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

Abandoned
Detour
Below grade
Candela
Compression
Bridge
Elastomeric
Corrected
cement
Coordinate
Act
Asphalt
Alignment
Angularity
Inlet
Corrugated steel traversable end section
gutter
alley
meter
drawing
wire
safety
guard
section
Book
Crossing
Buck
point
contraction
Approach
Breakaway
Hydrant
backsight
ahead
Building
Line
beacon
feet
Electric/al
flange
Culvert
Fill
and
Dynamic speed display sign
spiral
construction
Concrete
block
bypass
Drive
D-101-1
Combination
Clear
hole
evergreen
center
ramp
optic
locker
Sample
Drive
yard
Driveway
each
East
Clean-out
easement
Bituminous
crown
Pipe
Crossroad
cap
Boulevard
Equation
grade
Basin
assumed
Equal
sides
Begin
Meter
Elevation
Abutment
corrugated steel flared end section
Heavy
delineate
Engineer
Side
adjusted
deflection
corner
Balcony
Existing
bearing
valve
Extruded
Approximate
load
Feet
Inlet
Arm
Post
delineator
Centimeter
Foresight
Flared
Farad
Description
barricade
Emulsion/emulsified
Expansion
Aluminum
Footing
Calculate
Panel
Concrete erosion control blanket
Coarse gravel
Meter
Guardrail
Elliptical
Face
Boundary
direction
setting
Circle
Deformed
Pipe
Court
Sections
Continuous
Alternate
Aggregate
Block
Station
This document was originally issued and sealed by Roger Weigle, Registration Number PE-2930, on 09/20/18 and the original document is stored at the North Dakota Department of Transportation.
### Existing Topography
- Existing Ground Void
- Existing Cemetery Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Ramps
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guernsey Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Guardrail
- Existing Field Line
- Exit Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter

### 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 TV Fiber optic
- Existing Gas Pipe
- Existing Overhead Utility Line
- Existing Power
- Existing Fuel Pipeline
- Existing Undefined Above Ground Pipe Line

### Proposed Utilities
- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain
- Corridor
- 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
- Existing Overhead Sign Structure
- Existing Overhead Sign Structure Cantilever
- Existing Overhead Sign Structure Cantilever
- Overhead Sign Structure Cantilever

### Traffic Utilities
- Existing Telegraph Line
- Existing TV Line
- Existing Water or Steam Line
- Existing Under Drain
- Existing Slotted Drain
- Existing Conductor
- Existing Overhead Call Box
- Existing Underground Vault or Lift Station

### Sign Structures
- Existing Overhead Sign Structure
- Existing Overhead Sign Structure Cantilever
- Existing Overhead Sign Structure Cantilever
- Overhead Sign Structure Cantilever

---

**Line Styles**

- **Existing**
- **Proposed**

**Traffic Utilities**

- **Sign Structures**

---

**DEPARTMENT OF TRANSPORTATION**

**NORTH DAKOTA**

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 09/23/16 and the original document is stored at the North Dakota Department of Transportation.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pad Mounted Feed Point</td>
<td>Light Standard 100 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Pipe Mounted Feed Point with Pad</td>
<td>Light Standard 150 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Pole Mounted Feed Point</td>
<td>Light Standard 175 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Headwall</td>
<td>Light Standard 200 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Double Headwall with Vegetation Barrier</td>
<td>Light Standard 290 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Single Headwall with Vegetation Barrier</td>
<td>Light Standard 310 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Pole Mounted Head</td>
<td>Light Standard 35 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Sprinkler Head</td>
<td>Light Standard 400 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Fire Hydrant</td>
<td>Light Standard 50 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Inlet Type 1</td>
<td>Light Standard 70 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Inlet Type 2</td>
<td>Light Standard 705 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Double Inlet Type 2</td>
<td>Light Standard 90 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Inlet Grate Type 2</td>
<td>Light Standard 100 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Junction Box</td>
<td>Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 10 Luminaire</td>
<td>Light Standard 150 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 3 Luminaire</td>
<td>Light Standard 175 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 4 Luminaire</td>
<td>Light Standard 195 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 5 Luminaire</td>
<td>Light Standard 200 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 6 Luminaire</td>
<td>Light Standard 250 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 7 Luminaire</td>
<td>Light Standard 310 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>High Mast Light Standard 8 Luminaire</td>
<td>Light Standard 35 Watt High Pressure Sodium Vapor Luminaire</td>
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<tr>
<td>High Mast Light Standard 9 Luminaire</td>
<td>Light Standard 400 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>HDWL</td>
<td>Light Standard 50 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>C S B</td>
<td>Light Standard 70 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>FA</td>
<td>Light Standard 700 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>SB</td>
<td>Light Standard 100 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>T</td>
<td>Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Incl</td>
<td>Light Standard 150 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>Inc</td>
<td>Light Standard 200 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
<tr>
<td>N</td>
<td>Light Standard 250 Watt High Pressure Sodium Vapor Luminaire</td>
</tr>
</tbody>
</table>

