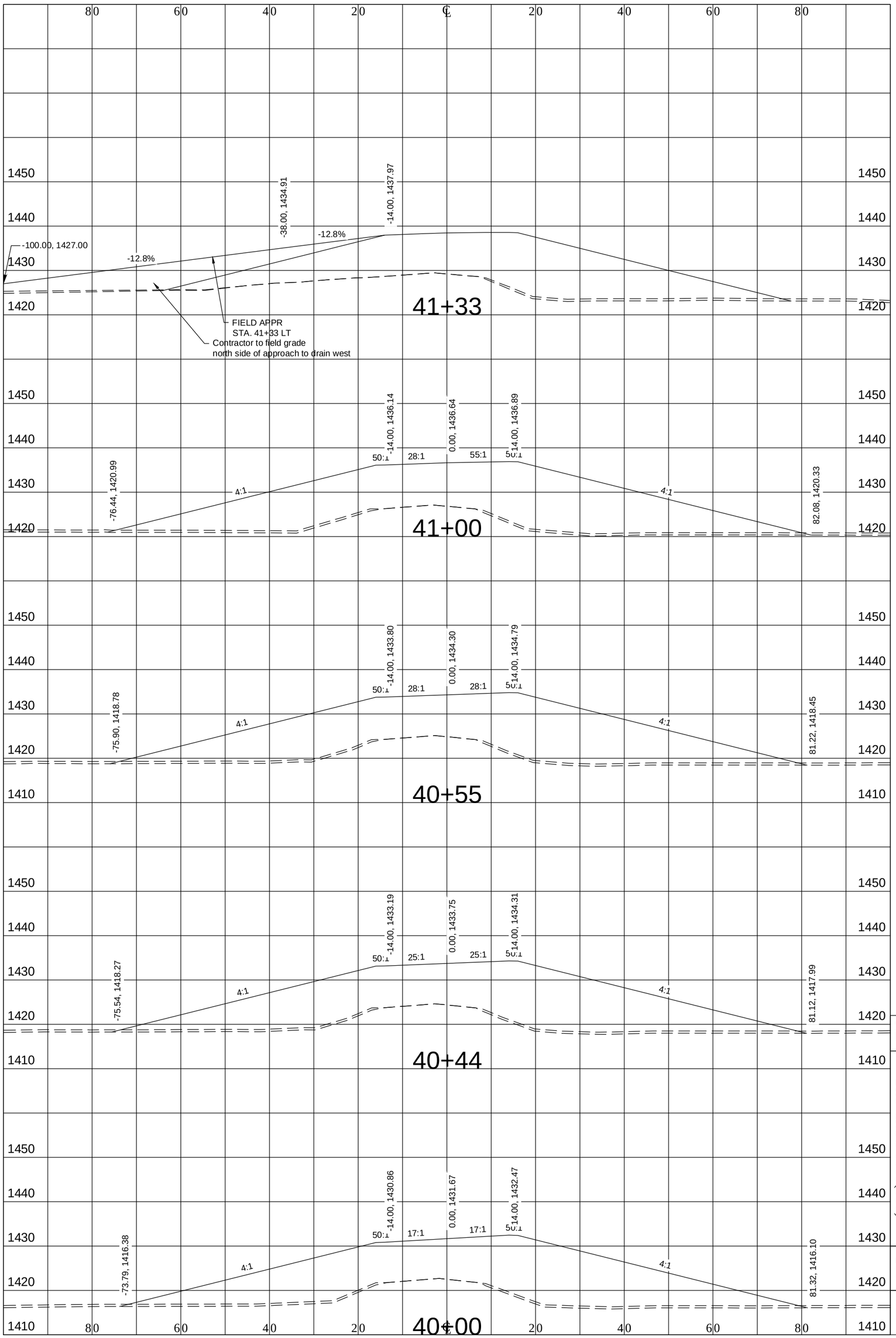


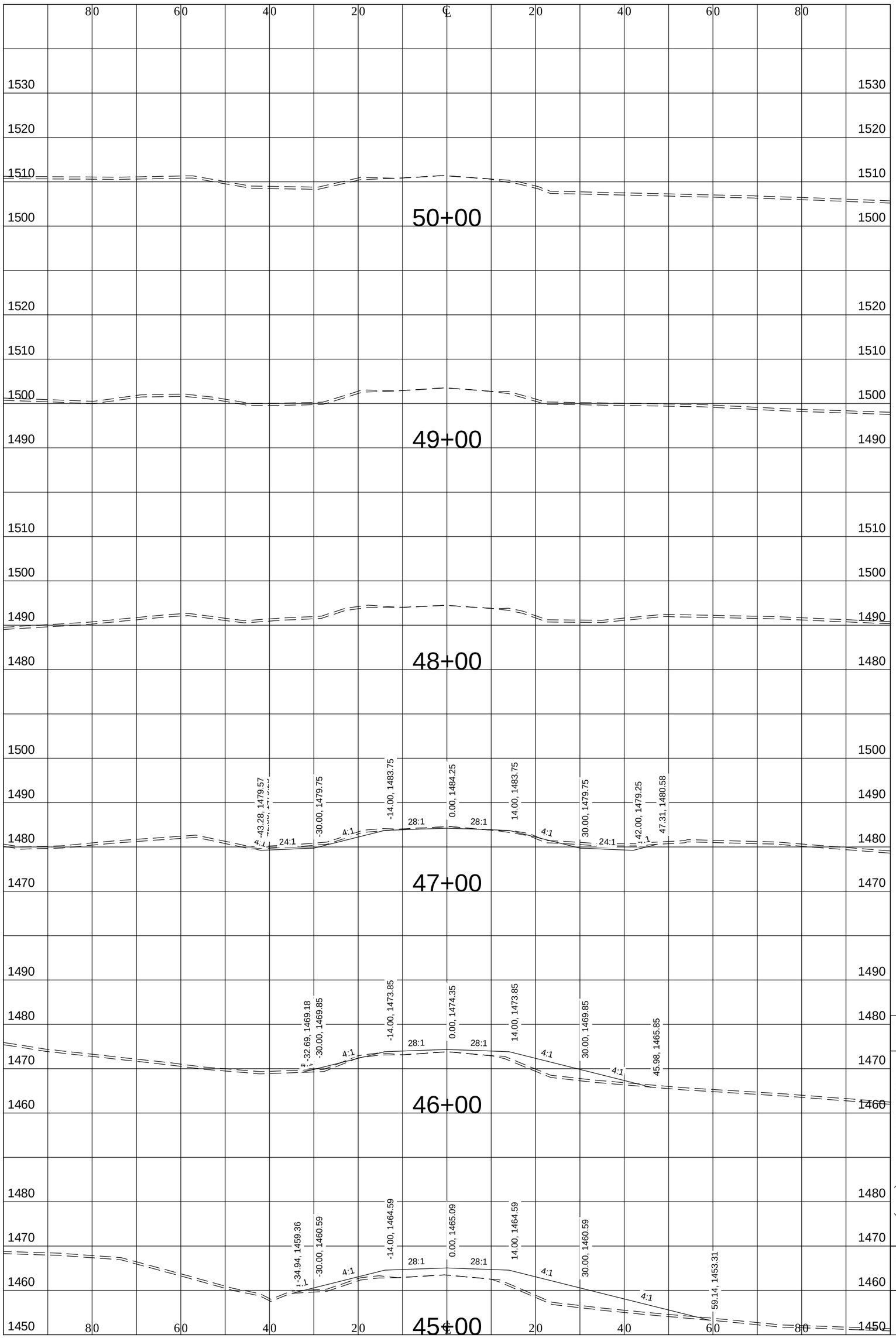

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 200 | 9 |

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 200 | 10 |




| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 200 | 11 |

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | BRO-CNOC-0003(050) | 200 | 12 |




| | |
|---|---|
| STATE | ND |
| PROJECT NO. | BRO-CNOC-0003(050) |
| SECTION NO. | 200 |
| SHEET NO. | 13 |

# 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 |
| Ac | acres |
| Adj | adjusted |
| Aggr | aggregate |
| Ahd | ahead |
| ARV | air release valve |
| Align | alignment |
| Al | alley |
| Alt | alternate |
| Alum | aluminum |
| ADA | Americans with Disabilities Act |
| A | ampere |
| & | 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 |
| Az | azimuth |
| Bk | back |
| BF | back face |
| Bs | backsight |
| Balc | balcony |
| B Wire | barbed wire |
| Barr | barricade |
| Btry | battery |
| Brg | bearing |
| BI | beehive inlet |
| Beg | begin |
| BM | bench mark |
| Bkwy | bikeway |
| Bit | bituminous |
| Blk | block |
| Bd Ft | board feet |
| BH | bore hole |
| BS | both sides |
| Bot | bottom |
| Blvd | Boulevard |
| Bndry | boundary |
| BC | brass cap |
| Brkwy | breakaway |
| Br | bridge |
| Bldg | building |
| BV | butterfly valve |
| Byp | bypass |
| C Gdrl | cable guardrail |
| Calc | calculate |
| Cd | candela |
| CIP | cast iron pipe |
| CB | catch basin |
| CRS | cationic rapid setting |
| C Gd | cattle guard |
| C To C | center to center |
| Cl or ℄ | centerline |
| Cm | centimeter |
| Ch | chain |
| Chnlk | chain-link |
| Ch Blk | channel block |
| Ch Ch | channel change |
| Chk | check |
| Chsld | chiseled |
| Cir | circle |
| Cl | class |
| Cl | clay |
| Cl F | clay fill |
| Cl Hvy | clay heavy |
| Cl Lm | clay loam |
| Clnt | clean-out |
| Clr | clear |
| Cl&gr | clearing & grubbing |
| Co S | coal slack |
| Comb. | combination |
| Coml | commercial |
| Compr | compression |
| CADD | computer aided drafting & design |
| Conc | concrete |
| 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 |
| CSP | corrugated steel pipe |
| C | coulomb |
| Co | County |
| Crse | course |
| C Gr | course gravel |
| CS | course sand |
| Ct | Court |
| Xarm | cross arm |
| Xbuck | cross buck |
| Xsec | cross sections |
| Xing | crossing |
| Xrd | Crossroad |
| Crn | crown |
| CF | cubic feet |
| M3 | cubic meter |
| M3/s | cubic meters per second |
| CY | cubic yard |
| Cy/mi | cubic yards per mile |
| Culv | culvert |
| C&G | curb & gutter |
| CI | curb inlet |
| CR | curb ramp |
| CS | curve to spiral |
| C | cut |
| Dd Ld | dead load |
| Defl | deflection |
| Defm | deformed |
| Deg or D | degree |
| Dlnt | delineate |
| Dlntr | delineator |
| Depr | depression |
| Desc | description |
| Det | detail |
| DWP | detectable warning panel |
| Dtr | detour |
| Dia | 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 |
| Eq | equation |
| Evgr | evergreen |
| Exc | excavation |
| Exst | existing |
| Exp | expansion |
| Expy | Expressway |
| E | external of curve |
| Extru | extruded |
| FOS | factor of safety |
| F | Fahrenheit |
| FS | far side |
| F | farad |
| Fed | Federal |
| FP | feed point |
| Ft | feet/foot |
| Fn | fence |
| Fn P | fence post |
| FO | fiber optic |
| FB | field book |
| FD | field drive |
| F | fill |
| FAA | fine aggregate angularity |
| FS | fine sand |
| 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 |
| Fs | foresight |
| Fnd | found |
| Fdn | foundation |
| Frac | fractional |
| Frwy | freeway |
| Frt | front |
| FF | front face |
| F Disp | fuel dispenser |

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# NDDOT ABBREVIATIONS

D-101-2

| | |
|---|---|
| FFP | fuel filler pipes |
| FLS | fuel leak sensor |
| Furn | furnish/ed |
| Gal | gallon |
| 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 |
| Geod | geodetic |
| GIS | Geographical Information System |
| G | giga |
| GPS | Global Positioning System |
| Gov | government |
| Grd | graded/grade |
| Gr | gravel |
| Grnd | ground |
| GWM | ground water monitor |
| Gdrl | guardrail |
| Gtr | gutter |
| H Plg | H piling |
| Hdwl | headwall |
| Ha | hectare |
| Ht | height |
| HI | height of instrument |
| Hel | helical |
| H | henry |
| Hz | hertz |
| HDPE | high density polyethylene |
| HM | high mast |
| HP | high pressure |
| HPS | high pressure sodium |
| Hwy | highway |
| Hor | horizontal |
| HBP | hot bituminous pavement |
| HMA | hot mix asphalt |
| Hr | hour(s) |
| Hyd | hydrant |
| Ph | hydrogen ion content |
| Id | identification |
| In or " | inch |
| Incl | inclinometer tube |
| IMH | inlet manhole |
| ID | inside diameter |
| Inst | instrument |
| Intchg | interchange |
| Intmdt | intermediate |
| Intscn | intersection |
| Inv | invert |
| IM | iron monument |
| I Pn | Iron Pin |
| IP | iron Pipe |
| Jt | joint |
| J | joule |
| Jct | junction |
| K | kelvin |
| Kn | kilo newton |
| Kpa | kilo pascal |
| Kg | kilogram |
| Kg/m3 | kilogram per cubic meter |
| Km | kilometer |
| K | Kip(s) |
| LS | Land Surveyor (licensed) |
| LSIT | Land Surveyor In Training |
| Ln | lane |
| Lg | large |
| Lat | latitude |
| Lt | left |
| L | length of curve |
| Lens | lenses |
| Lvl | level |
| LB | level book |
| Lvlng | leveling |
| Lht | light |
| LP | light pole |
| Ltg | lighting |
| Lig Co | lignite coal |
| Lig Sl | lignite slack |
| LF | linear foot |
| Liq | liquid |
| LL | liquid limit |
| L | litre |
| Lm | loam |
| Loc | location |
| LC | long chord |
| Long. | longitude |
| Lp | loop |
| LD | loop detector |
| Lm | lumen |
| Lum | luminaire |
| L Sum | lump sum |
| Lx | lux |
| ML | main line |
| M Hr | man hour |
| 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 |
| M | mega |
| Mer | meridian |
| M | meter |
| M/s | meters per second |
| M | mid ordinate of curve |
| Mi | mile |
| MM | mile marker |
| MP | mile post |
| Ml | milliliter |
| Mm | millimeter |
| Mm/hr | millimeters per hour |
| Min | minimum |
| Misc | miscellaneous |
| Mon | monument |
| Mnd | mound |
| Mtbl | mountable |
| Mtd | mounted |
| Mtg | mounting |
| Mk | muck |
| Mun | municipal |
| N | nano |
| NGS | National Geodetic Survey |
| NS | near side |
| Neop | neoprene |
| Ntwk | network |
| N | newton |
| N | North |
| NE | North East |
| NW | North West |
| NB | Northbound |
| No. or # | number |
| Obsc | obscure(d) |
| Obsn | observation |
| Ocpd | occupied |
| Ocpy | occupy |
| Off Loc | office location |
| 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 |
| PK | Parker-Kalon nail |
| Pa | pascal |
| PSD | passing sight distance |
| Pvmt | pavement |
| Ped | pedestal |
| Ped | pedestrian |
| PPP | pedestrian pushbutton post |
| Pen. | penetration |
| Perf | perforated |
| Per. | perimeter |
| PL | pipeline |
| Pl | place |
| P&P | plan & profile |
| PL | plastic limit |
| Pl | plate |
| Pt | point |
| 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 |
| PE | polyethylene |
| PVC | polyvinyl chloride |
| PCC | Portland Cement concrete |
| Lb or # | pounds |
| PP | power pole |
| Preempt | preemption |
| Prefab | prefabricated |
| Prfmd | 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 |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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# NDDOT ABBREVIATIONS

| | |
|---|---|
| Qty | quantity |
| Qtr | quarter |
| Rad or R | radius |
| RR | railroad |
| Rlwy | railway |
| Rsd | raised |
| RTP | random traverse point |
| Rge or R | range |
| 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 |
| Refl | reflectorized |
| RCB | reinforced concrete box |
| RCES | reinforced concrete end section |
| RCP | reinforced concrete pipe |
| RCPS | reinforced concrete pipe sewer |
| Reinf | reinforcement |
| Res | reservation |
| 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 |
| Salv | salvage(d) |
| Sd | sand |
| Sdy Cl | sandy clay |
| Sdy Cl Lm | sandy clay loam |
| Sdy Fl | sandy fill |
| Sdy Lm | sandy loam |
| San | sanitary sewer line |
| Sc | scoria |
| Sec | seconds |
| Sec | section |
| SL | section line |
| Sep | separation |
| Seq | sequence |
| Serv | service |
| Sh | shale |
| Sht | sheet |
| Shtng | sheeting |
| Shldr | shoulder |
| Sw | sidewalk |
| S | siemens |
| SD | sight distance |
| SN | sign number |
| Sig | signal |
| Si Cl | silt clay |
| Si Cl Lm | silty clay loam |
| Si Lm | silty loam |
| Sgl | single |
| 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 |
| SC | spiral to curve |
| ST | spiral to tangent |
| SB | split barrel sample |
| SH | sprinkler head |
| SV | sprinkler valve |
| Sq | square |
| SF | square feet |
| Km2 | square kilometer |
| M2 | square meter |
| SY | square yard |
| Stk | stake |
| Std | standard |
| N | standard penetration test |
| Std Specs | standard specifications |
| Sta | station |
| Sta Yd | station yards |
| 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 |
| SE | superelevation |
| SS | supplement specification |
| Supp | supplemental |
| Surf | surfacing |
| Surv | survey |
| Sym | symmetrical |
| SI | systems international |
| Tan | tangent |
| T | tangent (semi) |
| TS | tangent to spiral |
| Tel | telephone |
| Tel B | Telephone Booth |
| Tel P | telephone pole |
| Tv | television |
| Temp | temperature |
| Temp | temporary |
| TBM | temporary bench mark |
| T | tesla |
| T | thinwall tube sample |
| T/mi | tons per mile |
| Ts | topsoil |
| Twp or T | township |
| Traf | traffic |
| TSCB | traffic signal control box |
| Tr | trail |
| Transf | transformer |
| TB | transit book |
| Trans | transition |
| TT | transmission tower |
| Trans | transverse |
| Trav | traverse |
| TP | traverse point |
| Trtd | treated |
| Trmt | treatment |
| Qc | triaxial compression |
| TERO | tribal employment rights ordinance |
| Tpl | triple |
| TP | turning point |
| Typ | typical |
| Qu | unconfined compressive strength |
| Ugrnd | underground |
| USC&G | US Coast & Geodetic Survey |
| USGS | US Geologic Survey |
| Util | utility |
| VG | valley gutter |
| Vap | vapor |
| Vert | vertical |
| VC | vertical curve |
| VCP | vitrified clay pipe |
| V | volt |
| Vol | volume |
| 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 |
| W | watt |
| Wrng | wearing |
| Wb | weber |
| WIM | weigh in motion |
| W | west |
| WB | westbound |
| Wrng | wiring |
| W/ | with |
| W/o | without |
| WC | witness corner |
| WGS | world geodetic system |
| Z | zenith |

