



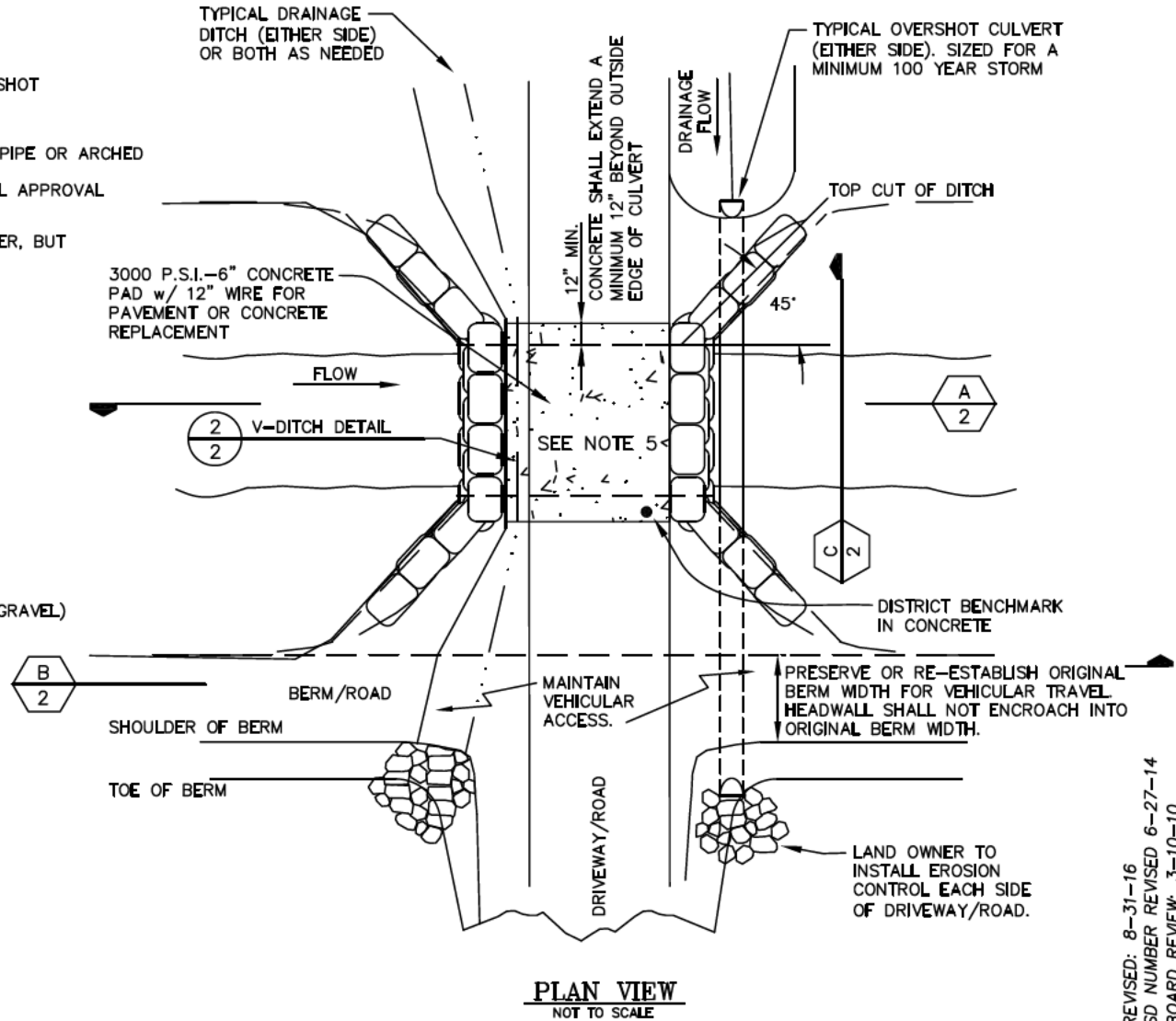
1. ENDWALLS SHALL BE CONSTRUCTED OF BURLAP SACKS (NO PAPER SACKS) FILLED WITH CONCRETE OR APPROVED EQUAL SUCH AS REINFORCED CONCRETE WALLS OR CONCRETED ROCK WALLS.
2. ALL CONCRETE SHALL BE A MINIMUM OF FIVE SACK PER YARD MIX.
3. ALL DRAINAGE CREATED BY NEW CONSTRUCTION SHALL BE DIVERTED OVER THE CANAL. DITCHES AND/OR OVERSHOT CULVERTS SHALL BE PLACED AS APPROVED BY DISTRICT. NO DRAINAGE WILL BE ALLOWED IN CANAL.
4. ROUND, DOUBLE WALLED HIGH DENSITY POLYETHYLENE (HDPE) PIPE OR ARCHED VINYL COATED GALVANIZED CORRUGATED PIPE MAY BE USED. STEEL, ALUMINUM OR OTHER PIPES CAN BE USED WITH SPECIAL APPROVAL OF THE DISTRICT ENGINEER.
5. CULVERT SIZE SHALL BE DETERMINED BY THE DISTRICT ENGINEER, BUT SHALL BE 18" MINIMUM OR EQUAL.