**Symbols**

- Pad Mounted Feed Point
- Pipe Mounted Feed Point with Pad
- Pole Mounted Feed Point
- Headwall
- Double Headwall with Vegetation Barrier
- Single Headwall with Vegetation 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
- HDWL
- C S B
- FA
- SB
- T
- Incl
- N

**Alignment Monument**

- Iron Pin Reference Monument
- Reset Right of Way Marker
- Reinforced Concrete End Section 48 Inch
- Reset USGS Marker
- Reinforced Concrete End Section 54 Inch
- Right of Way Markers
- Reinforced Concrete End Section 60 Inch
- Reinforced Concrete End Section 66 Inch

**Object Markers**

- Object Marker Type I
- Object Marker Type II
- Object Marker Type III
- Caution Mode Arrow Panel
- Reset Right of Way Marker
- Continuous Split Barrel Sample
- Split Barrel Sample

**Highway Signs**

- Back to Back Vertical Panel Sign
- Right of Way Marker
- Double Direction Arrow Panel
- Left Directional Arrow Panel
- Right Directional Arrow Panel
- Sequencing Arrow Panel
- Truck Mounted Arrow Panel

**Tubular Markers**

- Power Pole
- Highway Sign
- Wood Pole
- Pedestrian Push Button Post

**Intelligent Signage**

- Pull Box
- Intelligent Transportation Pull Box
- Transformer
- Inclinometer Tube
- Underdrain Cleanout

**Excavation Units**

- Standard Penetration Test
- 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
- Reinforced Concrete End Section 60 Inch
- Reinforced Concrete End Section 66 Inch

**Pumps**

- Storm Drain Pump
- Sanitary Pump
- Storm Drain Cleanout
- 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
- Reinforced Concrete End Section 60 Inch
- Reinforced Concrete End Section 66 Inch

**Other**

- Water Valve
- Reinforced Pavement
- Excavation Unit
- 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
- Reinforced Concrete End Section 60 Inch
- Reinforced Concrete End Section 66 Inch

**Registration Numbers**

- Roger Weigel, Registration Number 07-01-14
- This document was originally issued and sealed by Roger Weigel, Registration Number 07-01-14, on 07/01/14 and the original document is stored at the North Dakota Department of Transportation.
### Cross Section Legend

<table>
<thead>
<tr>
<th>Description</th>
<th>Longitudinal</th>
<th>Transverse</th>
<th>Description</th>
<th>Longitudinal</th>
<th>Transverse</th>
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<tbody>
<tr>
<td>Overhead Line</td>
<td></td>
<td></td>
<td>Overhead Line</td>
<td></td>
<td></td>
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<tr>
<td>Transmission Line</td>
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<td></td>
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<td>Overhead Power</td>
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<td>Electric Line</td>
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<td>Conduct Line</td>
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<td>Fiber Optic Line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Main Line</td>
<td></td>
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<td>Gas Service Line</td>
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<td>Gas Transmission Line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Pipeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sanitary Sewer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force Main</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sanitary Sewer</td>
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<td></td>
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<td>Steam Line</td>
<td></td>
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<tr>
<td>Storm Drain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Assumed Depth)</td>
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<td></td>
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<td>Telephone Line</td>
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<td>TV Line</td>
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<td>Water Main Line</td>
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<tr>
<td>Water Service Line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Usually the transverse utilities are shown on a cross section with 2 or more symbols. The utility runs from one symbol to the other, but the crossing may not be shown.*

Connection to infer that probably will not be displayed.

On the right side of most cross sections there is an earthwork table. The following example (values not related to project) details the earthwork table layout.

- **Cut Area**
- **Fill Area**
- **Cut Volume**
- **Fill Volume**
- **Mass Ordinate**

When storm drain invert elevations are NOT used to draw pipe, they will appear as shown to the left. When inlet elevations are used to draw pipe, they will be a cross section similar to the graphics shown below.

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**NOTE:**
If a Single Net Blanket is used the side with the netting should be on the top once the blanket is installed.

**DETAIL A**
ANCHOR TRENCH & BLANKET INSTALLATION

- **Single Net Blanket**
  - Compacted backfill soil
  - Staple 1" on center

- **Double Net Blanket**
  - Compacted backfill soil
  - Staple 1" on center

**INSTALLATION AT PIPE ENDS**

- **PIPE OUTLETS**
  - Flow
  - 6"
  - Existed Ground
  - See Detail A

- **PIECE ROLLS**
  - Flow
  - 6"
  - Existed Ground
  - See Detail A

**BLANKET LAYOUT**

- **CHANNEL OR SLOPE INSTALLATION**
  - 6" overlapping
  - 6"
  - 6"
  - 6"

- **OVERLAP**
  - 6" overlapping

- **TRENCH EXCAVATION DETAIL**
  - 6" overlapping
  - 6"

- **STAPLE PATTERN**
  - 3.8 staples per square yard using 8-inch 11 gauge wire "U" staples.