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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 PI | 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 |
| 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 |
| 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 |
| 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 |
| MID-CONT CABLE | Mid-Continent Cable |
| MIDSTATE TEL | Midstate Telephone Company |
| MINOT CABLE | Minot Cable Television |
| MINOT TEL | Minot Telephone Company |
| 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 |
| ONEOK | Oneok gas |
| OSHA | Occupational Safety and Health Administration |
| OTTR TL PWR | Otter Tail Power Company |
| 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 |
| RAMSEY R SEW | Ramsey Rural Sewer Association |
| RAMSEY RW | Ramsey Rural Water Association |
| RAMSEY UTIL | Ramsey County Rural Utilities |
| RED RIV TEL | Red River Rural Telephone |
| RESVTN TEL | Reservation Telephone |
| ROBRTS TEL | Roberts Company Telephone |
| R-RIDER ELEC | Roughrider Electric Coop |
| RRVW | Red River Valley & Western Railroad |
| RSR ELEC | R.S.R. Electric Cooperative |
| 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 |
| 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 | |
|---|---|
| 07-01-14 | |
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| DATE | CHANGE |
| | |

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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

## Proposed Topography

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

## Existing Utilities

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

## Proposed Utilities

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

## Traffic Utilities

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

## Sign Structures

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

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

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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

- Hidden Object
- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Centerline Main
- Centerline
- Existing Ground (Details)
- Existing Conditions
- 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

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| 07-01-14 | |
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| DATE | CHANGE |
| 09-23-16 | Added and Revised Items, Organized by Functional Groups |

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# Symbols

D-101-30

North Arrow (Half Scale)

Truck Mounted Attenuator

Type I Barricade

Type II Barricade

Type III Barricade

Catch Basin

Cairn or Stone Circle

Video Detection Camera

Storm Drain Cap or Stub

Corrugated Metal End Section 18 Inch

Corrugated Metal End Section 24 Inch

Corrugated Metal End Section 30 Inch

Corrugated Metal End Section 36 Inch

Corrugated Metal End Section 42 Inch

Corrugated Metal End Section 48 Inch

Concrete Foundation

Ground Connection Conductor

Neutral Connection Conductor

Phase 1 Connection Conductor

Phase 2 Connection Conductor

Traffic Cone

Signal Controller

Pad Mounted Signal Controller

Alignment Data Point

Emergency Vehicle Detector

Attenuation Device

Diamond Grade Delineator Type A

Diamond Grade Delineator Type B

Diamond Grade Delineator Type C

Diamond Grade Delineator Type D

Diamond Grade Delineator Type E

Flexible Delineator

Flexible Delineator Type A

Flexible Delineator Type B

Flexible Delineator Type C

Flexible Delineator Type D

Flexible Delineator Type E

Delineator Type A

Delineator Type A Reset

Delineator Type B

Delineator Type B Reset

Delineator Type C

Delineator Type D

Delineator Type E

Delineator Drums

Spot Elevation

Existing Access Control Arrow

Existing Artifact

Existing Flashing Beacon

Existing Benchmark

Existing Railroad Battery Box

Existing Bush or Shrub

Existing Gas Cap or Stub

Existing Sanitary Cap or Stub

Existing Storm Drain Cap or Stub

Existing Water Cap or Stub

Existing Sanitary Cleanout

Existing Concrete Foundation

Existing Traffic Signal Controller

Existing Pad Mounted Signal Controller

Existing Sixteenth Section Corner

Existing Quarter Section Corner

Existing Section Corner

Existing Railroad Crossbuck

Existing Satellite Dish

Existing Fuel Dispensers

Existing Flexible Delineator Type A

Existing Flexible Delineator Type B

Existing Flexible Delineator Type C

Existing Flexible Delineator Type D

Existing Flexible Delineator Type E

Existing Delineator Type A

Existing Delineator Type B

Existing Delineator Type C

Existing Delineator Type D

Existing Delineator Type E

Existing EFB Misc

Existing Flashing Beacon

Existing Pipe Mounted Flasher

Existing Pad Mounted Feed Point

Existing Pipe Mounted Feed Point with Pad

Existing Pole Mounted Feed Point

Existing Railroad Frog

Existing Snow Gate 18

Existing Snow Gate 28

Existing Snow Gate 40

Existing Headwall

Existing Pedestrian Head with Number

Existing Signal Head

Existing Sprinkler Head

Existing Fire Hydrant

Existing Catch Basin Drop Inlet

Existing Curb Inlet

Existing Manhole Inlet

Existing Junction Box

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# Symbols

D-101-31

- Existing Light Standard
- Existing High Mast Light Standard 10 Luminaire
- Existing High Mast Light Standard 3 Luminaire
- Existing High Mast Light Standard 4 Luminaire
- Existing High Mast Light Standard 5 Luminaire
- Existing High Mast Light Standard 6 Luminaire
- Existing High Mast Light Standard 7 Luminaire
- Existing High Mast Light Standard 8 Luminaire
- Existing High Mast Light Standard 9 Luminaire
- Existing Overhead Sign Structure Load Center
- Existing Luminaire
- Existing Light Standard Luminaire
- Existing Federal Mailbox
- Existing Private Mailbox
- Existing Meander Section Corner
- Existing Meter
- Existing Electrical Manhole
- Existing Gas Manhole
- Existing Sanitary Manhole
- Existing Sanitary Force Main Manhole
- Existing Sanitary Manhole with Valve
- Existing Storm Drain Manhole
- Existing Force Main Storm Drain Manhole
- Existing Force Main Storm Drain Manhole with Valve
- Existing Telephone Manhole
- Existing Manhole with Valve Water
- Existing Water Manhole
- Existing Mile Post Type A
- Existing Mile Post Type B
- Existing Mile Post Type C
- Existing Reference Marker
- Existing RW Marker
- Existing Utility Marker
- Iron Monument Found
- Iron Pin R/W Monument
- Existing Object Marker Type I
- Existing Object Marker Type II
- Existing Object Marker Type III
- Existing Electrical Pedestal
- Existing Telephone Pedestal
- Existing Fiber Optic Telephone Pedestal
- Existing TV Pedestal
- Existing Fiber Optic TV Pedestal
- Existing Fuel Filler Pipes
- Existing Traverse PI Aerial Panel
- Existing Pole
- Existing Power Pole
- Existing Power Pole with Transformer
- Existing Telephone Pole
- Existing Wood Pole
- Existing Post
- Existing Pedestrian Push Button Post
- Existing Control Point CP
- Existing Control Point GPS-RTK
- Existing Control Point TRI
- Existing Reference Marker Point NGS
- Existing Pull Box
- Existing Intelligent Transportation Pull Box
- Existing Water Pump
- Existing Slotted Reinforced Concrete Pipe
- Existing RR Profile Spot
- Existing Fuel Leak Sensors
- Existing Highway Sign
- Existing Miscellaneous Spot
- Existing Lighting Standard Pole
- Existing Traffic Signal Standard
- Existing Transformer
- Existing Large Evergreen Tree
- Existing Small Evergreen Tree
- Existing Large Tree
- Existing Small Tree
- Existing Tree Trunk
- Existing Pad Mounted Traffic Signal Control Box
- Existing Undefined Manhole
- Existing Undefined Pull Box
- Existing Undefined Pedestal
- Existing Undefined Valve
- Existing Undefined Pipe Vent
- Existing Gas Valve
- Existing Water Valve
- Existing Fuel Pipe Vent
- Existing Gas Pipe Vent
- Existing Sanitary Pipe Vent
- Existing Storm Drain Pipe Vent
- Existing Water Pipe Vent
- Existing Weather Station
- Existing Ground Water Well Bore Hole
- Existing Windmill or Tower
- Existing Witness Corner
- Flashing Beacon
- Flagger
- Pipe Mounted Flasher
- Sanitary Force Main with Valve

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# Symbols

D-101-32

- Pad Mounted Feed Point
- Pipe Mounted Feed Point with Pad
- Pole Mounted Feed Point
- Headwall
- Double Headwall with Vegitation Barrier
- Single Headwall with Vegitation Barrier
- Pole Mounted Head
- Sprinkler Head
- Fire Hydrant
- Inlet Type 1
- Inlet Type 2
- Double Inlet Type 2
- Inlet Grate Type 2
- Junction Box
- High Mast Light Standard 10 Luminaire
- High Mast Light Standard 3 Luminaire
- High Mast Light Standard 4 Luminaire
- High Mast Light Standard 5 Luminaire
- High Mast Light Standard 6 Luminaire
- High Mast Light Standard 7 Luminaire
- High Mast Light Standard 8 Luminaire
- High Mast Light Standard 9 Luminaire
- Relocate Light Standard
- Overhead Sign Structure Load Center
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 175 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 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 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 700 Watt High Pressure Sodium Vapor Luminaire
- Manhole
- Manhole 48 Inch
- Sanitary Force Main Manhole
- Sanitary Sewer Manhole
- Storm Drain Manhole
- Storm Drain Manhole with Inlet
- Reset Mile Post
- Mile Post Type A
- Mile Post Type B
- Mile Post Type C
- Right of Way Marker
- Tubular Marker
- Alignment Monument
- Iron Pin Reference Monument
- Object Marker Type I
- Object Marker Type II
- Object Marker Type III
- Caution Mode Arrow Panel
- Back to Back Vertical Panel Sign
- Double Direction Arrow Panel
- Left Directional Arrow Panel
- Right Directional Arrow Panel
- Sequencing Arrow Panel
- Truck Mounted Arrow Panel
- Power Pole
- Wood Pole
- Pedestrian Push Button Post
- Property Corner
- Pull Box
- Intelligent Transportation Pull Box
- Sanitary Pump
- Storm Drain Pump
- Reinforced Pavement
- Reinforced Concrete End Section 15 Inch
- Reinforced Concrete End Section 18 Inch
- Reinforced Concrete End Section 24 Inch
- Reinforced Concrete End Section 30 Inch
- Reinforced Concrete End Section 36 Inch
- Reinforced Concrete End Section 42 Inch
- Reinforced Concrete End Section 48 Inch
- Reinforced Concrete End Section 54 Inch
- Reset Right of Way Marker
- Reset USGS Marker
- Right of Way Markers
- Riser 30 Inch
- Continuous Split Barrel Sample (CSB)
- Flight Auger Sample (FA)
- Split Barrel Sample (SB)
- Thinwall Tube Sample
- Highway Sign
- SNOW GATE 18 FT
- SNOW GATE 28 FT
- SNOW GATE 40 FT
- Standard Penetration Test (N)
- Transformer
- Inclinometer Tube (Incl)
- Underdrain Cleanout
- Excavation Unit
- Water Valve

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| | |

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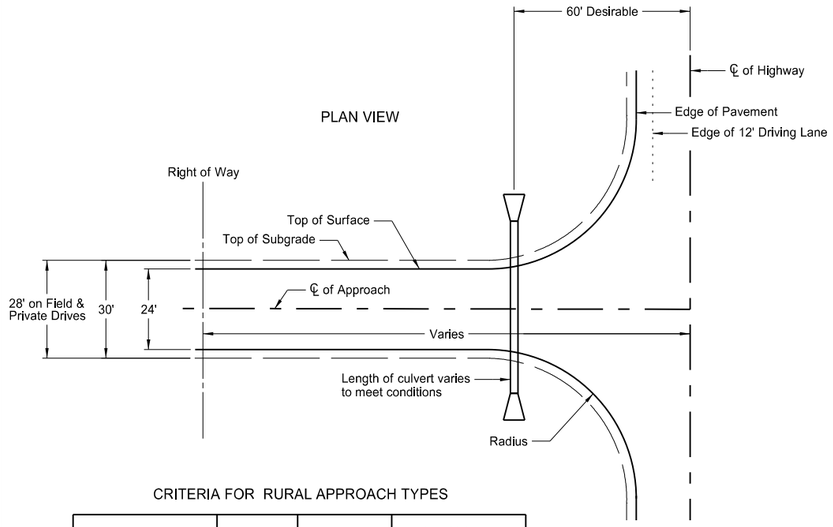
# STANDARD RURAL APPROACHES

D-203-8

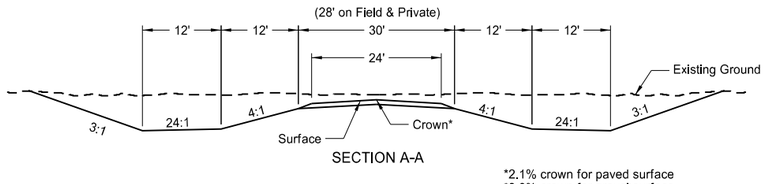
NOTES:

1. 5% Max Rollover between approach storage platform and highway.