PIPE DIA. (ID)	ARCH EQUIVALENT SPAN x RISE	MIN. COVER (*)	
		CMP	HDPE
18	21" x 15"	12	12
21	24" x 18"	12	12
24	28" x 20"	12	12
30	35" x 24"	12	12
36	42" x 29"	12	12
42	49" x 33"	12	12
48	57" x 38"	12	12
54	64" x 43"	12	24
60	71" x 47"	12	24
66	77" x 52"	12	n.a.
72	83" x 57"	12	n.a.

\*TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT (SUCH AS GRAVEL)  
 \*TOP OF PIPE TO TOP OF RIGID PAVEMENT

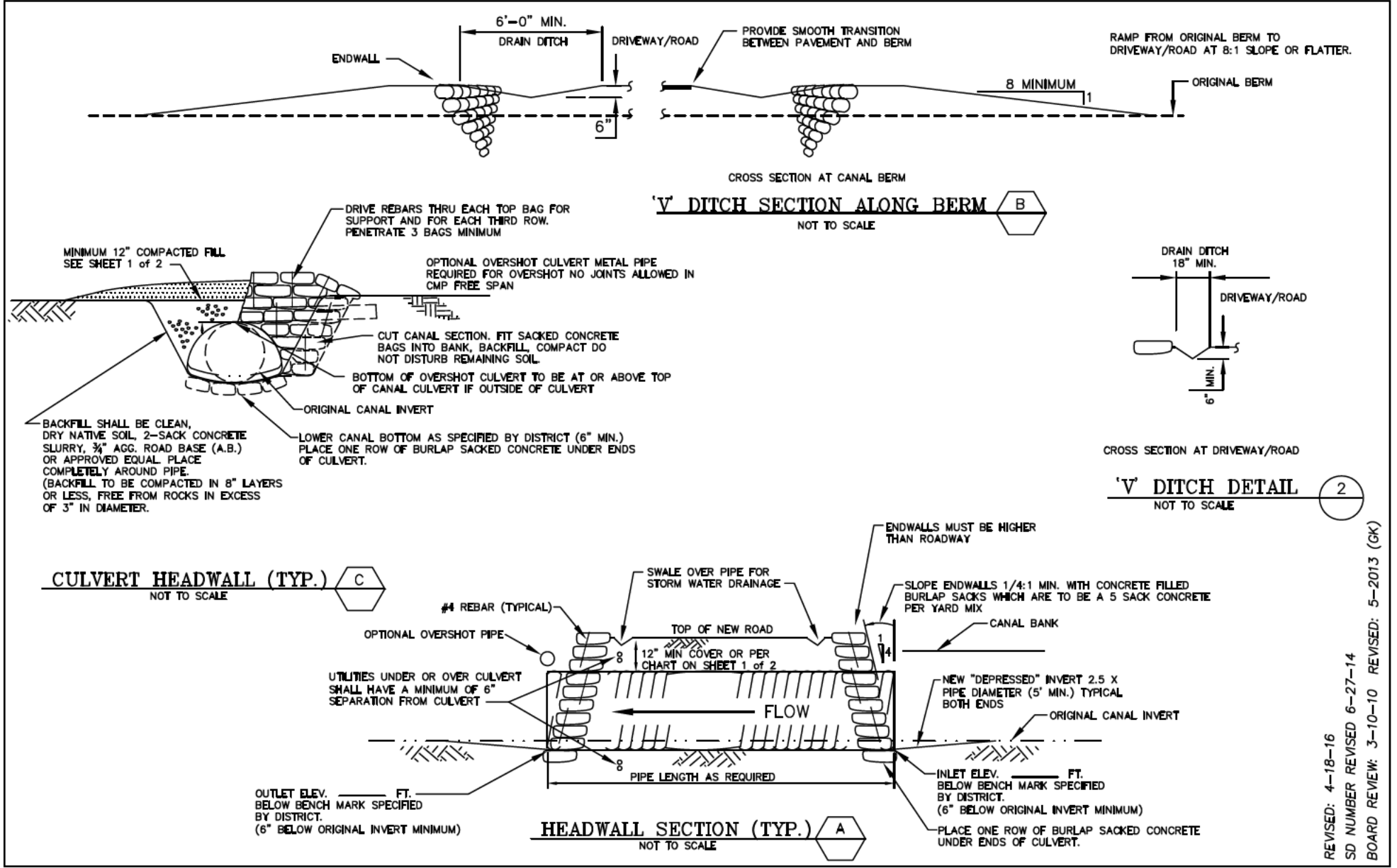
5. IF THIS IS A REPLACEMENT, THE LENGTH OF CULVERT REPLACEMENT WILL BE AGREED UPON BETWEEN NID AND THE LAND OWNER.
6. EXCEPT FOR REPLACEMENTS, CULVERT LENGTH WILL BE DETERMINED BY OWNER. THE FOLLOWING FORMULA CAN BE USED:  