**DETAIL B**

**DETAIL C**

- **ANCHOR TRENCH & BLANKET INSTALLATION**

- **EROSION AND Siltation Control**
  - Erosion Control Blanket
  - 4"

- **OVERLAP**
  - 6" overlapping

**PIPE INLETS**

**STAPLE PATTERN**

**ANCHOR TRENCH & BLANKET INSTALLATION**

- **Single Net Blanket**
  - Compacted backfill soil
  - Staple 1" on center

- **Double Net Blanket**
  - Compacted backfill soil
  - Staple 1" on center

**PIPE OUTLETS**

- **Flow**
  - 6"
  - Existed Ground
  - See Detail A

**PIECE ROLLS**

- **Flow**
  - 6"
  - Existed Ground
  - See Detail A

**BLANKET LAYOUT**

- **CHANNEL OR SLOPE INSTALLATION**
  - 6" overlapping
  - 6"
  - 6"
  - 6"

- **OVERLAP**
  - 6" overlapping

- **TRENCH EXCAVATION DETAIL**
  - 6" overlapping
  - 6"

- **STAPLE PATTERN**
  - 3.8 staples per square yard using 8-inch 11 gauge wire "U" staples.
**Fiber Roll Placement Details**

**12 or 20 Inch Fiber Roll - Ditch Bottom**

- Ends overlapped 12" minimum
- Stake 4" to 6" from end of roll
- Backslope
- Optional Weir
- Details A, B, C
- For stake installations see staking detail
- Stagger joints between rows of fiber rolls

**Side Slope**

- Overlap fiber rolls 12" min.
- Place stake at each toe of ditch slope
- Place stake at each toe of ditch slope
- Stake 4" to 6" from end of roll
- Soil from trench

**PLAN VIEW FOR DITCH APPLICATION**

<table>
<thead>
<tr>
<th>Fiber Roll Diameter</th>
<th>Nominal Stake Size</th>
<th>Minimum Stake Length</th>
<th>Minimum Trench Depth</th>
<th>Maximum Trench Depth</th>
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<tbody>
<tr>
<td>6&quot;</td>
<td>2&quot; x 2&quot;</td>
<td>18&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>2&quot; x 2&quot;</td>
<td>24&quot;</td>
<td>2&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>20&quot;</td>
<td>2&quot; x 2&quot;</td>
<td>36&quot;</td>
<td>3&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

**Optional Weir**

*Use in flat areas, such as the Red River Valley, where there is potential for water to back 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.

*Optional Weir* Use in flat areas, such as the Red River Valley, where there is potential for water to back 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.

**Plan View for Ditch Application**

**Plan View for Slope Application**

**NOTE:** Runoff must not be allowed to run under or around roll.
Two Lane, Two Way Roadways

- Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.
- Use flagger to protect the work area and warn oncoming traffic.
- Use flagger to protect the work area and warn oncoming traffic. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
- Use these layouts during daylight hours and in areas of good visibility only.
- Use flagger to protect the work area and warn oncoming traffic. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.

Typical Protection Vehicle
- Flagger
- Work vehicle
- Flashing or rotating beacons
- High intensity flashing lights
- Truck mounted attenuator - optional

Multilane Roadways

- Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.
- Use flagger to protect the work area and warn oncoming traffic.
- Use flagger to protect the work area and warn oncoming traffic. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
- Use these layouts during daylight hours and in areas of good visibility only.
- Use flagger to protect the work area and warn oncoming traffic. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.

Typical Protection Vehicle
- Flagger
- Work vehicle
- Flashing or rotating beacons
- High intensity flashing lights
- Truck mounted attenuator - optional

Notes:
1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.
2. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
3. Use these layouts during daylight hours and in areas of good visibility only.
4. Use flagger to protect the work area and warn oncoming traffic. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
Minimum 10 gauge anchor plate (post post installation).  

\[ \text{Note:} \]

1. Torque slip bolt nuts as specified by manufacturer.
2. Use anchor with 65 ksi yield strength and 50 ksi tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4\(^\circ\) angle from post location and back and ahead of post.
4. In concrete sidewalks, use same anchor without washer.
5. Provide more than 7' between the first and fourth posts of a four post sign.

**Notes:**

1. Torque slip bolt nuts as specified by manufacturer.
2. Use anchor with 65 ksi yield strength and 50 ksi tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4\(^\circ\) angle from post location and back and ahead of post.
4. In concrete sidewalks, use same anchor without washer.
5. Provide more than 7' between the first and fourth posts of a four post sign.

---

**Perforated Tube**

---

**Top Post Receiver**

Plate - ASTM A53 grade A-2  
Angle Receiver - 2\(^\circ\)/3\(^\circ\)/4\(^\circ\)/5\(^\circ\) /ASTM A36 structural angle

---

**Telescoping Perforated Tube**

<table>
<thead>
<tr>
<th>Number of Posts</th>
<th>Post Size</th>
<th>Wall Thickness Gauge</th>
<th>Wall Thickness Gauge</th>
<th>Slope Block Size</th>
<th>Slope Block Size</th>
<th>Anchor Base Size</th>
<th>Slope Block Size</th>
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<tbody>
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<td>2 x 1.25</td>
<td>0.190 12</td>
<td>No</td>
<td>25</td>
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<td>0.190 12</td>
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<td>2 x 4</td>
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<td>2 x 12</td>
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<td></td>
<td>2 x 16</td>
<td>0.190 12</td>
<td>No</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