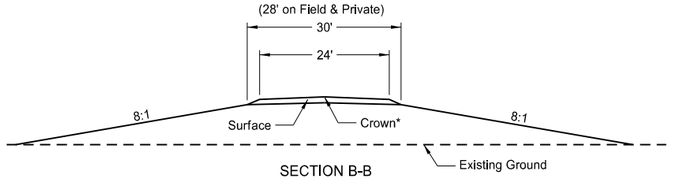

CRITERIA FOR RURAL APPROACH TYPES

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

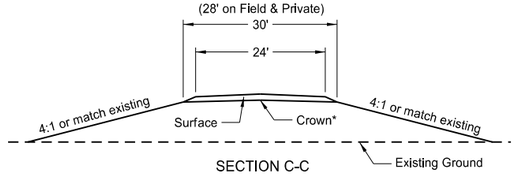



SECTION A-A

*2.1% crown for paved surface
*3.0% crown for gravel surface

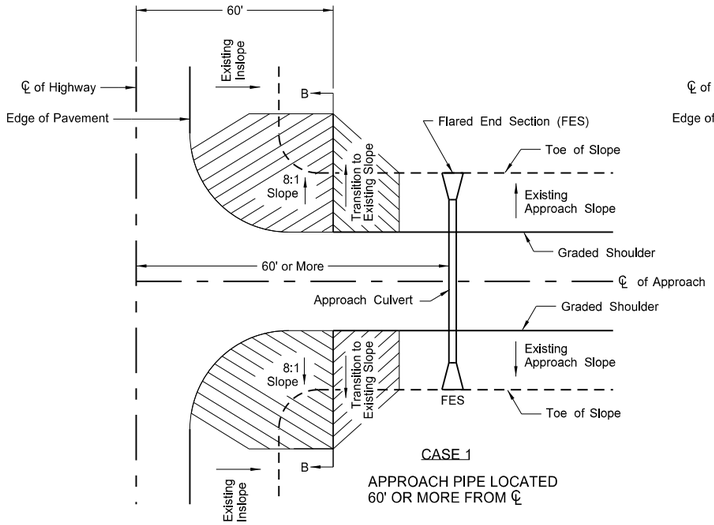



SECTION B-B



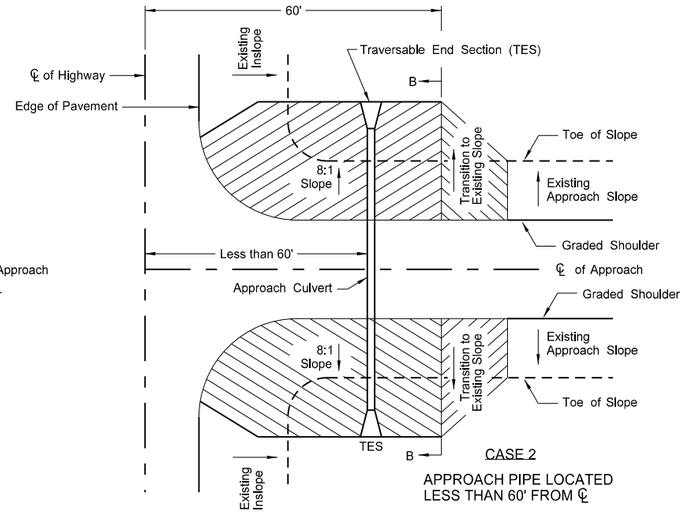

SECTION C-C

APPROACH INSLOPES



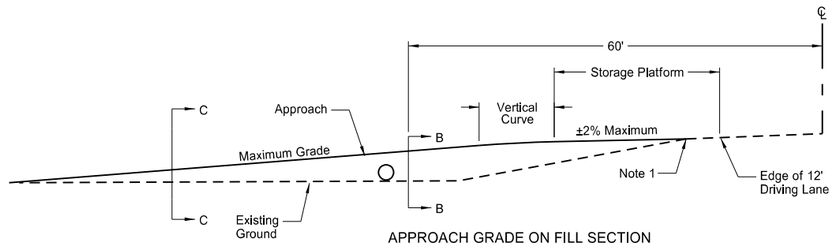

CASE 1

APPROACH PIPE LOCATED 60' OR MORE FROM ℄

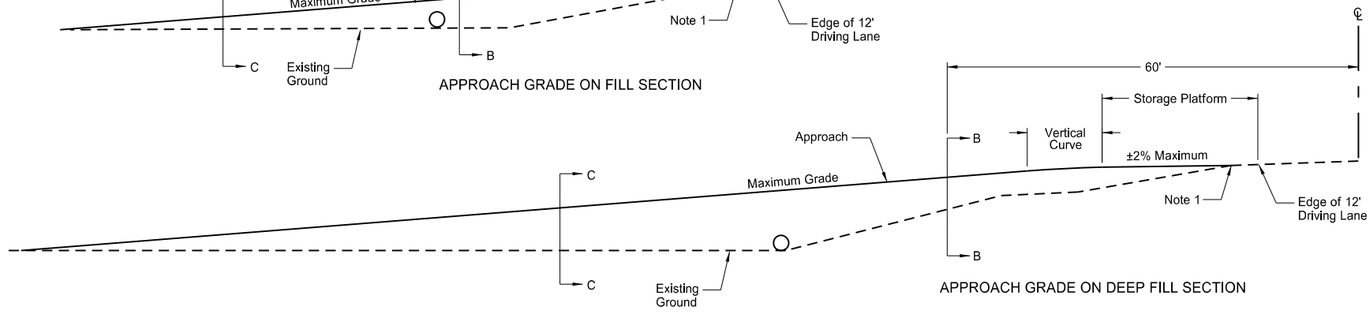



CASE 2

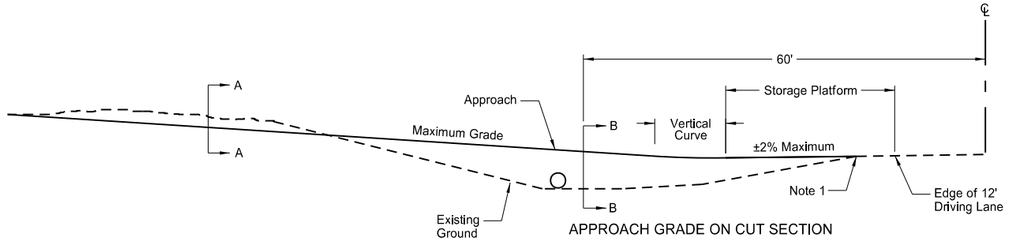
APPROACH PIPE LOCATED LESS THAN 60' FROM ℄




APPROACH GRADE ON FILL SECTION




APPROACH GRADE ON DEEP FILL SECTION




APPROACH GRADE ON CUT SECTION

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 2-25-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 6-30-2017 | Revised Radius, Storage Platform, Inslope dimensions, and Note 1. |

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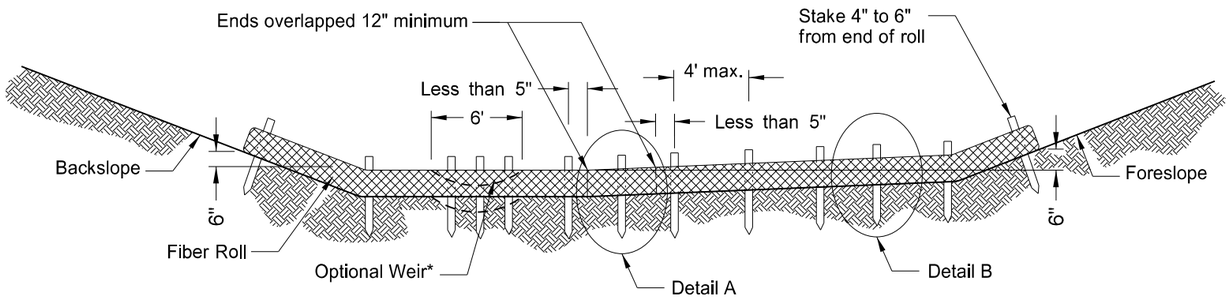
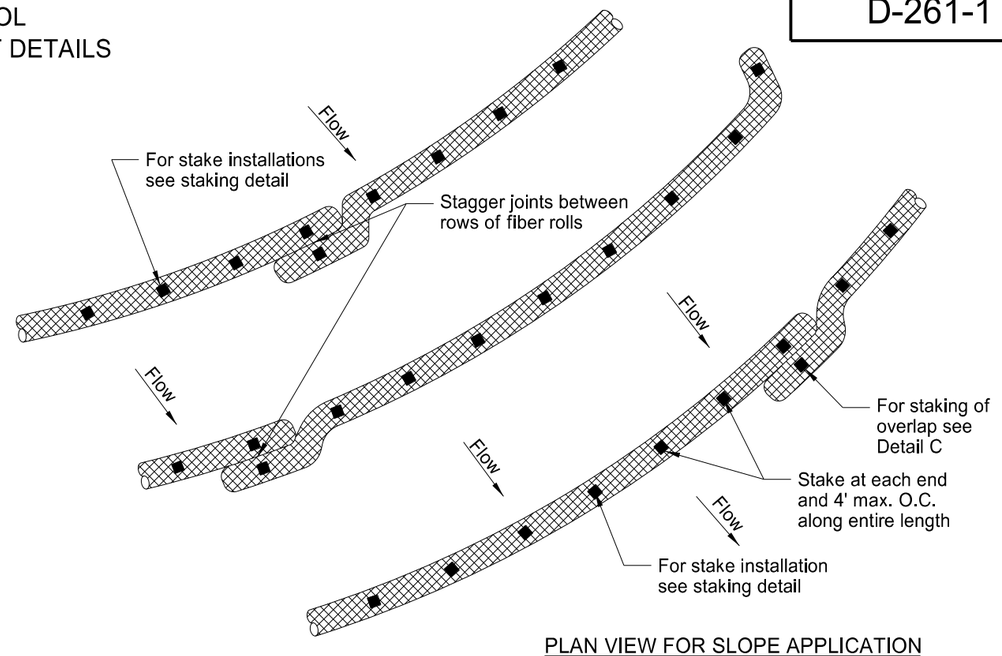
D-261-1

# EROSION CONTROL
# FIBER ROLL PLACEMENT DETAILS

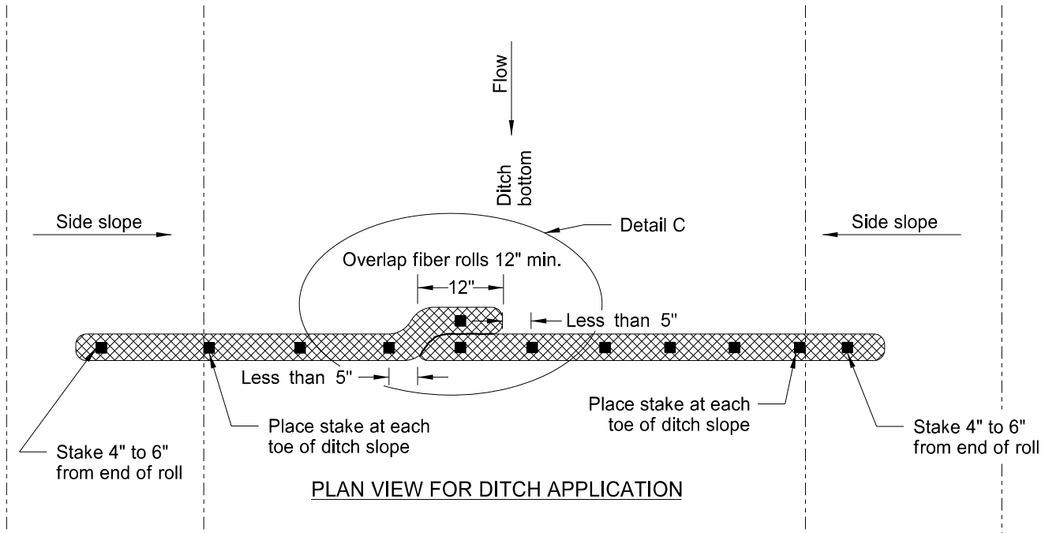



*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up on adjacent property.

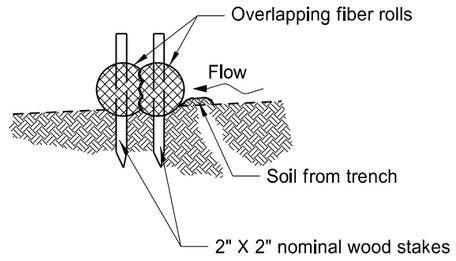
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM




PLAN VIEW FOR SLOPE APPLICATION

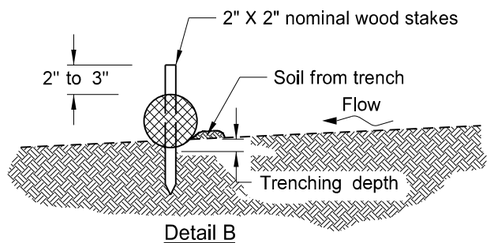



PLAN VIEW FOR DITCH APPLICATION




Detail A

Fiber Roll Overlapping Staking Detail




Detail B

Fiber Roll Staking Detail

| FIBER ROLL DIAMETER | NOMINAL STAKE SIZE | MINIMUM STAKE LENGTH | MINIMUM TRENCH DEPTH | MAXIMUM TRENCH DEPTH |
|---|---|---|---|---|
| 6" | 2" x 2" | 18" | 2" | 2" |
| 12" | 2" x 2" | 24" | 2" | 3" |
| 20" | 2" x 2" | 36" | 3" | 5" |

NOTE: Runoff must not be allowed to run under or around roll.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 11-18-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 06-10-13 | Added plan view for ditch and slope application. Added table with values for stake and trench dimensions. |
| 10-04-13 | Revised fiber roll overlap detail. |
| 06-26-14 | Changed standard drawing number from D-708-7 to D-261-1 |

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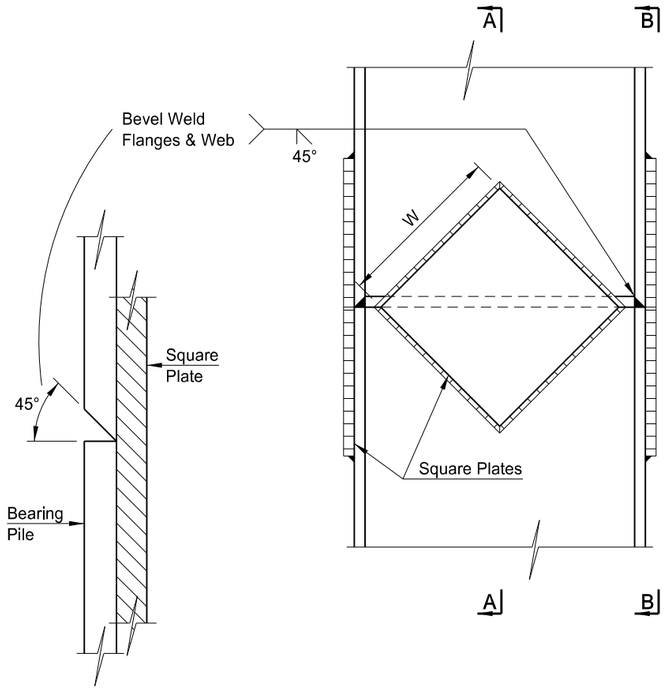
# PILE SPLICE DETAILS

D-622-1



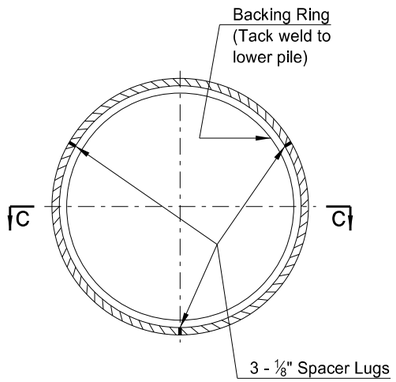

ENLARGED VIEW



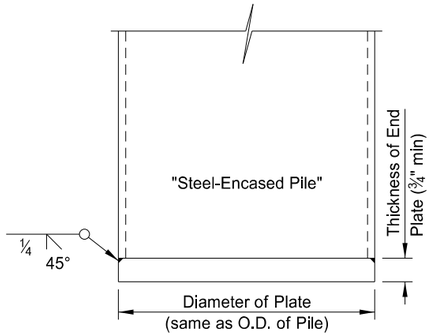

B-B

A-A

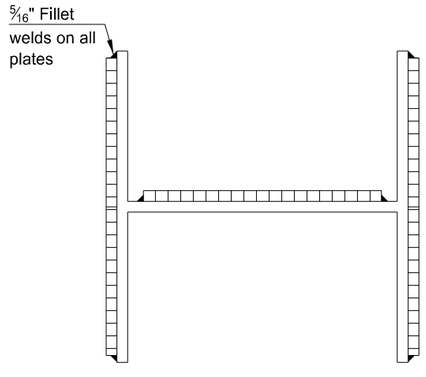
Flame scarf inside of both flanges and one side of web of upper section.




Backing Ring may be made from pile cut-offs or other material of a like quality.

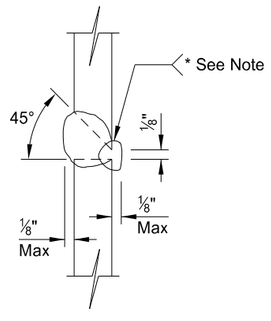



END PLATE DETAIL

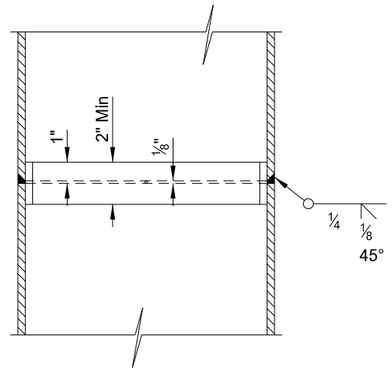



| PILE | 8" | 10" | 12" | 14" |
|---|---|---|---|---|
| "F" FLANGE | 5" | 6½" | 8" | 10" |
| "W" WEB | 4" | 5½" | 6½" | 8" |

H-PILE SPLICE DETAIL

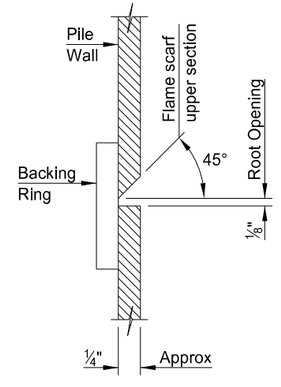



ALTERNATE H-PILE SPLICE DETAIL




C-C

STEEL-ENCASED CONCRETE PILE SPLICE DETAIL




ENLARGED VIEW

## NOTES:

Steel H-Pile may be spliced with complete penetration groove welds in both flanges and web in lieu of using the reinforcing plates.

AWS classification E7OXX Low Hydrogen Electrodes shall be used.

* Welds made without the use of backing material shall have the root gouged to sound metal and welded from the second side.

All welding shall conform to the current AASHTO/AWS D1.5 Bridge Welding Code.

The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.