$$L = W + 3 + 2(H \times 1/4)$$
 WHERE:  
 L = LENGTH OF CULVERT  
 W = DESIRED ROAD WIDTH PLUS DRAINAGE DITCHES  
 H = HEIGHT OF ROAD SURFACE FROM BOTTOM OF PIPE (RISE OF PIPE PLUS COVER OVER PIPE)
7. USE OF MANUFACTURED FLARED END SECTION IS OPTIONAL. FLARED END SECTION WILL NOT REPLACE REQ'T FOR RIP-RAP.
8. MINOR MODIFICATIONS TO MEET FIELD CONDITIONS SUBJECT TO APPROVAL BY ENGINEERING MANAGER.



**PLAN VIEW**  
NOT TO SCALE

REVISED: 8-31-16  
 SD NUMBER REVISED 6-27-14  
 BOARD REVIEW: 3-10-10



CANAL CULVERT INSTALLATION

NOT TO SCALE

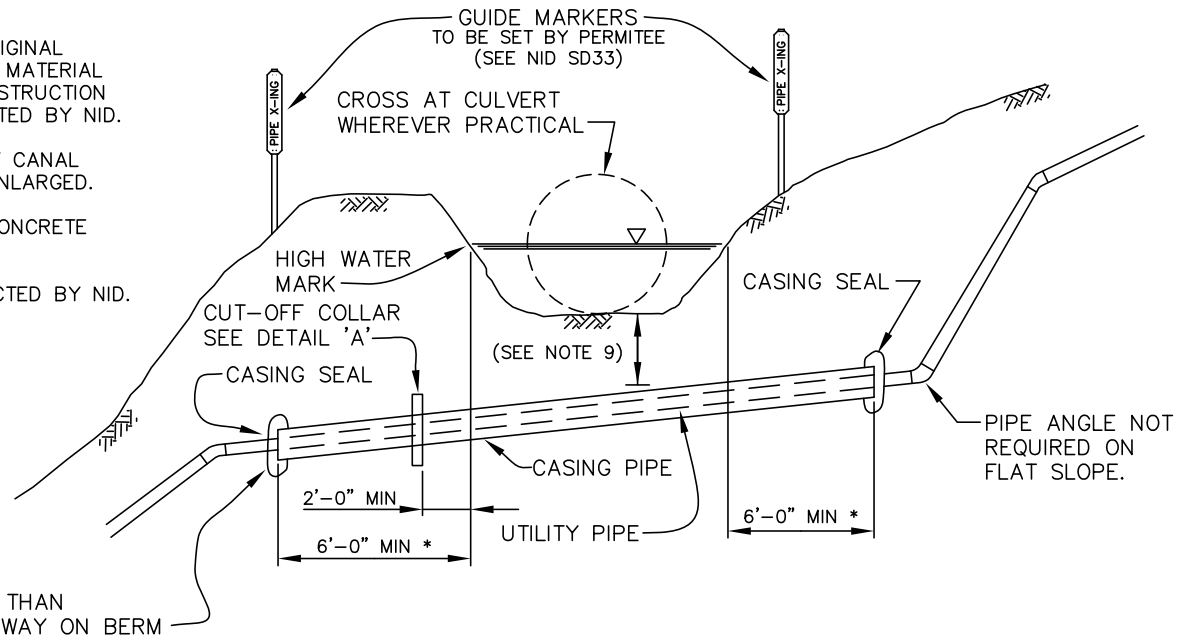
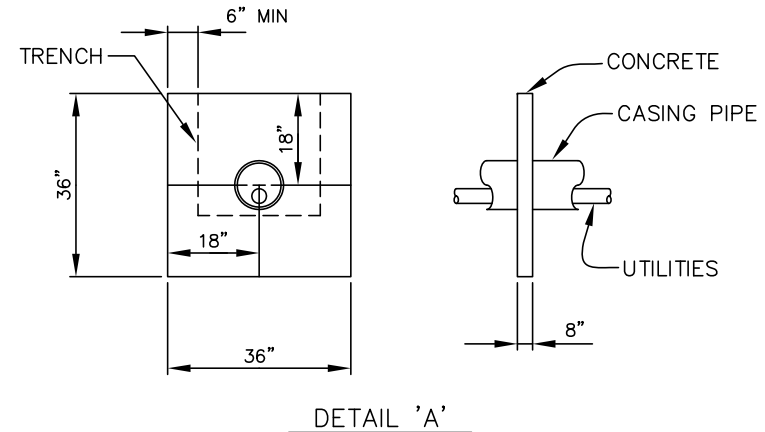
NID SD25