**Properties of Telescoping Perforated Tube**

<table>
<thead>
<tr>
<th>Tube Size</th>
<th>Wall Thickness Gauge</th>
<th>U.S. Standard Gauge</th>
<th>Weight per Piece</th>
<th>Moment of Inertia</th>
<th>Cross Sect. Area</th>
<th>Section Modulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 1.25</td>
<td>0.190</td>
<td>0.190</td>
<td>2.416</td>
<td>0.372</td>
<td>0.570</td>
<td>0.372</td>
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<tr>
<td>2 x 2.25</td>
<td>0.190</td>
<td>0.190</td>
<td>2.773</td>
<td>0.651</td>
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<td>2 x 4</td>
<td>0.190</td>
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<td>3.433</td>
<td>0.855</td>
<td>1.414</td>
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<tr>
<td>2 x 6</td>
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<td>0.190</td>
<td>4.193</td>
<td>1.060</td>
<td>2.041</td>
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<tr>
<td>2 x 8</td>
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<td>0.190</td>
<td>4.953</td>
<td>1.265</td>
<td>2.672</td>
<td>0.726</td>
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<tr>
<td>2 x 10</td>
<td>0.190</td>
<td>0.190</td>
<td>5.713</td>
<td>1.469</td>
<td>3.303</td>
<td>0.804</td>
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<tr>
<td>2 x 12</td>
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<td>0.190</td>
<td>6.473</td>
<td>1.672</td>
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<td>0.190</td>
<td>7.233</td>
<td>1.872</td>
<td>4.565</td>
<td>0.966</td>
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<tr>
<td>2 x 16</td>
<td>0.190</td>
<td>0.190</td>
<td>7.993</td>
<td>2.072</td>
<td>5.196</td>
<td>1.047</td>
</tr>
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</table>

**Breakaway System for Construction Zone Signs**

**Notes:**

1. Torque slip bolt nuts as specified by manufacturer.
2. Use anchor with 65 ksi yield strength and 50 ksi tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4\(^\circ\) angle from post location and back and ahead of post.
4. In concrete sidewalks, use same anchor without washer.
5. Provide more than 7' between the first and fourth posts of a four post sign.

---

**Post Sleeve Data Table**

<table>
<thead>
<tr>
<th>Square Post Base (3)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>2(\times)10 ga.</td>
<td>16</td>
<td>25</td>
<td>35</td>
<td>70</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>3(\times)10 ga.</td>
<td>19</td>
<td>25</td>
<td>35</td>
<td>70</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>3(\times)10 ga.</td>
<td>19</td>
<td>25</td>
<td>35</td>
<td>70</td>
<td>15</td>
<td>7</td>
</tr>
</tbody>
</table>

---

**Bottom Soil Stub**

Tube - ASTM A53 grade B  
Sleeve-ASTM A53 grade B  
Post - ASTM A52 grade B

---

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

**(B)** For additional wind load, inset the 2\(\times\)4 x 10 ga. into 2\(\times\)4 x 10 ga.

---

**North Dakota Department of Transportation**

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Alternate A Steps of Installation:

1. Drive anchor unit into ground.
2. Establish proper assembly by lining up bottom hole of retainer strap with a hole in the anchor unit.
3. Assemble strap to anchor unit using 1-1/2" bolt, lock washer, and nut.
4. Rotate strap 90° to left.
5. Assemble strap to back of anchor unit using 1-1/2" bolt, lock washer, and nut.
6. Rotate strap to vertical position.
7. Drive anchor unit to 4" above ground.

Alternate B:

Install a maximum of 3 posts within 7'.

Alternate C:

Install a maximum of 2 posts within 7'.

Notes:

- Properly nest base post, strap, and sign post. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post all line up in a straight line.
- Use only the Grade 5, 1-1/2" bolts with nuts and lock washers specified, and use of U-channel post is limited to 2.5 and 3 lb/ft.
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

ROAD WORK
NEXT XX MILES
G20-1-60
Legend: black (non-refl)
Background: orange

NO WORK IN PROGRESS
G20-1b-60
Legend: black (non-refl)
Background: orange

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

SPEED LIMIT ENFORCED
MINIMUM FEE $80
WHEN WORKERS ARE PRESENT
G20-55-96
Legend: black (non-refl)
Background: orange

WAIT FOR PILOT CAR
G20-4b-36
Legend: black (non-refl)
Background: orange

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

DETOUR
G20-52a-72
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.