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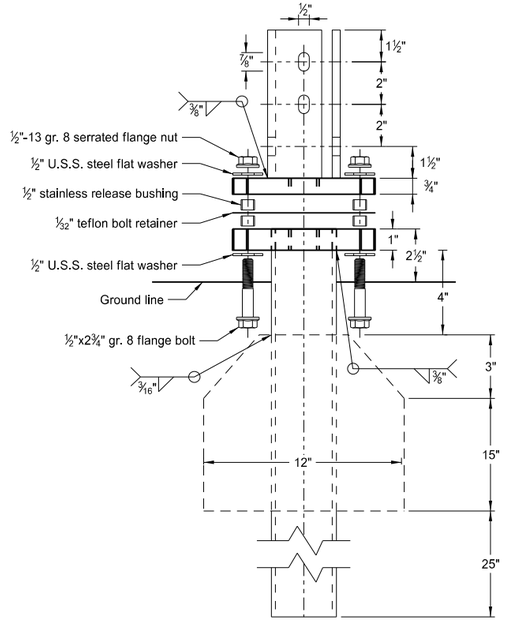
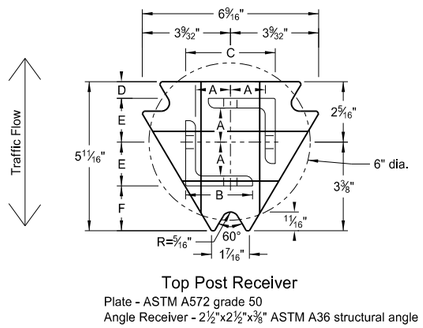
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

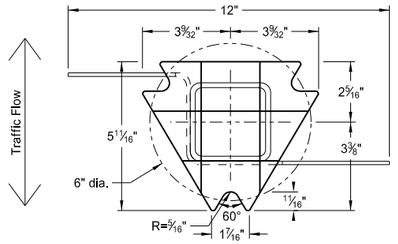



Multi-Directional
Slip Base Assembly

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

Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

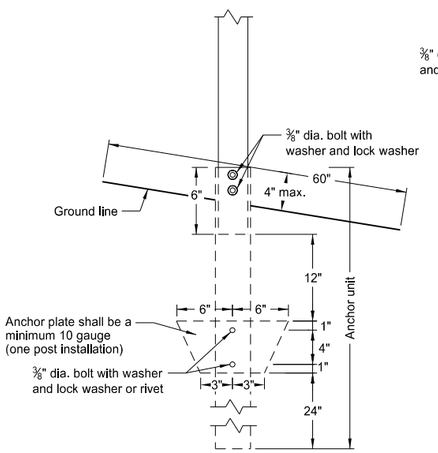
| Telescoping Perforated Tube | | | | | | |
|---|---|---|---|---|---|---|
| Number of Posts | Post Size in. | Wall Thick-ness Gauge | Sleeve Size in. | Wall Thick-ness Gauge | Slip Base | Anchor Size without Slip Base in. |
| 1 | 2 | 12 | | | No | 2¼ |
| 1 | 2¼ | 12 | | | No | 2½ |
| 1 | 2½ | 12 | | | (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 |

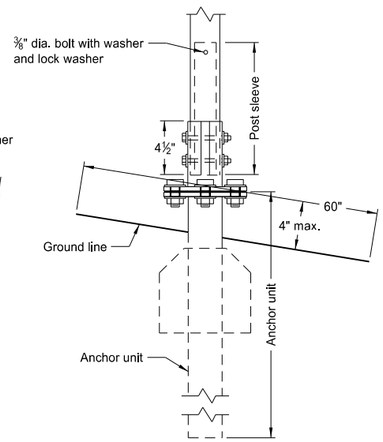
| Top Post Receiver Data Table | | | | | | |
|---|---|---|---|---|---|---|
| Square Post Sizes (B) | A | B | C | D | E | F |
| 2³⁄₁₆"x10 ga. | 1⁹⁄₆₄" | 2½" | 3¹⁄₃₂" | 25⁄₃₂" | 1³³⁄₆₄" | 1⅞" |
| 2½"x10 ga. | 1⁹⁄₃₂" | 2½" | 3⁵⁄₁₆" | ⅝" | 1²¹⁄₃₂" | 1¾" |

(A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.

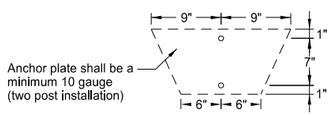
(B) The 2³⁄₁₆"x10 ga. may be inserted into 2½"x10 ga. for additional wind load.

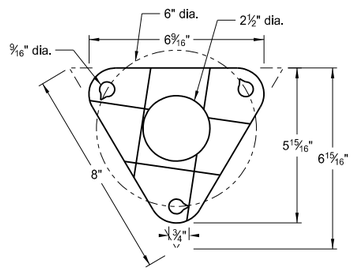



Anchor Unit and Post Assembly




Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly




Bolt Retainer for Base Connection
Bolt Retainer- ¹⁄₃₂" Reprocessed Teflon

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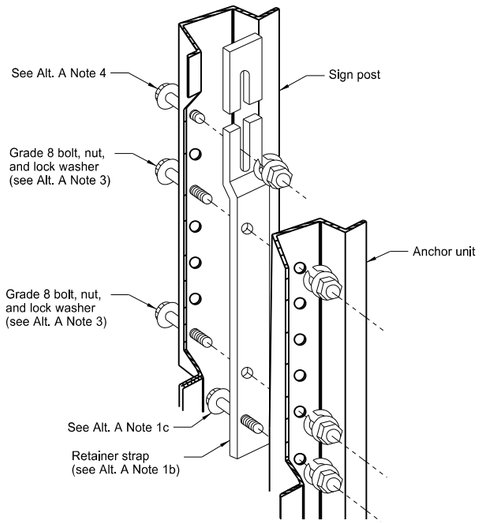
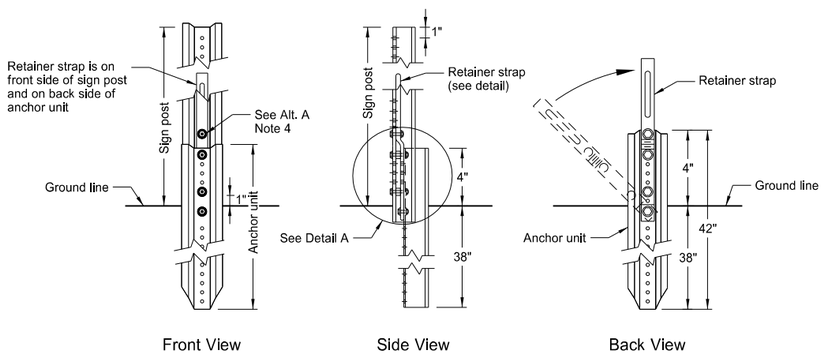
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

## U-Channel Post



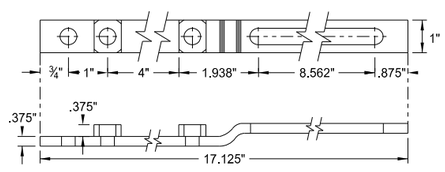

Detail A



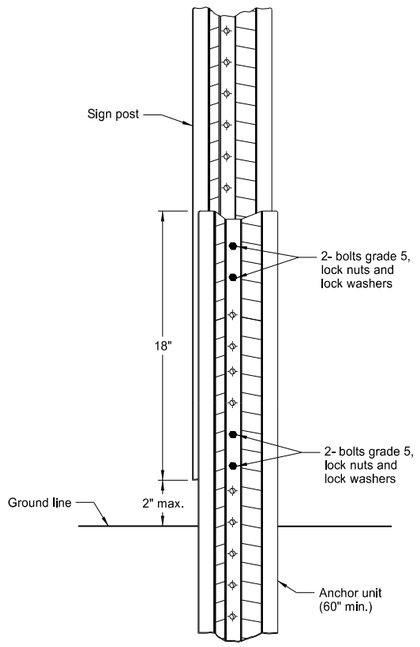

Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

A maximum of 2 posts shall be installed within 7'.

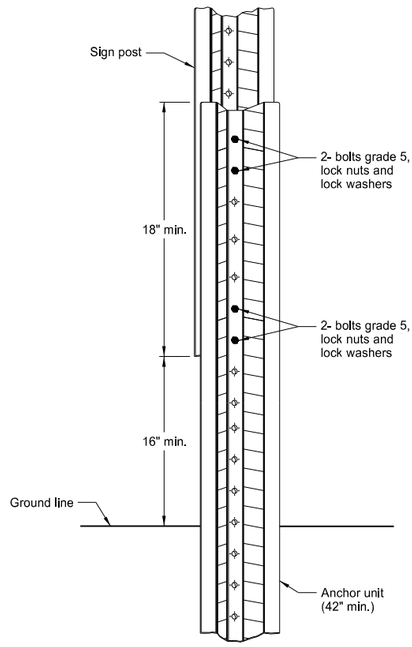



Retainer Strap Detail




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

A maximum of 3 posts shall be installed within 7'.




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

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Proper assembly established by lining up the bottom hole of retainer strap with the 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. The base post, strap and sign post shall be properly nested. 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.

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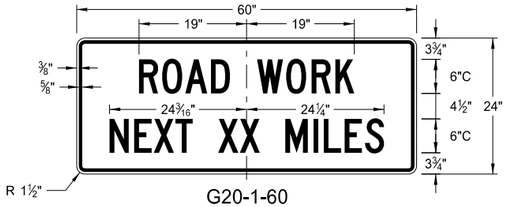
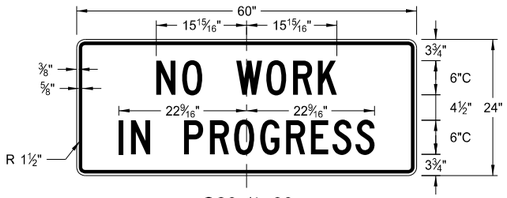
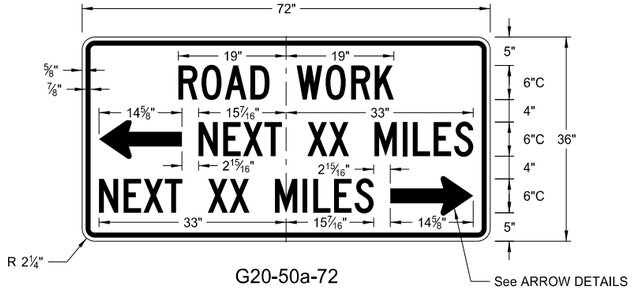
# CONSTRUCTION SIGN DETAILS
# TERMINAL AND GUIDE SIGNS



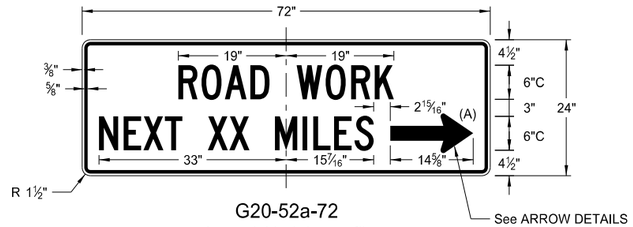

G20-1-60
Legend: black (non-refl)
Background: orange



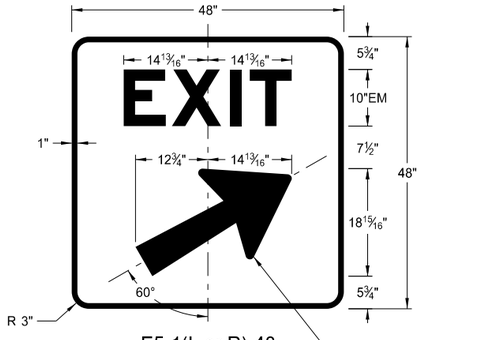

G20-1b-60
Legend: black (non-refl)
Background: orange



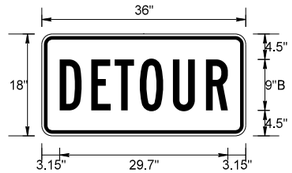

G20-50a-72
Legend: black (non-refl)
Background: orange



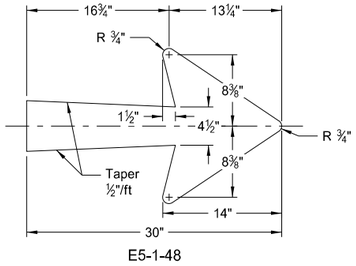

G20-52a-72
Legend: black (non-refl)
Background: orange



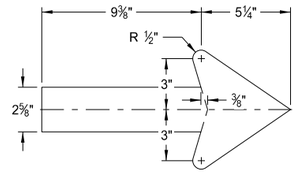

E5-1(L or R)-48
Legend: white
Background: green (orange optional)



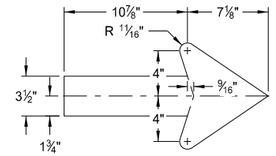

M4-8-36
Legend: black (non-refl)
Background: orange



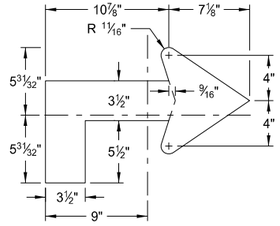
E5-1-48



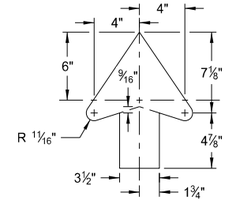
G20-50a-72
G20-52a-72



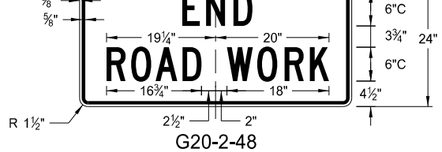
M4-9(L or R)-30
Right or Left



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

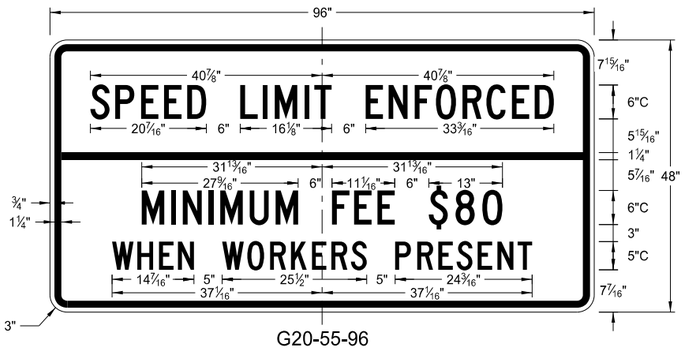


M4-9-30
Straight

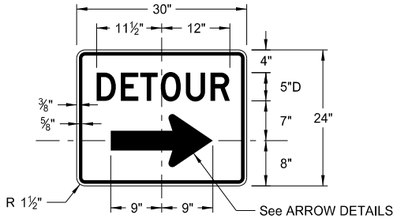



G20-2-48
Legend: black (non-refl)
Background: orange


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




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




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

## ARROW DETAILS

NOTES:

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

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| DATE | CHANGE |
| 8-17-17 | Added sign & background color |

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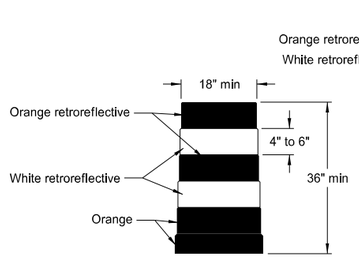
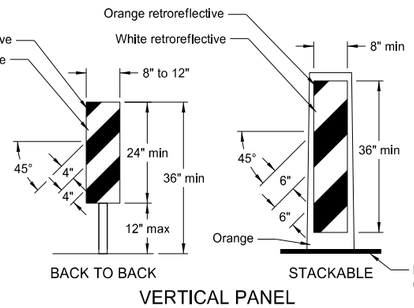
# BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



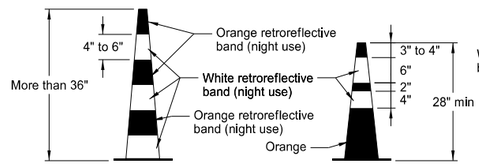

DELINEATOR DRUM

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.



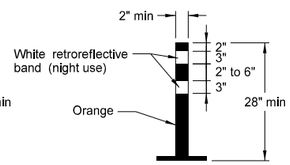

VERTICAL PANEL

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have 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, a stripe width of 6 inches shall be used.



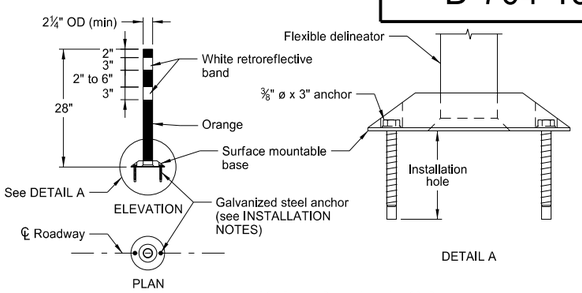

TRAFFIC CONE

Retroreflectorization of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized space between the orange and white stripes shall not exceed 3" wide.