2 of 2

REVISED: 4-18-16  
 SD NUMBER REVISED 6-27-14  
 BOARD REVIEW: 3-10-10 REVISED: 5-2013 (GK)

**NOTES:**

1. CROSS THE CANAL UNDER A CULVERT WHEREVER PRACTICAL. CENTER THE CROSSING ON THE CULVERT PIPE.
2. WATERLINE, ELECTRICAL AND TELECOM CAN CROSS IN THE SAME CASING PIPE. ELECTRICAL AND TELECOM MUST BE ENCLOSED IN SEPARATE PIPES WITHIN THE CASING.
3. CASING PIPE SHALL BE EITHER CONTINUOUS #10 GAUGE DIPPED AND WRAPPED STEEL OR CMP WITH #16 GAUGE FOR STEEL AND #14 GAUGE FOR ALUMINUM OR C-900 PVC. A CASING SHALL BE AT LEAST TWO INCHES LARGER INTERIOR DIAMETER THAN THE EXTERIOR WATER PIPE DIAMETER, WITH A MINIMUM OF FOUR INCHES. EXTEND CASING PIPE ON UPHILL SIDE TO ABOVE THE ELEVATION OF THE MAXIMUM WATER LEVEL.
4. CANAL OUTAGES MUST BE APPROVED BY THE DISTRICT IN ADVANCE. IF A CASING PIPE ELBOW IS TO BE INSTALLED, IT MUST BE FABRICATED BEFORE THE OUTAGE IS SCHEDULED (MINIMUM TWO WEEKS NOTIFICATION). EFFORT WILL BE MADE TO REDUCE TURBIDITY IN CANAL AFTER INSTALLATION.
5. THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO ITS ORIGINAL DENSITY OR HIGHER. RECONSTRUCTION IN GUNITED SECTIONS WILL REQUIRE SPECIAL ATTENTION AS DIRECTED BY NID.
6. THE CASING PIPE MAY REQUIRE EXTENDING BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
7. SEAL BOTH ENDS OF CASING WITH BURLAP SACKS FILLED WITH CONCRETE OR AN APPROVED EQUIVALENT.
8. GUIDE MARKERS SHALL BE INSTALLED BY THE PERMITEE AS DIRECTED BY NID. SEE NID SD33 FOR DETAILS.
9. CLEARANCE:  
1'-6" MINIMUM UNDER CANAL AS DETERMINED BY DISTRICT  
1'-0" MINIMUM UNDER CULVERT AS DETERMINED BY DISTRICT  
DISTRICT MAY REQUIRE FLOW FILL.