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

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

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

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

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CONSTRUCTION SIGN DETAILS
WARNING SIGNS

THRU TRAFFIC, RIGHT LANE
WS-8-48
Legend: black (non-refl)
Background: orange

TRUCKS ENTERING HIGHWAY
W8-53-48
Legend: black (non-refl)
Background: orange

TRUCKS EXITING HIGHWAY
W8-56-48
Legend: black (non-refl)
Background: orange

ROAD WORK TRAFFIC ONLY
WS-8-48
Legend: black (non-refl)
Background: orange

TRUCKS ENTERING
W8-64-48
Legend: black (non-refl)
Background: orange

TRUCKS CROSSING
W8-9a-48
Legend: black (non-refl)
Background: orange

SHOULDER DROP OFF
W8-9a-48
Legend: black (non-refl)
Background: orange

ARROW DETAILS

DISTANCE MESSAGES

W5-8-a-48
Legend: black (non-refl)
Background: orange

WORD LETTER SPACING

<table>
<thead>
<tr>
<th>40.9°</th>
<th>45°</th>
<th>90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 FT</td>
<td>500 FT</td>
<td>500 FT</td>
</tr>
</tbody>
</table>

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CONSTRUCTION SIGN DETAILS

WARNING SIGNS

BRIDGE PAINTING

RUMBLE STRIPS AHEAD

EQUIPMENT WORKING

MATERIAL ON ROADWAY

FRESH OIL LOOSE ROCK

NEXT 50 MILES

PAVEMENT BREAKS

### Word and Letter Spacing

<table>
<thead>
<tr>
<th>WORD</th>
<th>LETTER SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHEAD</td>
<td>Standard</td>
</tr>
<tr>
<td>200 FT</td>
<td>Standard</td>
</tr>
<tr>
<td>350 FT</td>
<td>Standard</td>
</tr>
<tr>
<td>500 FT</td>
<td>Standard</td>
</tr>
<tr>
<td>1000 FT</td>
<td>Reduce 40%</td>
</tr>
<tr>
<td>1500 FT</td>
<td>Reduce 40%</td>
</tr>
<tr>
<td>1 1/2 MILE</td>
<td>Reduce 50%</td>
</tr>
<tr>
<td>1 MILE</td>
<td>Standard</td>
</tr>
</tbody>
</table>

*DISTANCE MESSAGES

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SHOULDER CLOSURE TAPERS

SHOULDER CLOSURE WITH LANE CLOSURE
(when shoulder is 8' or wider)

Portable Traffic Signal or Changeable Message Sign

SHOULDER CLOSURE USED WITH LANE CLOSURE
(when shoulder is less than 8' wide)

Merging taper length L

Delineator drum S spacing

Delineator drums 5' spacing

Notes:
1. L = Taper length in feet
W = Width of offset in feet
S = Speed limit in mph
L = WS / 60 (45 mph or more)
L = WS (40 mph or less)

2. If a shoulder taper is used, use a length of approximately \( \frac{W}{2} \). If a shoulder is used as a travel lane, use a normal merging or shifting taper.

3. When paved shoulders of 8 foot width or more are closed, use channelizing devices to close shoulder in advance, to delineate beginning of work space, and to direct vehicular traffic to remain within the traveled way.

KEY
- Delineator Drum
- Sequencing Arrow Panel
- Message Display
- Portable Traffic Signal

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10/25/19
10/25/19
Registration Number
Issued and sealed by Kirk J Hoff.
Registration Number PE-4693.

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ROAD CLOSURE LAYOUTS

**Notes**

1. Variables:
   - $S$ = Numerical value of speed limit or 85th percentile.
   - $W$ = The width of taper in feet.
   - $L = Minimum length of taper
   - $S = 10$ for highways, expressways, and other roads with speeds of 45 mph or greater, or $W = 8$ for urban, residential, and other streets with speeds of 40 mph or less.

2. Place delineators on moveable assemblies and signs on portable assemblies when located in roadway.

3. Place delineator drums, barricades or cones for tapering traffic at an intersection 1 mile from the taper.

4. Place Sequencing Arrow Panels at the beginning of the taper when possible.

5. Where shoulder width does not provide sufficient room, move the panel closer to the work area.

6. Be prepared for shoulder closure.

7. Variables:
   - $L = > 1000$ for highways.
   - $L = 400$ for urban, residential, and other roads with speeds of 45 mph or greater, or $W = 8$ for urban, residential, and other streets with speeds of 40 mph or less.

8. Place delineators on moveable assemblies and signs on portable assemblies when located in roadway.

9. Use Type A on roadways with slow moving traffic speeds and low volumes.

10. Use Type B on roadways with moderate traffic speeds and volumes.

11. Use Type C on roadways with high traffic speeds and volumes.

12. Recommended using 40 mph speed limit, but other factors are to be considered.

**ADVANCE WARNING SIGN SPACING**

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Longitudinal Buffer Space</th>
<th>Minimum (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural  - High Speed (over 50 mph to 65 mph)</td>
<td>600</td>
<td>1500</td>
</tr>
<tr>
<td>Rural  - Low Speed (25 mph or less and 5000 ADT or less)</td>
<td>420</td>
<td>1500</td>
</tr>
<tr>
<td>Urban - Low Speed (30 mph or less)</td>
<td>420</td>
<td>1500</td>
</tr>
<tr>
<td>Urban Expressway and Freeway</td>
<td>420</td>
<td>1500</td>
</tr>
<tr>
<td>Rural Expressway and Freeway</td>
<td>420</td>
<td>1500</td>
</tr>
</tbody>
</table>

**KEY**

- **Delineator drum**
- **Work area**
- **Sequence arrow panel**
- **Tow truck markers**
- **Vertical signs back to front**

This document was originally issued and signed by Kirk J. Hoff.