TUBULAR MARKER

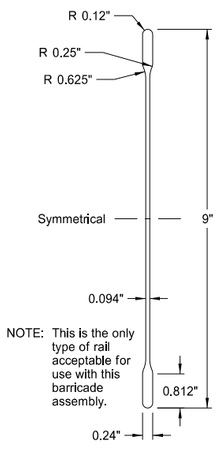
Retroreflectorization of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



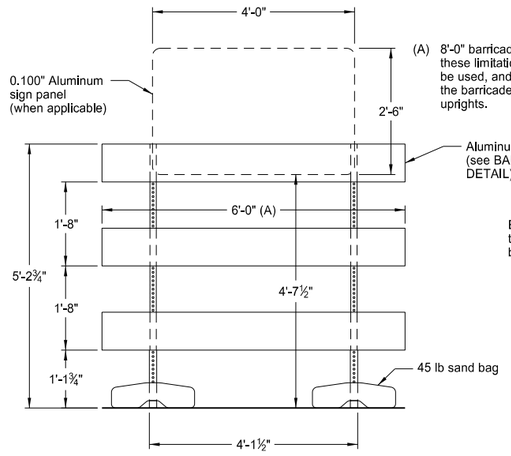

FLEXIBLE DELINEATOR

INSTALLATION NOTES:

1. Drill installation holes to diameter and depth as 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, the contractor may use an 8" x 8" butyl pad or hot melt butyl. Butyl shall be removed as close as possible to pavement surface.

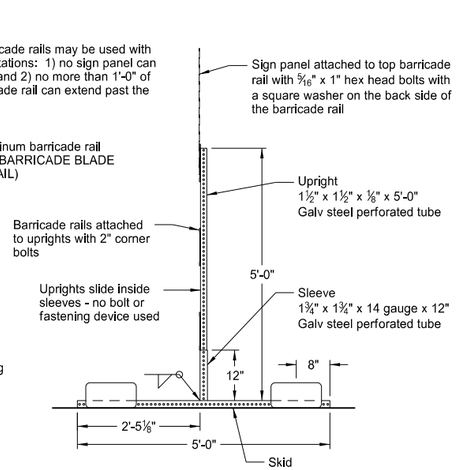



BARRICADE BLADE DETAIL



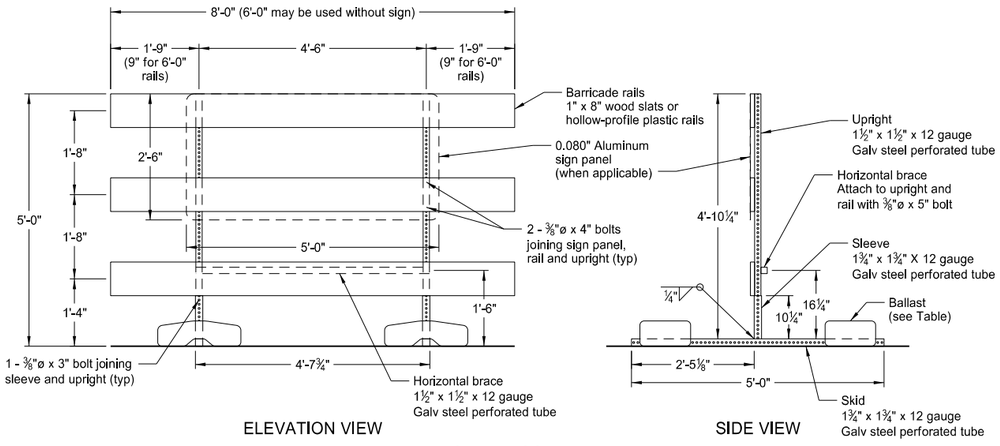

ELEVATION VIEW

(A) 8'-0" barricade rails may be used with these limitations: 1) no sign panel can be used, and 2) no more than 1'-0" of the barricade rail can extend past the uprights.




SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

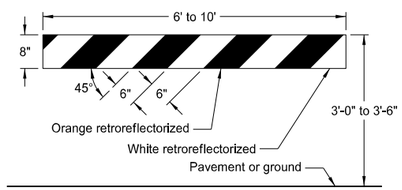



ELEVATION VIEW

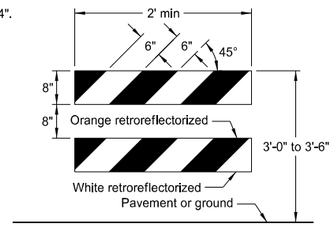
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

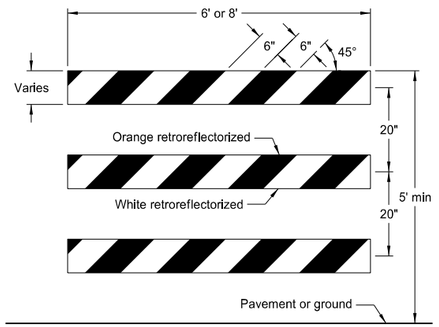
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".




TYPE I BARRICADE

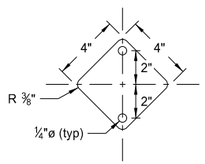


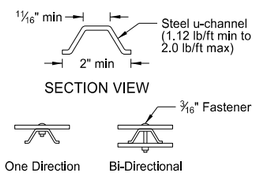

TYPE II BARRICADE

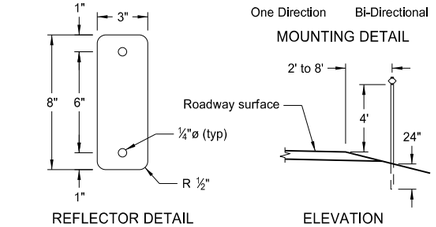



TYPE III BARRICADE

BARRICADE RAIL DETAILS




DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

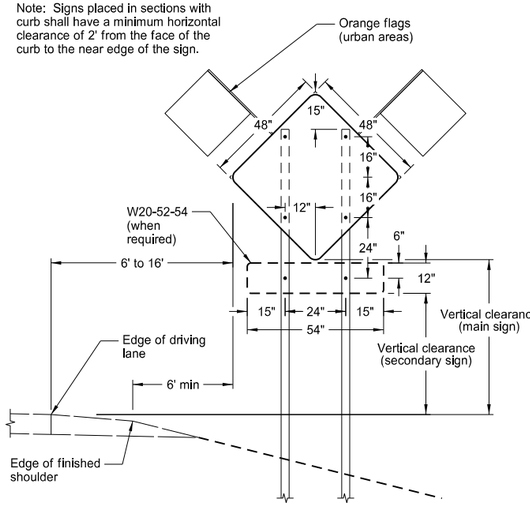
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 10/3/13 and the original document is stored at the North Dakota Department of Transportation

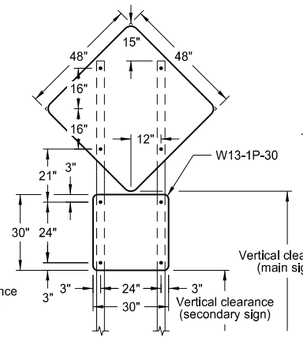
# CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

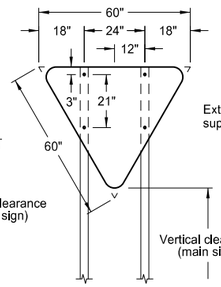
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



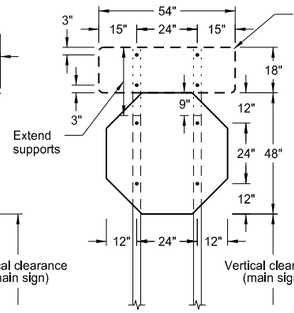

TYPICAL SECTION
(48" x 48" diamond warning sign shown)



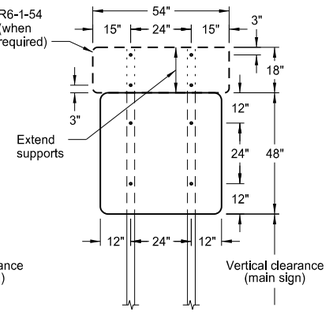

48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



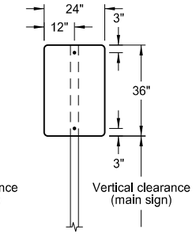

R1-2-60 - YIELD SIGN



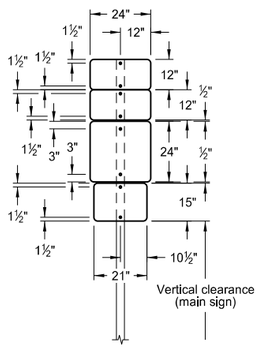

R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



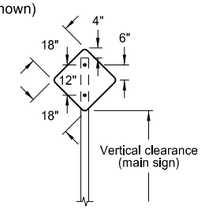

48" x 48" SIGN
(with R6-1-54 sign as required)



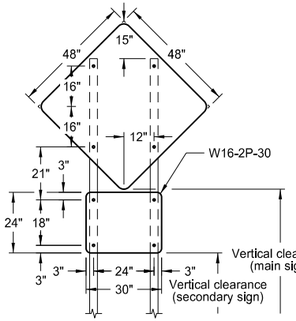

24" x 36" SIGN



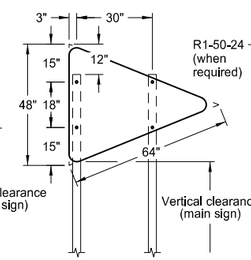

24" x 24"
ROUTE MARKER
ASSEMBLY



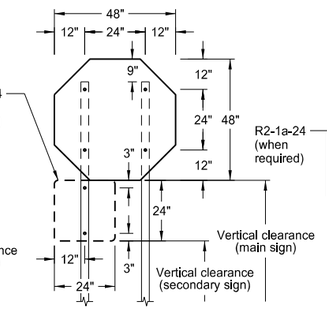

18" x 18"
DIAMOND SIGN



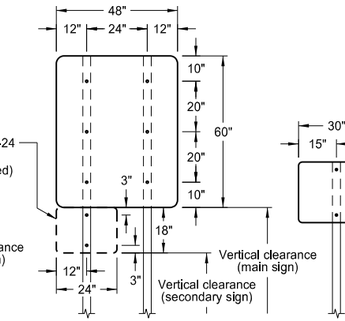

48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



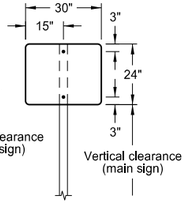

W14-3-64 - PENNANT SIGN



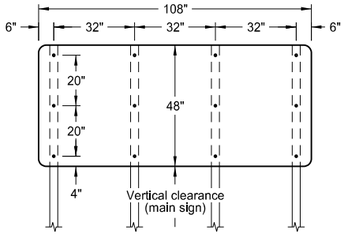

R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



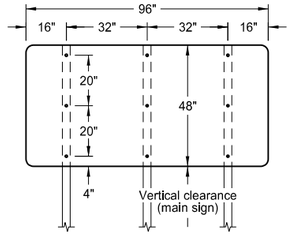

48" x 48" SIGN
(with R2-1a-24 sign as required)



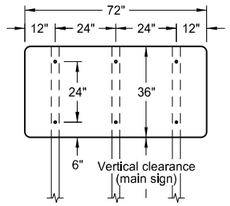

30" x 24" SIGN



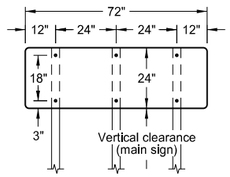

108" x 48" SIGN



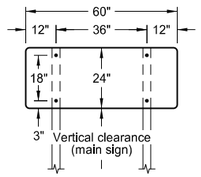

96" x 48" SIGN



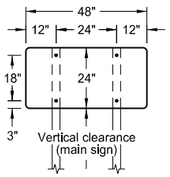

72" x 36" SIGN



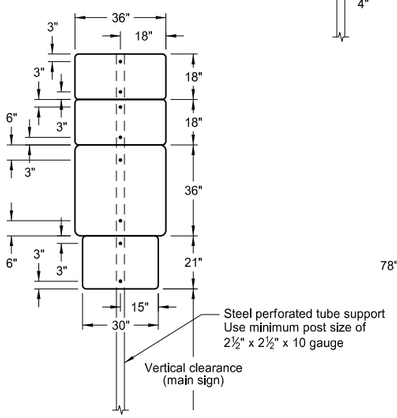

72" x 24" SIGN



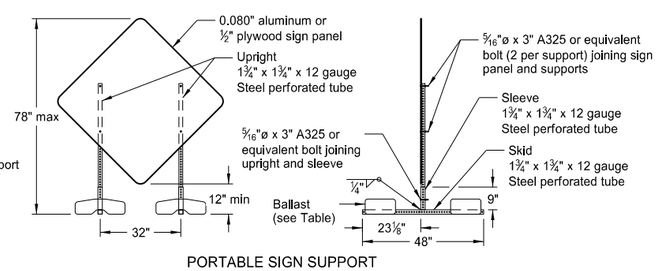

60" x 24" SIGN



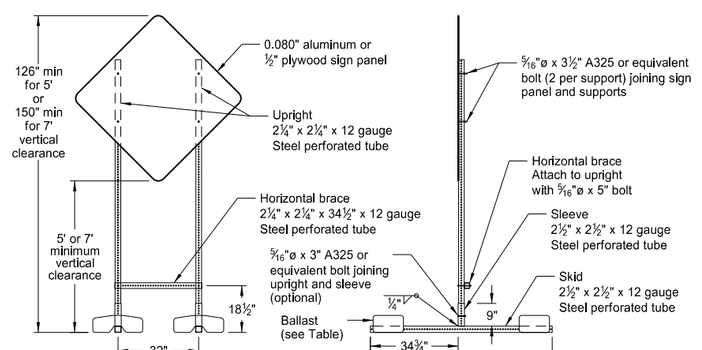

48" x 24" SIGN




36" x 36"
ROUTE MARKER
ASSEMBLY




PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT




PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Supports shall be galvanized or painted. 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, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.

   Signs over 50 square feet should be installed on 2½" x 2½" perforated tube supports as a minimum.

   Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.

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

3. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a 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 as stated above.

   Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.

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

   When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used 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. The R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.

   Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

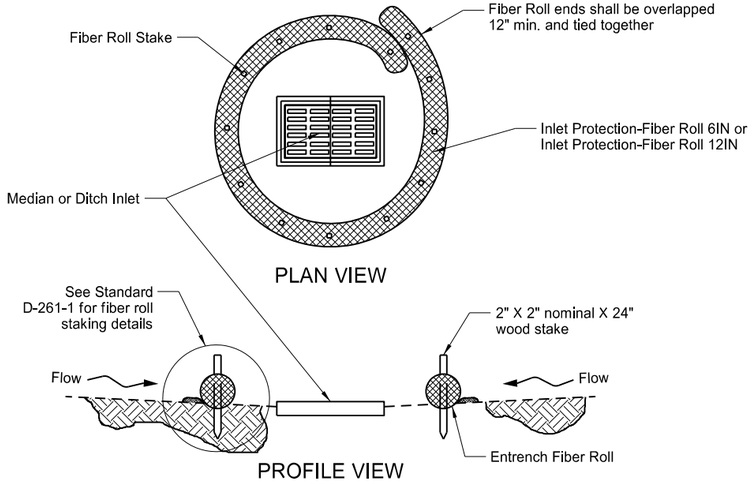
| Sign Panel Mounting Height (ft) | Number of 25 lb sandbags for 4' x 4' sign panel |
|---|---|
| 1' | 6 |
| 5' | 8 |
| 7' | 10 |

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

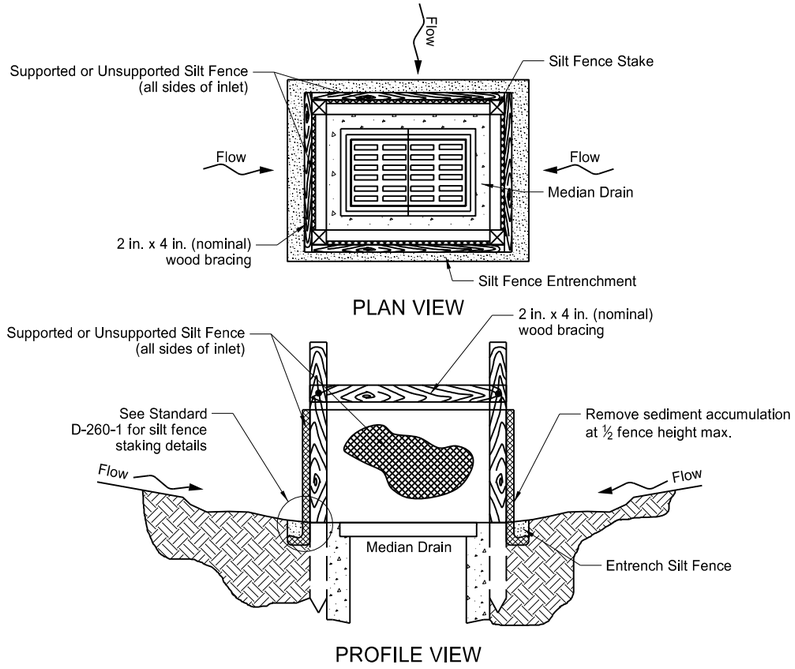
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-4-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 11-14-13 | Revised Note 6. |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 11/14/13 and the original document is stored at the North Dakota Department of Transportation