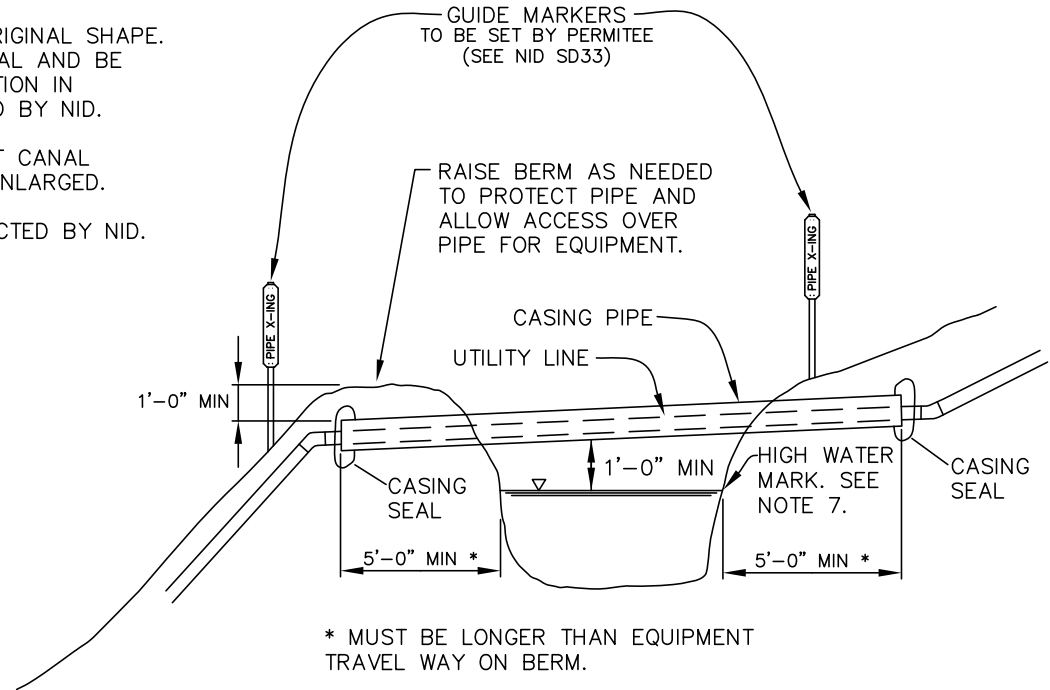


\* MUST BE LONGER THAN EQUIPMENT TRAVEL WAY ON BERM

SD NUMBER REVISED 6-27-14  
BOARD REVIEW: 2-5-14

NOTES:

1. UTILITY CROSSINGS INSTALLED OVER THE CANAL WILL NOT BE APPROVED UNLESS PHYSICAL CONSTRAINTS PRECLUDE AN UNDER CANAL INSTALLATION. ALL OVER CANAL-CROSSINGS SHALL BE REVIEWED AND APPROVED ON AN INDIVIDUAL BASIS.
2. WATERLINE, ELECTRICAL AND TELECOM CAN CROSS IN THE SAME CASING PIPE. ELECTRICAL AND TELECOM MUST BE ENCLOSED IN A SEPARATE PIPE WITHIN THE CASING.
3. CASING PIPE SHALL BE EITHER CONTINUOUS #10 GAUGE DIPPED AND WRAPPED STEEL PIPE OR CMP WITH #16 GAUGE FOR STEEL AND #14 GAUGE FOR ALUMINUM. A CASING SHALL BE AT LEAST TWO INCHES LARGER INTERIOR DIAMETER THAN THE EXTERIOR WATER PIPE DIAMETER, WITH A MINIMUM OF FOUR INCHES.
4. THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO ITS ORIGINAL DENSITY OR GREATER. RECONSTRUCTION IN GUNITED SECTIONS WILL REQUIRE SPECIAL ATTENTION AS DIRECTED BY NID.
5. THE CASING PIPE MAY REQUIRE EXTENDING BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
6. GUIDE MARKERS SHALL BE INSTALLED BY THE PERMITEE AS DIRECTED BY NID. SEE NID SD33 FOR DETAILS.
7. 12" ABOVE HIGH WATER MARK OR GREATER.