Registration Number: PE-4693

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CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

TYPE K
TRUCKS ENTERING ROADWAY
Heavy truck traffic on through highway. Cover signs or take down in right.

TYPE L
TRUCKS CROSSING ROADWAY
Trucks crossing through highway. Cover signs or take down in right.

TYPE M
TEMPORARY DETOUR LAYOUT
Temporary traffic control material within major work area. Cover signs or take down in right.

TYPE N
TEMPORARY CONSTRUCTION
Temporary half-roadway construction for two-lane highway. Cover signs or take down in right.

Notes:
1. Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
2. Where necessary, safe speed to be determined by the Engineer.
3. Determine the reduced speed limit based on the actual speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
4. Install flag on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. Covered when approved by engineer or obliterated pavement marking measured as Obliteration of Pavement Marking.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
8. Install sign Q20-10-69 when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. This document was originally issued and sealed by Kirk J. Hoff.
   Registration Number PE-4683.
   This is an original document, 11/11/19.
10. Determine the reduced speed limit dependent on the in place speed limit before construction. Where speed limits are to be reduced more than 

11. As an option use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14. 

12. Sign G20-55-96 is not required if this standard is part of other traffic control layouts or the work is less than 15 days.

Notes: 
1. Install advance signs for flagging when flaggers are flagging. 

2. Move the advanced flagger sign and speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Place the 40 mph speed limit sign at 1/4 in advance of the flagger sign and move the 90 mph speed limit signs. Cover or remove the 40 mph speed limit and the Minimum Fee $80 signs upon completion of the work day or when workers are not present. Determine the exact speed limit in the field, dependent on location and conditions. 

3. Approaches: When the work area encompasses an approach, install a 40 mph speed limit sign to control the approach. Cover the existing stop sign and install a new portable stop sign when the approach is on the side of the lane closure. Remove the approach speed limit sign once the main line 40 mph speed zone is moved past the approach.

4. Variables: 
S - Numerical value of speed limit or 85th percentile speed prior to work 
L - Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or (WxS)x60 for urban, residential, and other streets with speeds of 40 mph or less. 
B - The width of taper. 
S - Numerical value of speed limit or 85th percentile speed prior to work 
W - The width of taper.

5. Space delineator drums for tapering traffic at the dimension “S”. Space tubular markers used for tangents at 2 times dimension “S”.

6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface. 

7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.

8. Cover existing speed limit signs within a reduced speed zone.

9. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.

10. Determine the reduced speed limit dependent on the in place speed limit before construction. Where speed limits are to be reduced more than 

11. As an option use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.

12. Sign G20-55-96 is not required if this standard is part of other traffic control layouts or the work is less than 15 days.

Notes:
1. Install advance signs for flagging when flaggers are flagging. 

2. Move the advanced flagger sign and speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Place the 40 mph speed limit sign at 1/4 in advance of the flagger sign and move the 90 mph speed limit signs. Cover or remove the 40 mph speed limit and the Minimum Fee $80 signs upon completion of the work day or when workers are not present. Determine the exact speed limit in the field, dependent on location and conditions. 

3. Approaches: When the work area encompasses an approach, install a 40 mph speed limit sign to control the approach. Cover the existing stop sign and install a new portable stop sign when the approach is on the side of the lane closure. Remove the approach speed limit sign once the main line 40 mph speed zone is moved past the approach.

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L - Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or (WxS)x60 for urban, residential, and other streets with speeds of 40 mph or less. 
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5. Space delineator drums for tapering traffic at the dimension “S”. Space tubular markers used for tangents at 2 times dimension “S”.

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11. As an option use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.

12. Sign G20-55-96 is not required if this standard is part of other traffic control layouts or the work is less than 15 days.
PORTABLE SIGN SUPPORT ASSEMBLY

Notes:

1. The maximum weight of the assembly is 250 pounds.
2. Use a 14" wheel and tire.
3. Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
4. Other NCHRP 350 crash tested assemblies are acceptable.

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MOBILE OPERATION
Grinding Shoulder Rumble Strips

Notes:
1. Provide truck mounted attenuators on additional vehicles in the convoy, at no additional cost.
2. Provide rotating, flashing, oscillating, or strobe lights on vehicles.
3. Provide Type B or Type C flashing arrow panels that are controlled from inside the vehicle.
4. Provide two-way electronic communication capability in each vehicle.
5. Vary vehicle spacing between the protection vehicle and work vehicle depending on sight distance restrictions. Keep the spacing of the convoy vehicles such that motorists approaching the work convoy can see the protection vehicle in time to slow down and safely pass the work vehicles.
6. Move advance Road Work Ahead signs as the work area moves through the construction zone.