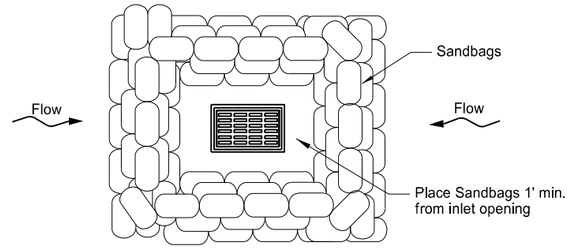
# EROSION AND SILTATION CONTROLS
# MEDIAN OR DITCH INLET PROTECTION



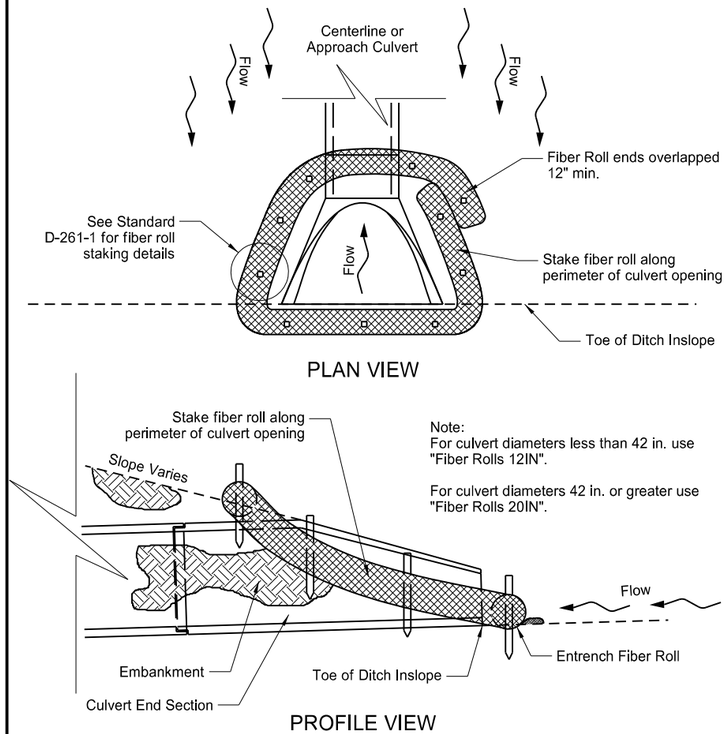

## FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



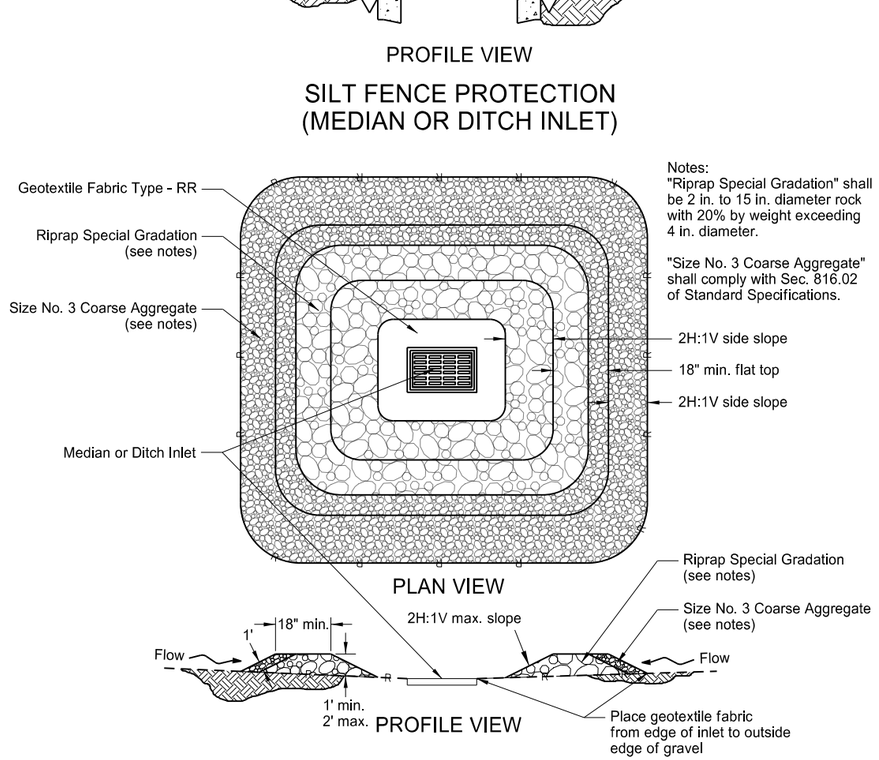

## SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



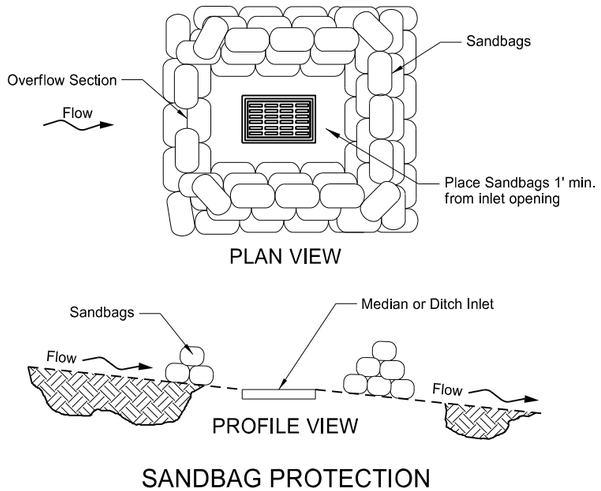

## SANDBAG PROTECTION (LOW POINT)




## FIBER ROLL PROTECTION (INLET OF CULVERT)




## GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



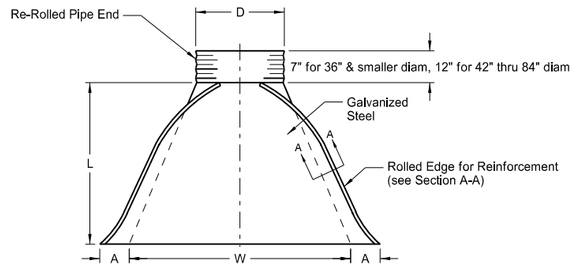

## SANDBAG PROTECTION (ON SLOPE)

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-03-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 06-26-14 | Updated reference to standard drawing number for fiber roll staking details. |
| 10-01-14 | Updated reference to standard drawing number for silt fence. |

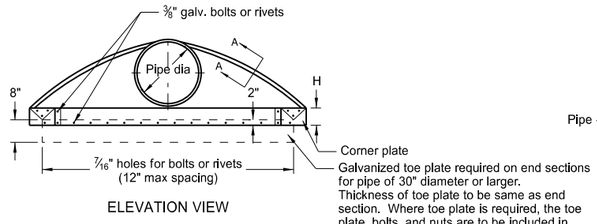
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 10/01/14 and the original document is stored at the North Dakota Department of Transportation

# ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4

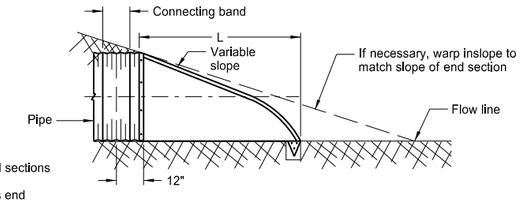



PLAN VIEW




ELEVATION VIEW

Galvanized toe plate required on end sections for pipe of 30" diameter or larger. Thickness of toe plate to be same as end section. Where toe plate is required, the toe plate, bolts, and nuts are to be included in price bid for end sections.




TYPICAL CROSS SECTION
(showing connector section)

| * * PIPE DIA. IN | GALV. THICK. IN | END SECTION DIMENSIONS A IN | B IN | H IN | L IN | W IN | APPROX. SLOPE RATE | BODY PIECE |
|---|---|---|---|---|---|---|---|---|
| 15 | 0.064 | 7 | 8 | 6 | 26 | 30 | 2½:1 | 1 |
| 18 | 0.064 | 8 | 10 | 6 | 31 | 36 | 2½:1 | 1 |
| 24 | 0.064 | 10 | 13 | 6 | 41 | 48 | 2½:1 | 1 |
| 30 | 0.079 | 12 | 16 | 8 | 51 | 60 | 2½:1 | 1 or 2 |
| 36 | 0.079 | 14 | 19 | 9 | 60 | 72 | 2½:1 | 2 |
| 42 | 0.109 | 16 | 22 | 11 | 69 | 84 | 2½:1 | 2 |
| 48 | 0.109 | 18 | 27 | 12 | 78 | 90 | 2½:1 | 2 |
| 54 | 0.109 | 18 | 30 | 12 | 84 | 102 | 2:1 | 2 |
| * 60 | 0.109 | 18 | 33 | 12 | 87 | 114 | 1¾:1 | 3 |
| * 66 | 0.109 | 18 | 36 | 12 | 87 | 120 | 1½:1 | 3 |
| * 72 | 0.109 | 18 | 39 | 12 | 87 | 126 | 1 1/3 :1 | 3 |
| * 78 | 0.109 | 18 | 42 | 12 | 87 | 132 | 1¼:1 | 3 |
| * 84 | 0.109 | 18 | 45 | 12 | 87 | 138 | 1 1/6 :1 | 3 |

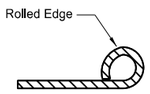
* These sizes have 0.109" sides and 0.138" center panels.

* * Pipe diameter is equal to dimension "D" of end section.

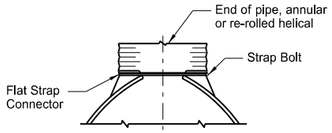
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

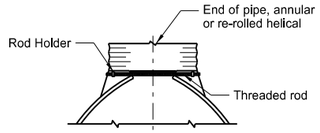
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



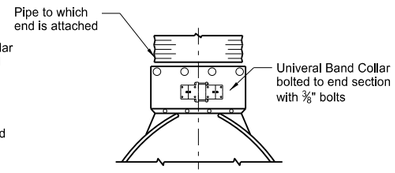

SECTION A-A




TYPE #1
For circular pipes with diameter 24" & smaller




TYPE #2
For circular pipes with diameter 30" through 36"

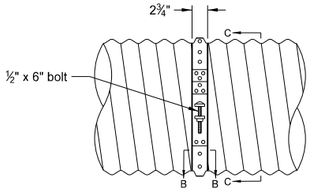



TYPE #3
For all pipe sizes

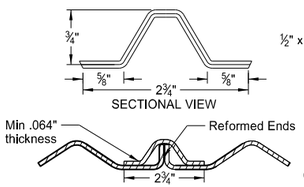
| COUPLING BAND DIMENSIONS | | | | |
|---|---|---|---|---|
| COUPLING TYPE | CORRUGATION PITCH x DEPTH | PIPE SIZE | COUPLING BAND LENGTH | MIN. BAND THICKNESS |
| Hat Band | 2⅔" x ½" | 12" - 48" | 2¾" | .064" |
| Annular Band | 2⅔" x ½" | 12" - 72" | 12" | .052" |
| | | 78" - 84" | 12" | .079" |
| | 3" x 1" | 48" - 120" | 14" | .052" |
| Hugger Band | 2⅔" x ½" Rerolled End | 12" - 72" | 10½" | .052" |
| | | 78" - 84" | 10½" | .079" |
| | 3" x 1" Rerolled End | 48" - 120" | 10½" | .052" |
| | 5" x 1" Rerolled End | 48" - 120" | 12" | .064" |

NOTES:

1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ⅜" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
3. Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
4. Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
5. ½" x 8" bolts may be used as a substitute for the ½" x 6" bolts shown in the details.
6. Coupling bands wider than 14" may be used if a minimum of four ½" bolts with maximum spacing of 5½" are used for the connection.
7. Length of spot welds shall be minimum ½".

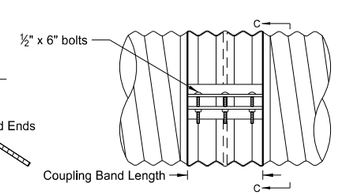



SIDE VIEW

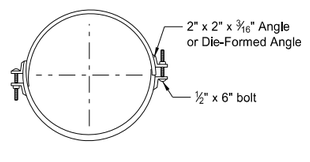



SECTION B-B

HAT BAND FOR FLANGED END PIPE

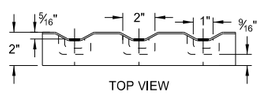



SIDE VIEW



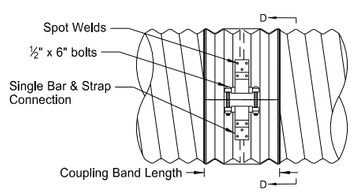

SECTION C-C
Angle Connection

ANNULAR BAND

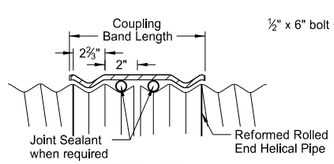



TOP VIEW

Die-Formed Angle Connector

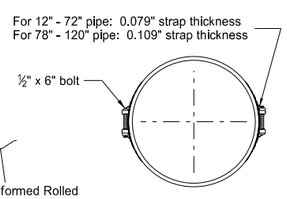



SIDE VIEW

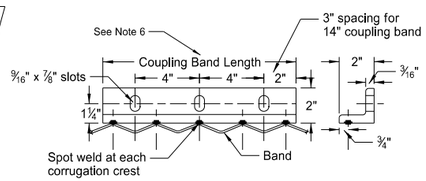



SECTIONAL VIEW

HUGGER COUPLING BAND



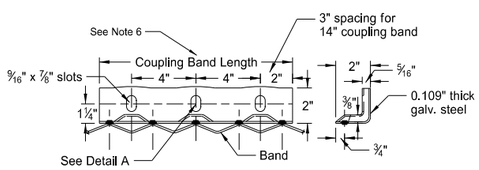

SECTION D-D
Bar & Strap Connection




SIDE VIEW

END VIEW

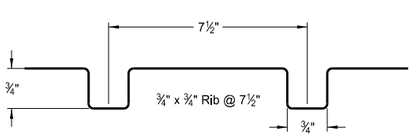
2" x 2" x 3/16" Angle Connector

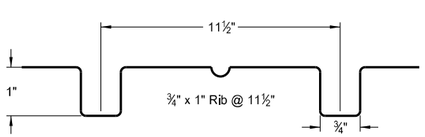



SIDE VIEW

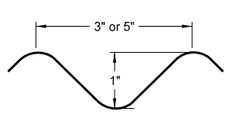
END VIEW

Die-Formed Angle Connector

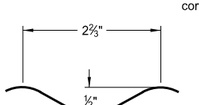


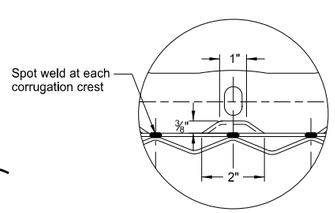

SPIRAL RIB CORRUGATIONS




3" x 1" CORRUGATIONS or
5" x 1" CORRUGATIONS




2⅔" x ½" CORRUGATIONS



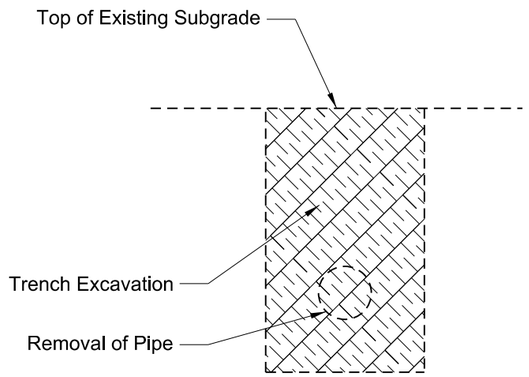

Detail A

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 08-06-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 01-07-14 | End Section Plan View |
| 02-27-14 | 3" x 1" Corrugation Detail |

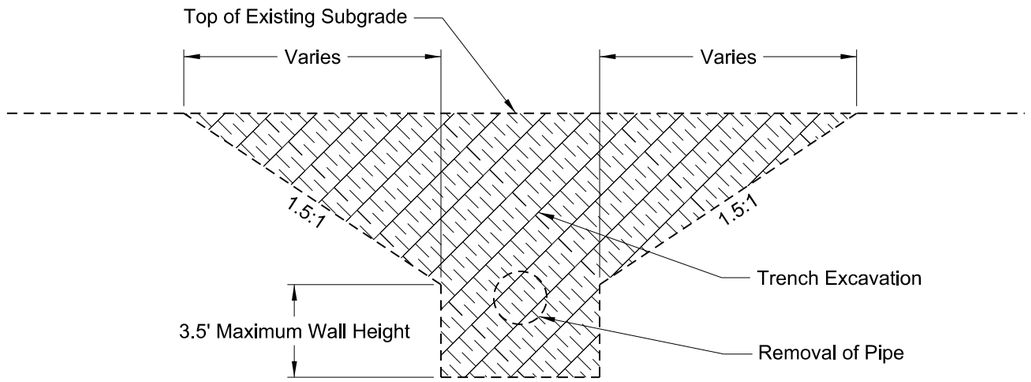
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 02/27/2014 and the original document is stored at the North Dakota Department of Transportation