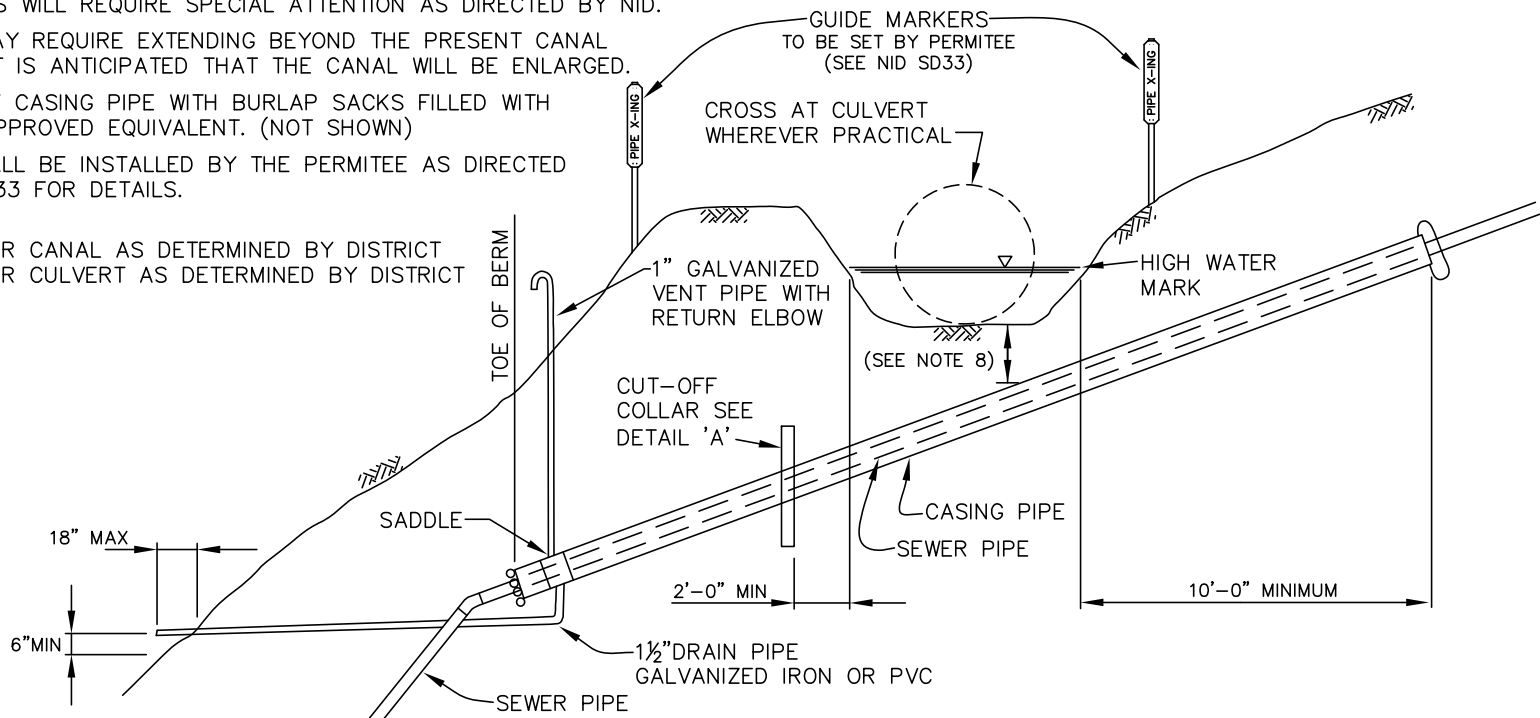
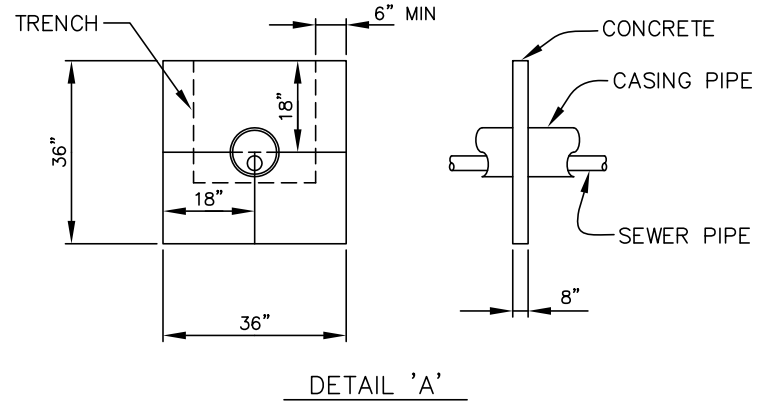
CANAL UTILITY CROSSING (OVER)

NOT TO SCALE

NID SD27

NOTES:

1. CROSS THE CANAL UNDER A CULVERT WHEREVER PRACTICAL. CENTER THE CROSSING ON THE CULVERT PIPE.
2. CASING PIPE SHALL BE EITHER CONTINUOUS #10 GAUGE DIPPED AND WRAPPED STEEL OR CMP WITH #16 GAUGE FOR STEEL AND #14 GAUGE FOR ALUMINUM OR C-900 PVC. A CASING SHALL BE AT LEAST TWO INCHES LARGER INTERIOR DIAMETER THAN THE EXTERIOR WATER PIPE DIAMETER, WITH A MINIMUM OF FOUR INCHES. EXTEND CASING PIPE ON UPHILL SIDE TO ABOVE THE ELEVATION OF THE MAXIMUM CANAL WATER LEVEL.
3. CANAL OUTAGES MUST BE APPROVED BY THE DISTRICT IN ADVANCE. IF A CASING PIPE ELBOW IS TO BE INSTALLED, IT MUST BE FABRICATED BEFORE THE OUTAGE IS SCHEDULED.
4. THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO ITS ORIGINAL DENSITY. RECONSTRUCTION IN GUNITED SECTIONS WILL REQUIRE SPECIAL ATTENTION AS DIRECTED BY NID.
5. THE CASING PIPE MAY REQUIRE EXTENDING BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
6. SEAL BOTH ENDS OF CASING PIPE WITH BURLAP SACKS FILLED WITH CONCRETE OR AN APPROVED EQUIVALENT. (NOT SHOWN)
7. GUIDE MARKERS SHALL BE INSTALLED BY THE PERMITEE AS DIRECTED BY NID. SEE NID SD33 FOR DETAILS.
8. CLEARANCE:  
 1'-6" MINIMUM UNDER CANAL AS DETERMINED BY DISTRICT  
 1'-0" MINIMUM UNDER CULVERT AS DETERMINED BY DISTRICT