Two Lane - Two Way Roadway

Protection Vehicle
Work Vehicle (Broom)
Work Vehicle (Milling Machine)

Two Lane - Two Way Roadway
Typical Protection Vehicle with Flashing Arrow Panel in Caution Mode

Key
- Truck mounted attenuator
- Flashing Arrow Panel
- Caution Mode
- Right Arrow
- Left Arrow

Notes:
1. Provide truck mounted attenuators on additional vehicles in the convoy, at no additional cost.
2. Provide rotating, flashing, oscillating, or strobe lights on vehicles.
3. Provide Type B or Type C flashing arrow panels that are controlled from inside the vehicle.
4. Provide two-way electronic communication capability in each vehicle.
5. Vary vehicle spacing between the protection vehicle and work vehicle depending on sight distance restrictions. Keep the spacing of the convoy vehicles such that motorists approaching the work convoy can see the protection vehicle in time to slow down and safely pass the work vehicles.
6. Move advance Road Work Ahead signs as the work area moves through the construction zone.
Provide a laboratory with the following:

1. A 1'x1' shelf at 36" above the regular countertop.

2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of 1/2 inch.

3. An exhaust fan capable of removing inside air at a rate of 400 CFM.

4. Fresh air vent hinged to open or close manually.

5. 24" x 48" table capable of holding a 200 lb masonry saw with a minimum clearance of 36" above the table.

6. A water supply tank with a capacity of 500 gallons and a 20 gallon capacity pressure tank on the pump.

7. Heavy duty type locks, latches, and hinges for doors made to withstand the intense use in service.

8. A wall between the office and the work area properly insulated to prevent the transmission of heat and noise.

9. The steel cable tie downs and ground anchors at each corner of the lab.

10. Electrical service entrance wired for 100 amps and separate circuits for air conditioners. Space convenience outlets in counter areas a minimum of four feet apart.

All counters 36" high, a minimum of 24" deep, and open underneath.

Note: Sections A-A and B-B provide more detailed views of the laboratory setup.
### Reinforced Concrete Pipe Culverts and End Sections

**Round Pipe**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>U</th>
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</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>3.2</td>
<td>2.1</td>
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<td>3.2</td>
<td>3.2</td>
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<td>5.8</td>
<td>9.3</td>
</tr>
</tbody>
</table>

**Reinforcement for Class III pipe reinforced as per AASHTO M170**

**NOTES:**
1. All reinforcing steel must meet AASHTO M170 requirements.
2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in place before the concrete is placed so as to maintain reinforcement in exact shape and correct positions within the forms.
3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet 3. Laying length of pipe: 15" to 66" (incl.) = not less than 6 feet 96" to 108" (incl.) = not less than 6 feet.
CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

required use of tie bolts

<table>
<thead>
<tr>
<th>Rod dia</th>
<th>Thread dia</th>
<th>Rod X Rod Min Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8&quot;</td>
<td>0.406</td>
<td>2</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>0.375</td>
<td>2.5</td>
</tr>
<tr>
<td>1&quot;</td>
<td>0.350</td>
<td>3</td>
</tr>
</tbody>
</table>

Notes:
1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe with.
2. Cattle pass and boxed pipe sleeves have pipe sizes inserted from the inside of the pipe and ground floor places. Jacked and boxed sleeves have a diameter of 24" or less do not require pipe sizes.
3. Nuts and washers are not required on jacked and boxed sleeves or sleeves with a diameter of 24" or less. Where nuts and washers are not used, the tie bars shall be installed and grouted this piece.
4. This is only for holding pipe or PCB sections together, not for pulling sections tight.
5. The bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
6. Holes in pipe to accommodate tie bolts can be precut or drilled. Holes are required when precut. Holes shall have a diameter 1/2" larger than the diameter of the thread. Holes in precut Rod's shall consist of 1/2" bolts with an inside diameter of 1 1/2".
7. The contractor has the option of selecting the type of tie bolt used from these.
8. The cost of precutting or drilling the required holes and turning up and inspecting the tie bolts shall be included in the price bid for the appropriate comb or PCB as it may.
9. All connections and approach PCB conduit bolts shall be hot. Storm drain systems shall have the first three bolts including the end section of all the voids that.
10. The bolts shall conform to ASTM A49, Grade B. Washers shall conform to ASTM A569. Washers do not depend on the fillet or threaded connections. The tie bolts shall be installed with washers and hex washers.
11. The rebar shall be positioned in accordance with the rebar location shown on the plans.

This document was originally created and issued by Jonathan David Kelting, Registration Number PE-3664, on 5/8/2017 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

Pay Items
1) Pipe
2) Removal of Pipe (if required)
*Included in Pipe Pay Item
3) Trench excavation
4) Embankment

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

<table>
<thead>
<tr>
<th>Bedding and Haunch (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipes Not Under Roadway = 0.5 O.D. + 0.5 Feet</td>
</tr>
<tr>
<td>Pipes Under the Roadway = 0.5 O.D. + 0.5 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Backfill Material (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Pipe = 0.5 O.D.</td>
</tr>
<tr>
<td>Metal and Plastic = 0.5 O.D. + 1 Foot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Backfill Material (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Pipe 4 Feet or Less Below the Top of Proposed Subgrade = Aggregate Base Course C13 or C15</td>
</tr>
<tr>
<td>Top of Pipe Greater than 4 Feet Below the Top of Proposed Subgrade = Common Excavation - Type A</td>
</tr>
<tr>
<td>Pipe Not Under Roadway = Common Excavation - Type B</td>
</tr>
</tbody>
</table>