# PIPE INSTALLATION DETAIL FOR LONGITUDINAL MAINLINE PIPE OR PIPE NOT UNDER THE ROADWAY

D-714-27




EXCAVATION DETAIL A



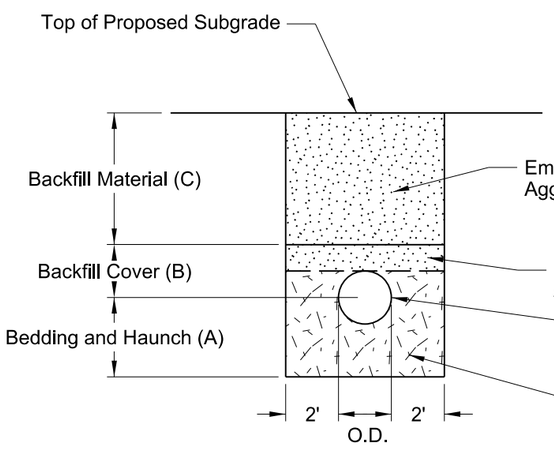

EXCAVATION DETAIL B

Pay Items
1) Pipe*
2) Removal of Pipe (if required)

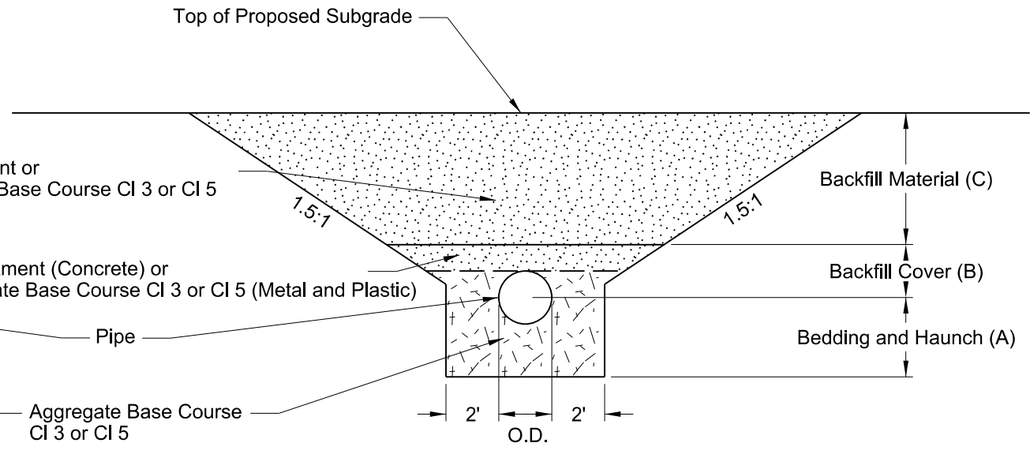
*Included in Pipe Pay Item
1) Pipe
2) Trench excavation
3) Aggregate base course Cl 3 or Cl 5
4) Embankment

NOTES:
1) This drawing does not apply to pipes in approaches.
2) It is the contactor's option to select Detail A or B.
3) Embankment may be either Borrow Excavation or Common Excavation - Type A

| Bedding and Haunch (A) |
|---|
| Pipes Not Under Roadway = 0.5 O.D. + 4 Inches |
| Pipes Under the Roadway = 0.5 O.D. + 2 Feet |
| |
| Backfill Cover (B) |
| Concrete Pipe = 0.5 O.D. |
| Metal and Plastic = 0.5 O.D. + 1 Foot |
| |
| Backfill Material (C) |
| Top of Pipe 4 Feet or Less Below the Top of Proposed Subgrade = Aggregate Base Course Cl3 or Cl 5 |
| Top of Pipe Greater than 4 Feet Below the Top of Proposed Subgrade = Common Excavation - Type A |
| Pipe Not Under Roadway = Common Excavation - Type B |




BACKFILL DETAIL A



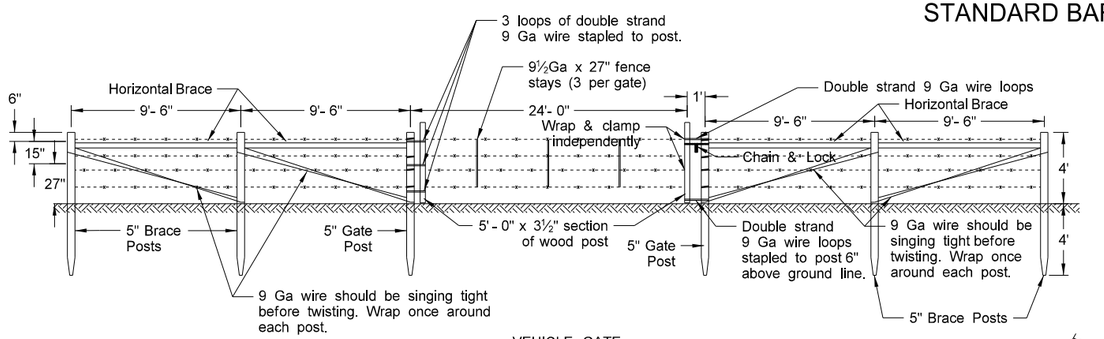

BACKFILL DETAIL B

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 7-26-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-15-13<br>1-21-15<br>12-10-15 | Label Formatting<br>Nomenclature<br>Added Plastic Pipe |

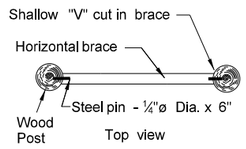
This document was originally issued and sealed by Ron Horner, Registration Number PE-2087, on 12/10/2015 and the original document is stored at the North Dakota Department of Transportation

# STANDARD BARBED WIRE FENCE

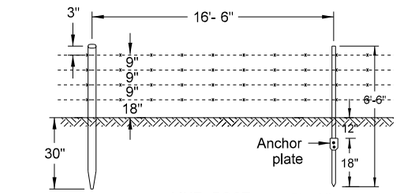
D-752-1




VEHICLE GATE




HORIZONTAL BRACE DETAIL




Wood line post (16'-6" Spacing) LINE POST DETAIL Steel line post (16'-6" Spacing)

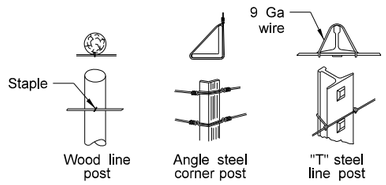
NOTES

1. No deduction in measured pay length of cable fence will be made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Abutment fencing shall be included in the price bid for fencing bid items.

2. Double brace assemblies shall be installed at locations shown on the plans or established by the Engineer. The distance between adjacent fence terminals, corner assemblies, or double brace assemblies shall not exceed 1,320 feet.

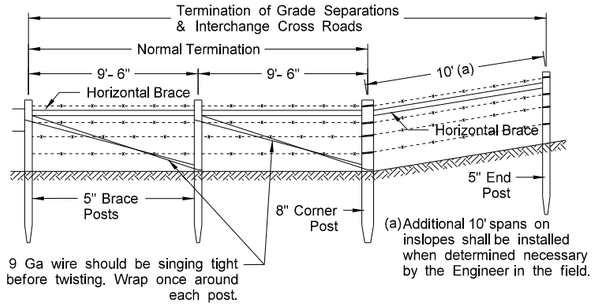
3. Cost of furnishing and installing inserts and eyebolts shall be included in the unit price bid for fencing bid items. Eyebolts shall be galvanized according to AASHTO designation M-30; inserts of corrosion resistant material need not be galvanized. Concrete inserts shall be of such design that, when installed in the concrete, will be capable of developing the full strength of the ⅝" diameter threaded eyebolt.

4. The type of posts to be used, either wood or steel, shall be determined by the contractor unless otherwise specified in the plans.

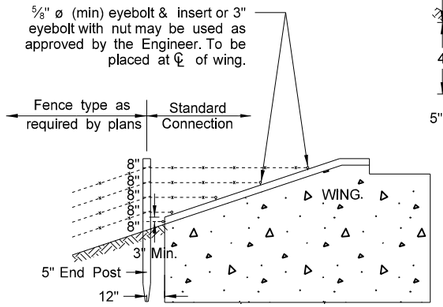



FASTENING TO POSTS

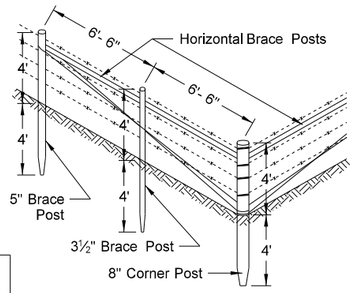
| POST SIZES | | | | | |
|---|---|---|---|---|---|
| | TREATED WOOD | | STEEL | | |
| USE OF POST | Post dia. | Post length | Post length | Post wt. Lbs/Ft | Anchor wt. Lbs. |
| Line post | 3½" | 6'-6" | 6'-6" | 1.33 | 0.67 |
| Corner post | 8" | 8' | 7' | 4.10 | (Conc.) |
| End post | 5" | 8' | | | |
| Brace post | 5" / 3½" | 8' | 7' | 3.19 | (Conc.) |
| Gate post | 5" | 8' | | | |
| Horizontal brace | 3½" | Var. | As appoved by the Engineer | | |



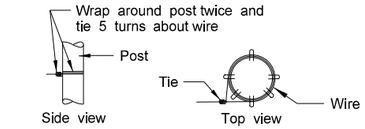

FENCE TERMINAL



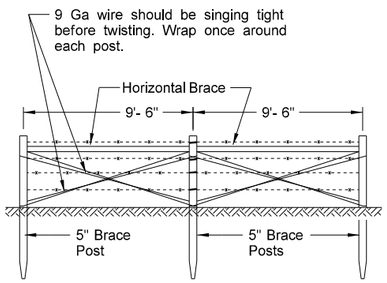

DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS



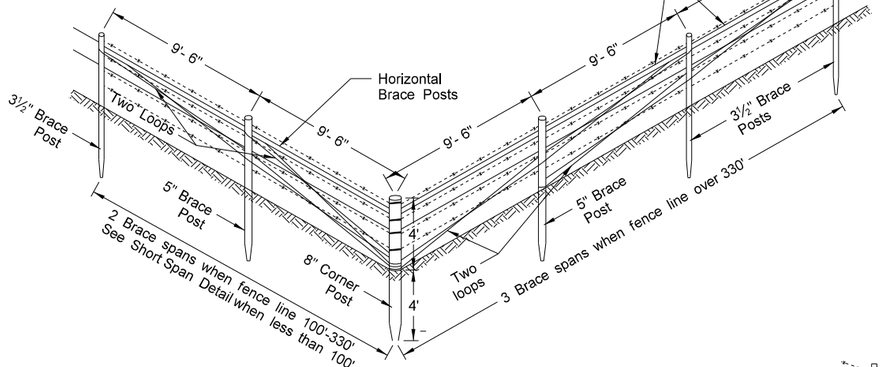

SHORT SPAN DETAIL (FENCE LINE 100' OR LESS)



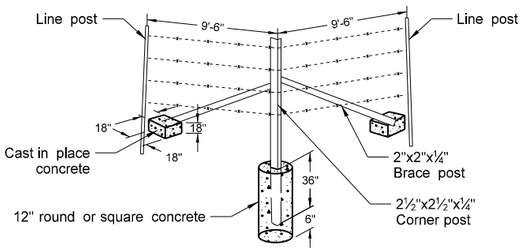

WRAP-AROUND DETAIL



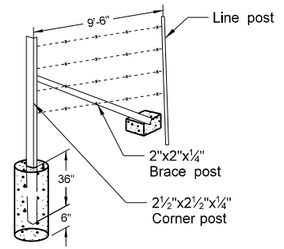

DOUBLE BRACE ASSEMBLY



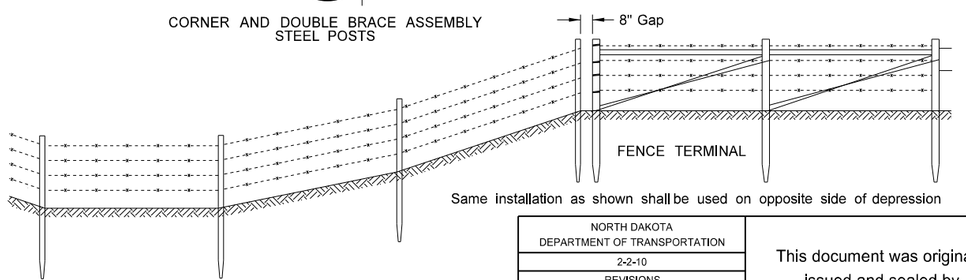

CORNER ASSEMBLY




CORNER AND DOUBLE BRACE ASSEMBLY STEEL POSTS

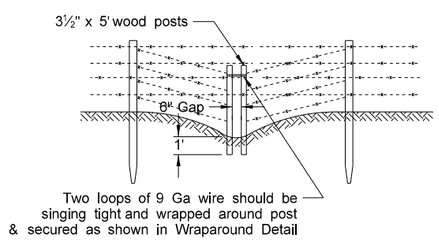



FENCE TERMINAL STEEL POSTS

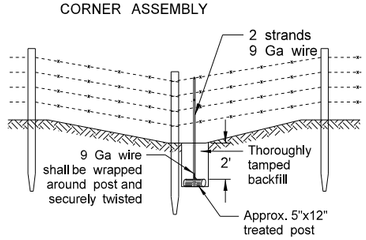



Same installation as shown shall be used on opposite side of depression

FENCING FOR WIDE DEPRESSIONS




BREAK-AWAY FENCE FOR NARROW DEPRESSIONS SUBJECT TO FLOODING



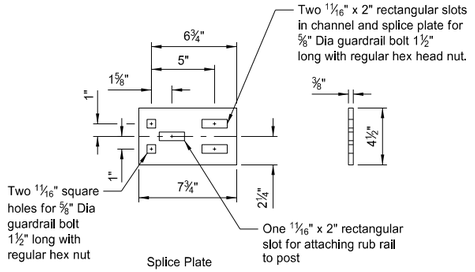

DETAIL FOR ANCHORING FENCES IN DEPRESSIONS*
*Locations shall be determined in the field and included in price bid for fencing. Other methods of anchoring the fence may be used if approved by the Engineer.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 2-2-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-02-12 | Notes, steel assemblies/posts |
| 11-25-13 | Revised Vehicle Gate |

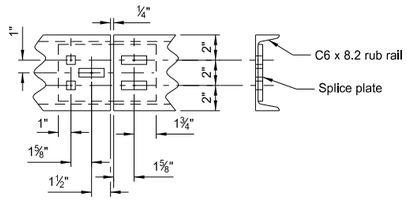
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 11/25/2013 and the original document is stored at the North Dakota Department of Transportation

# W-BEAM GUARDRAIL GENERAL DETAILS

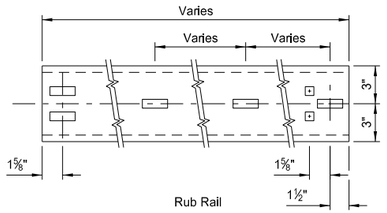
D-764-1




Splice Plate

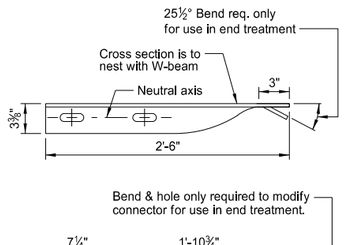



Splice Detail

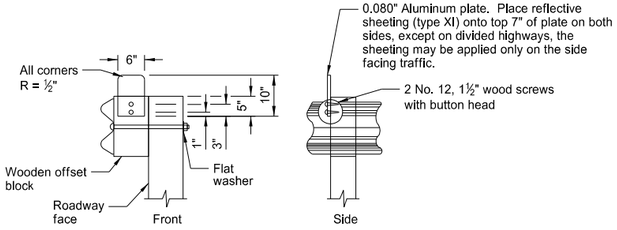



Rub Rail

## C6x8 RUB RAIL AND SPLICE PLATE

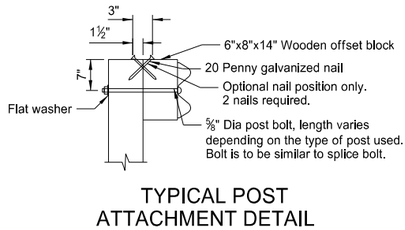



## W BEAM TERMINAL CONNECTOR

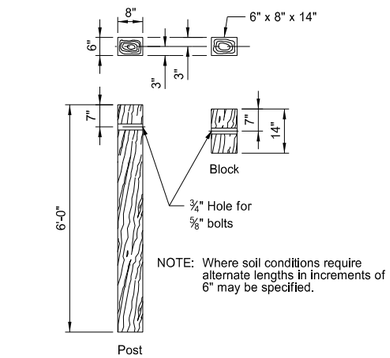



## REFLECTORIZED PLATE DETAIL

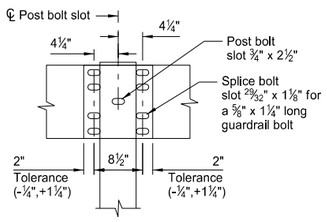
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