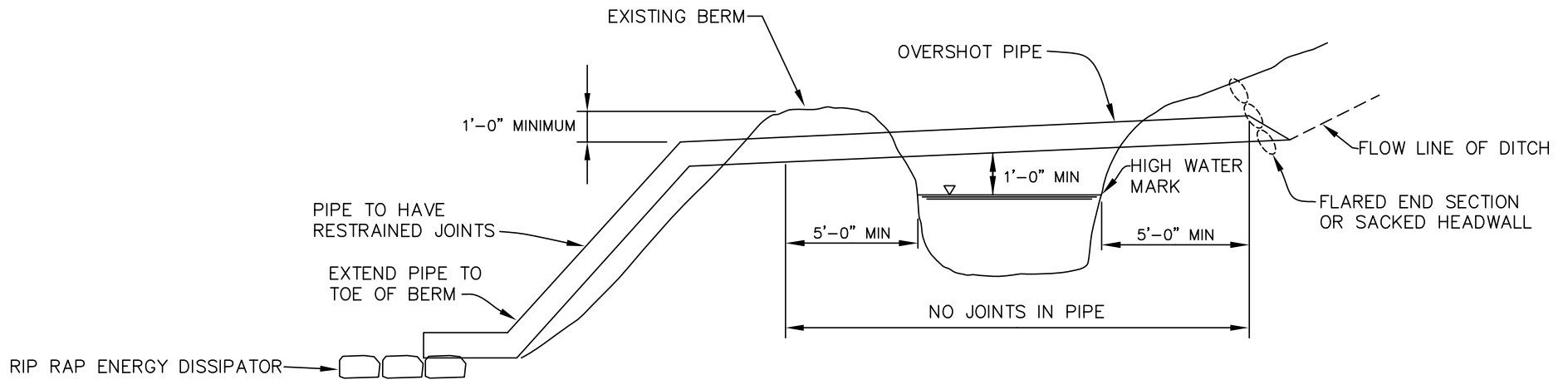
CANAL SEWER CROSSING (UNDER)

NOT TO SCALE

NID SD28

NOTES:

1. OWNER REQUESTED (BY DISTRICT ENGINEER APPROVAL ONLY).
2. OVERHEAD UTILITY CROSSINGS WILL NOT NORMALLY BE ALLOWED. REQUESTS FOR THESE TYPES OF CROSSINGS WILL BE REVIEWED ON AN INDIVIDUAL BASIS IF APPROVED.
3. OWNER SHALL BE RESPONSIBLE FOR SIZING OVERSHOT PIPE FOR BOTH DIAMETER AND BEAM STRENGTH.
4. PIPE SHALL BE RIGID SUCH THAT MINIMAL DEFLECTION OCCURS WHEN FULLY LOADED WITH WATER.
5. OVERSHOT PIPE SHALL BE MINIMUM #12 GAUGE CMP OR APPROVED EQUIVALENT.
6. THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO ITS ORIGINAL DENSITY OR GREATER. RECONSTRUCTION IN GUNITED SECTIONS WILL REQUIRE SPECIAL ATTENTION AS DIRECTED BY NID.
7. INLET TO OVERSHOT SHALL HAVE APPROPRIATE SIZED FLARED END SECTION OR SACKED HEADWALL TO DIRECT FLOW INTO PIPE. RIP RAP ENERGY DISSIPATOR SHALL BE PLACED AT THE OUTLET OF PIPE AT TOE OF CANAL BERM PER NID SD25.
8. THE OVERSHOT MAY REQUIRE EXTENDING BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.