EXCAVATION DETAIL A

EXCAVATION DETAIL B

BACKFILL DETAIL A

BACKFILL DETAIL B
### MANHOLE DETAILS

**PRECAST MANHOLE COVERS**

<table>
<thead>
<tr>
<th>Riser Diameter</th>
<th>Cover Diameter</th>
<th>Weight of Section</th>
<th>T</th>
<th>K</th>
<th>L</th>
<th>Bottom * Bars</th>
<th>Top * Bars</th>
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<td>0.000 Lb</td>
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<td>8&quot;</td>
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<td>6&quot; at 8&quot;</td>
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<tr>
<td>12&quot;</td>
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<td>8&quot;</td>
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<tr>
<td>12&quot;</td>
<td>48&quot;</td>
<td>0.000 Lb</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>6&quot; at 8&quot;</td>
<td>6&quot; at 8&quot;</td>
</tr>
</tbody>
</table>

**MANHOLE BASES**

<table>
<thead>
<tr>
<th>Riser Diameter</th>
<th>Base Diameter</th>
<th>Weight of Section</th>
<th>A</th>
<th>Bars *</th>
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</thead>
<tbody>
<tr>
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<td>4# at 12&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>24&quot;</td>
<td>0.000 Lb</td>
<td>6&quot;</td>
<td>4# at 12&quot;</td>
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<tr>
<td>12&quot;</td>
<td>30&quot;</td>
<td>0.000 Lb</td>
<td>6&quot;</td>
<td>4# at 12&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>36&quot;</td>
<td>0.000 Lb</td>
<td>6&quot;</td>
<td>4# at 12&quot;</td>
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<tr>
<td>12&quot;</td>
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<td>0.000 Lb</td>
<td>6&quot;</td>
<td>4# at 12&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>48&quot;</td>
<td>0.000 Lb</td>
<td>6&quot;</td>
<td>4# at 12&quot;</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Use class A8 concrete precast or cast-in-place bases constructed in accordance with NDDOT Standard Specifications. Use aggregate size approved by the engineer.

2. Use precast concrete manholes, risers and steps conforming to AASHTO M190. Place reinforcement listed in each direction.

3. Reinforce precast concrete bases and covers as shown in the table for the corresponding riser diameter.

4. Use Grade 60 reinforcing steel.

5. Cut or Precast manhole base bottoms square to fit the manhole base. Grout joint between base and riser with cement mortar.

6. The manhole riser length listed in the plans is based on a 7" manhole casting, plus 2 concrete adjusting rings (5"), plus the "T" dimension shown in the Precast Manhole Covers table.

7. Use corrosion resistant manhole steps with a minimum 800 pound vertical load resistance and a minimum 400 pound horizontal pull-out resistance. Use Grade 60 reinforcing steel.

8. Precast concrete manhole covers shown are designed for an HS-20 wheel load and maximum fill height of 15'-0". Special design is required for heavier wheel loads and/or greater fill heights.

9. Reinforce precast concrete bases and covers as shown in the table for the corresponding riser diameter.

10. Use precast concrete manholes, risers and steps conforming to AASHTO M190. Use metal from the Engineer who issued and sealed by Roger Weigel, PE-2930, on 10-17-2017 and the original document is stored at the North Dakota Department of Transportation.

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* - Place reinforcement listed in each direction.
Notes:

Mark each end of culverts crossing the roadway within the right-of-way with a post; install posts in front of culvert in direction of travel along the side of culvert and one foot from culvert opening unless shown otherwise in plans.

(A) Install additional marker where multiple pipe installations have a width of greater than 10'.
NOTES:

1) Discontinue shoulder rumble strips through the entire length of right turn lanes, 100' before right turn lane tapers, and at the radius of a paved or graveled highway, section line, approach, or private drive.

2) Discontinue centerline rumble strips through the entire length of left turn lanes, 100' before left turn lane tapers and median islands, and 100' before and after a paved or graveled highway, section line, approach, or private drive.

Discontinue rumble strip approx. 12" on both sides of PCC transverse joint.

Profile of Rumble Strips - Bituminous and PCC Pavements

Discontinue rumble strip approx. 12" on both sides of PCC transverse joint.
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.

NOTES:

Pavement Marking

Two Lane Two Way
RURAL ROADWAY

Two Lane Divided
PRIMARY HIGHWAY

Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section

Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section

Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section

Two Lane Divided
ROADWAY
RURAL ROADWAY

Asphalt Section

Concrete Section

URBAN FIVE LANE SECTION

INTERSTATE HIGHWAY

Asphalt Section

URBAN FIVE LANE SECTION

Asphalt Section

URBAN FOUR LANE SECTION

Asphalt Section

URBAN FOUR LANE SECTION

Asphalt Section

URBAN FOUR LANE SECTION

Asphalt Section

URBAN FOUR LANE SECTION

Asphalt Section

URBAN FOUR LANE SECTION

Asphalt Section

URBAN FOUR LANE SECTION

Centerline pavement marking skip spacing detail

PAVEMENT MARKING

D-762-4

This document was originally issued and sealed by Kirk J. Hoff, Registration Number PE-4683, on 8/27/19 and the original document is stored at the North Dakota Department of Transportation.
SHORT-TERM PAVEMENT MARKING

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

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