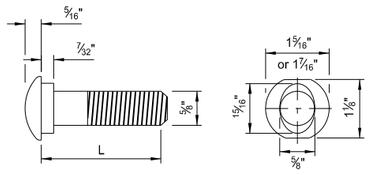

## TYPICAL POST ATTACHMENT DETAIL



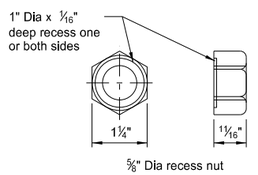

## 6"x8" TIMBER POST & BLOCK



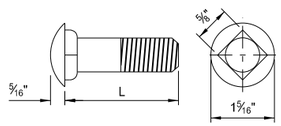

## SPLICE DETAIL




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

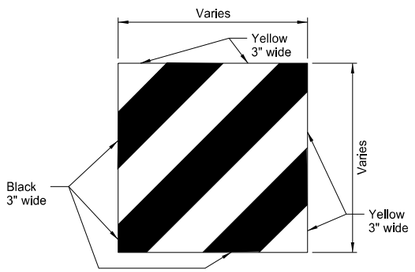



## 5/8" GUARDRAIL BOLT & RECESS NUT

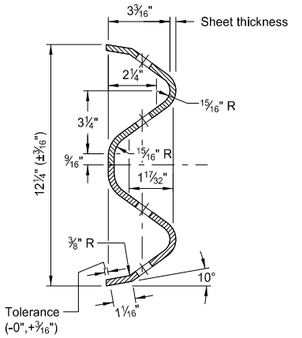



| 5/8" Diameter Carriage Bolt | |
|---|---|
| L | Thread Length |
| 1 1/2" | Full length thread |
| 3" | 1 1/2" Min thread length |
| 11" | 1 3/4" Min thread length |
| 13" | 1 3/4" Min thread length |


## 5/8" CARRIAGE BOLT & NUT




## IMPACT HEAD OBJECT MARKER




## W-BEAM CROSS SECTION

NOTES:

1. Reflectorized plates: Reflector plates shall begin at the first post and be spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
2. Manner of replacing bituminous material at guardrail post: All excess earth from excavations for guard posts shall be disposed of as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. The Object Marker shall fit within the vertical edges of the Impact Plate. The retroreflective sheeting shall be type XI sheeting meeting the requirements of Section 894.02.B of the standard specifications. The sheeting shall be applied to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. The Object Marker shall attach to the Impact Head Plate with rivets or some other attachment device. The rivets or attachment device shall be non-rust. The stripes shall slope downward toward the roadway side.
4. Guardrail installation height tolerance = - 1/4" , + 1".

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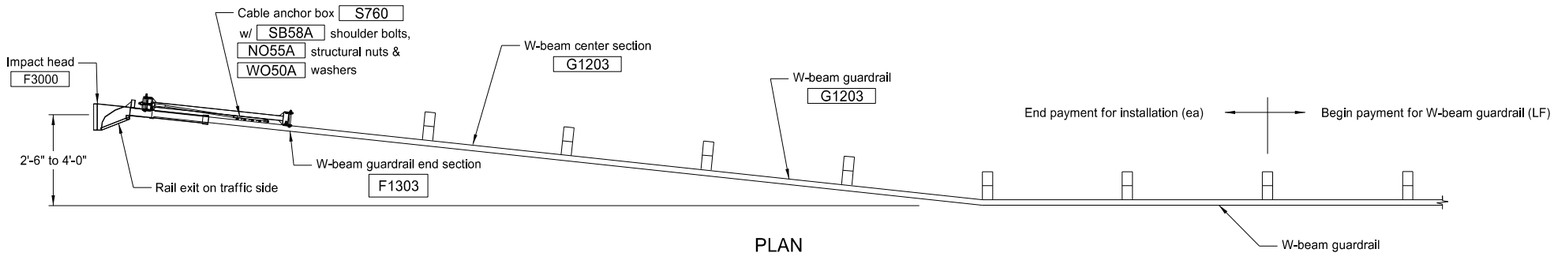
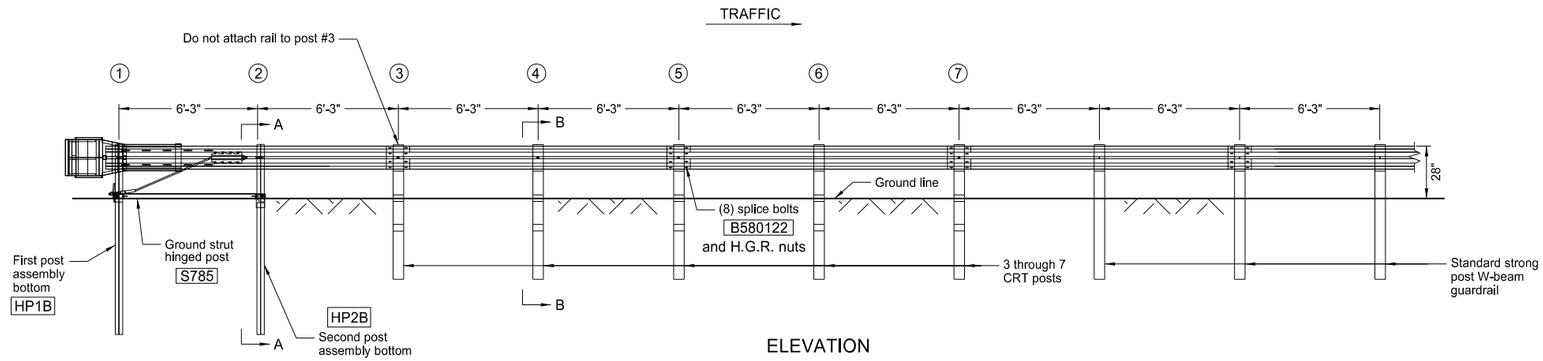
# FLARED ENERGY ABSORBING TERMINAL

D-764-6




PLAN

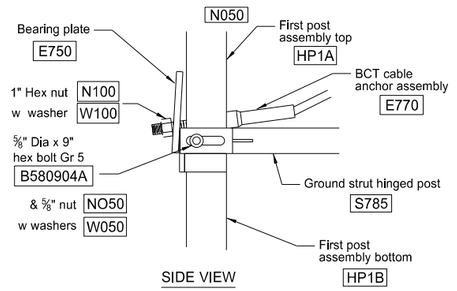



ELEVATION

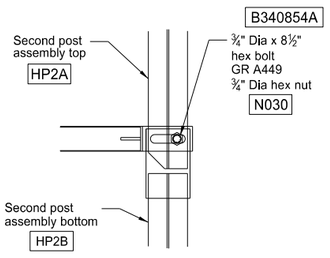
| ITEM # | QTY | BILL OF MATERIALS |
|---|---|---|
| F3000 | 1 | IMPACT HEAD |
| F1303 | 1 | W-BEAM GUARDRAIL END SECTION, 12 GA |
| G1203 | 2 | W-BEAM GUARDRAIL, 12 GA |
| HP1A | 1 | FIRST POST ASSEMBLY TOP |
| HP1B | 1 | FIRST POST ASSEMBLY BOTTOM |
| HP2A | 1 | SECOND POST ASSEMBLY TOP |
| HP2B | 1 | SECOND POST ASSEMBLY BOTTOM |
| P671 | 5 | WOOD CRT POST |
| P675 | 5 | TIMBER BLOCKOUT OR RECYCLED EQUIVALENT |
| E750 | 1 | BEARING PLATE |
| S760 | 1 | CABLE ANCHOR BOX |
| E770 | 1 | BCT CABLE ANCHOR ASSEMBLY |
| S785 | 1 | GROUND STRUT HINGED POST |
| | | HARDWARE (ALL DIMENSIONS IN INCHES) |
| B140404 | 2 | ¼ Dia x 4 HEX BOLT |
| WO14 | 4 | ¼ WASHER |
| N014 | 2 | ¼ HEX NUT |
| B580122 | 17 | ⅝ Dia x 1¼ SPLICE BOLT |
| B581802 | 4 | ⅝ Dia x 10 H.G.R. BOLT (POSTS 3 THRU 6) |
| B580904A | 1 | ⅝ Dia x 9 HEX BOLT GR 5 |
| W050 | 5 | ⅝ WASHER |
| N050 | 22 | ⅝ Dia H.G.R. NUT |
| B340854A | 1 | ¾ Dia x 8½ HEX BOLT GR A449 |
| NO30 | 1 | ¾ Dia HEX NUT |
| N100 | 2 | 1 ANCHOR CABLE HEX NUT |
| W100 | 2 | 1 ANCHOR CABLE WASHER |
| SB58A | 8 | CABLE ANCHOR BOX SHOULDER BOLT |
| N055A | 8 | ½ A325 STRUCTURAL NUT |
| W050A | 16 | 1 1/16 OD x 9/16 ID A325 STR. WASHER |

GENERAL NOTES

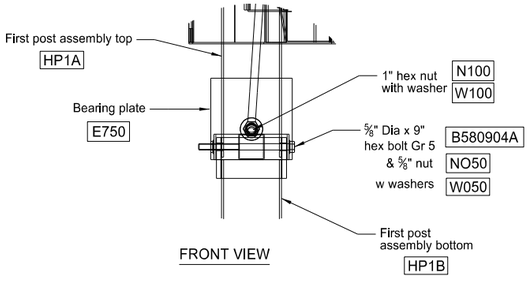
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts #1 and #2.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
4. Lower post sections shall not be driven with the upper post attached. If the the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" diameter post hole 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2½" deep to provide drainage. The soil tubes shall be field cut to length, placed in the hole and back filled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
7. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The nail shall be 20 penny and galvanized.
8. The Flared Energy Absorbing Terminal shall be flared only when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, the Flared Energy Absorbing Terminal shall have only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, the Flared Energy Absorbing Terminal shall be turned parallel to the roadway.




SIDE VIEW

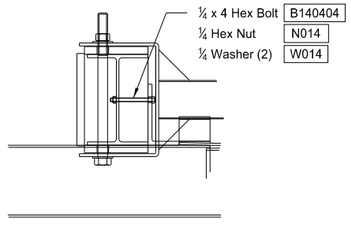



SIDE VIEW DETAIL OF POST #2

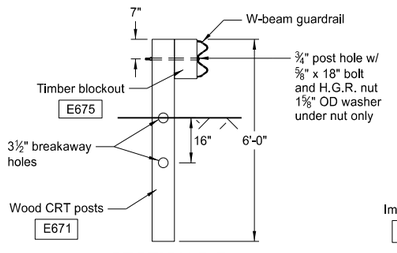



FRONT VIEW

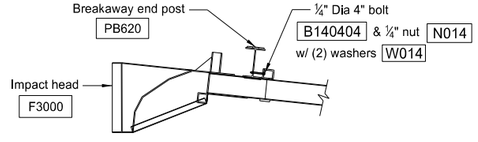
POST #1 CONNECTION DETAILS



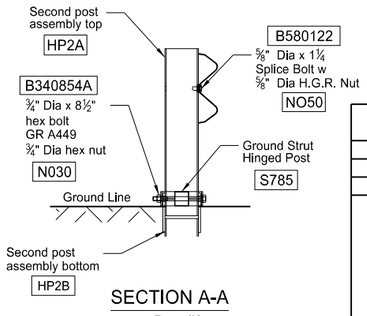

IMPACT HEAD CONNECTION DETAIL




SECTION B-B
POST 3 THRU 7




IMPACT HEAD CONNECTING DETAIL




SECTION A-A
at Post #2

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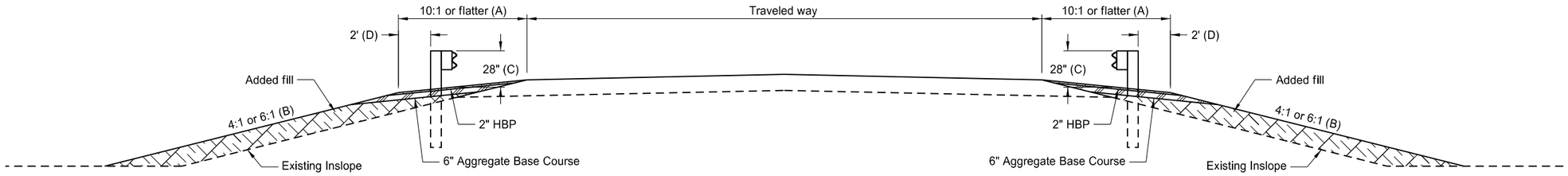
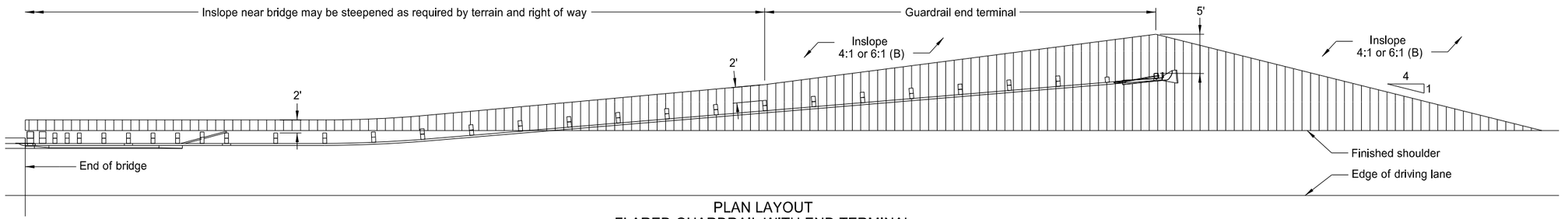
D-764-22

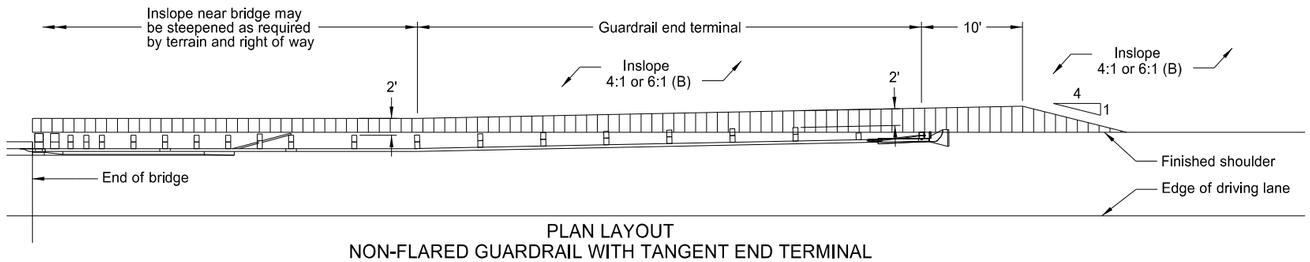
# TYPICAL GRADING AT BRIDGE ENDS WITH W-BEAM GUARDRAIL



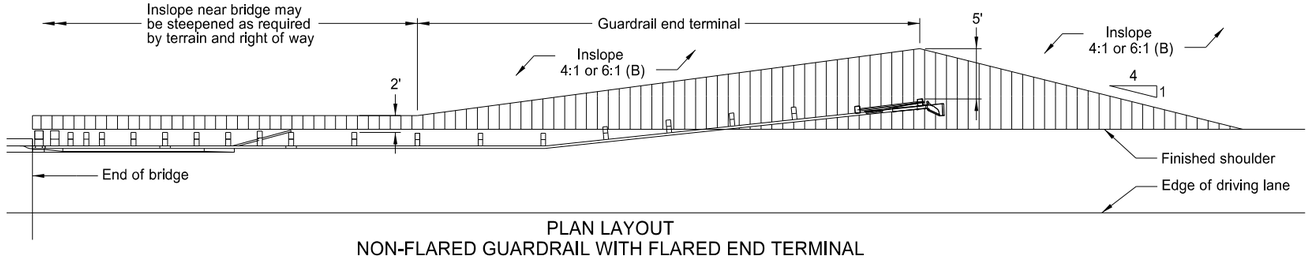

TYPICAL SECTION




PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL




PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL




PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Slope flatter than 10:1 may be required to provide proper guardrail height.

(B) Where normal inslope is 4:1 the added fill shall be 4:1. Where normal inslope is 6:1 the added fill shall be 6:1.

(C) Measured from top of guardrail to top of surfacing at front face of guardrail.

(D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

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