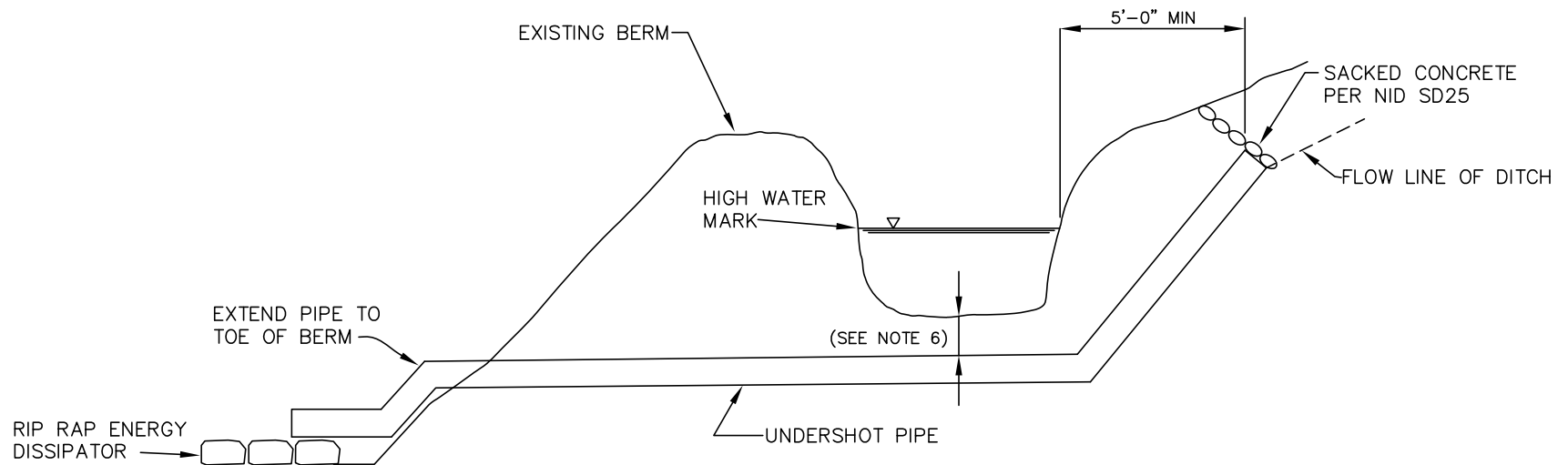
CANAL STORM WATER CROSSING (OVERSHOT)

NOT TO SCALE

NID SD29

NOTES:

1. OWNER REQUESTED (BY DISTRICT ENGINEER APPROVAL ONLY).
2. OWNER SHALL BE RESPONSIBLE FOR SIZING UNDERSHOT PIPE.
3. UNDERSHOT PIPE SHALL BE MINIMUM #12 GAUGE CMP OR APPROVED EQUIVALENT.
4. THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO ITS ORIGINAL DENSITY OR GREATER. RECONSTRUCTION IN GUNITED SECTIONS WILL REQUIRE SPECIAL ATTENTION AS DIRECTED BY NID.
5. INLET TO UNDERSHOT SHALL HAVE APPROPRIATE SIZED SACKED HEADWALL TO DIRECT FLOW INTO PIPE. RIP RAP ENERGY DISSIPATOR SHALL BE PLACED AT THE OUTLET OF PIPE AT TOE OF CANAL BERM.
6. THE UNDERSHOT MAY REQUIRE EXTENDING BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
7. CLEARANCE:  
1'-6" MINIMUM UNDER DITCH  
1'-0" MINIMUM UNDER CULVERT



CANAL STORM WATER CROSSING (UNDERSHOT)

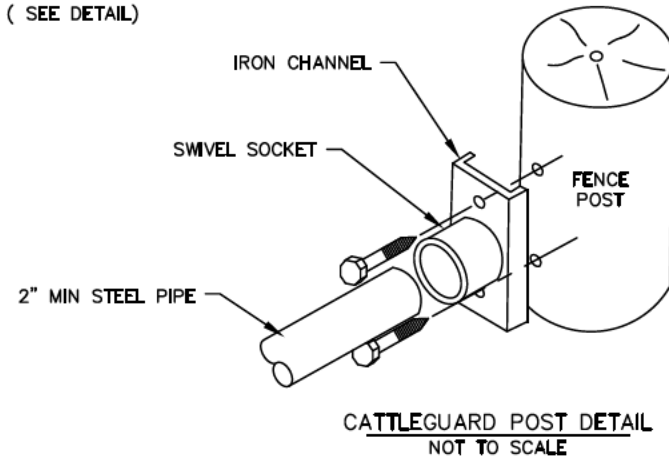
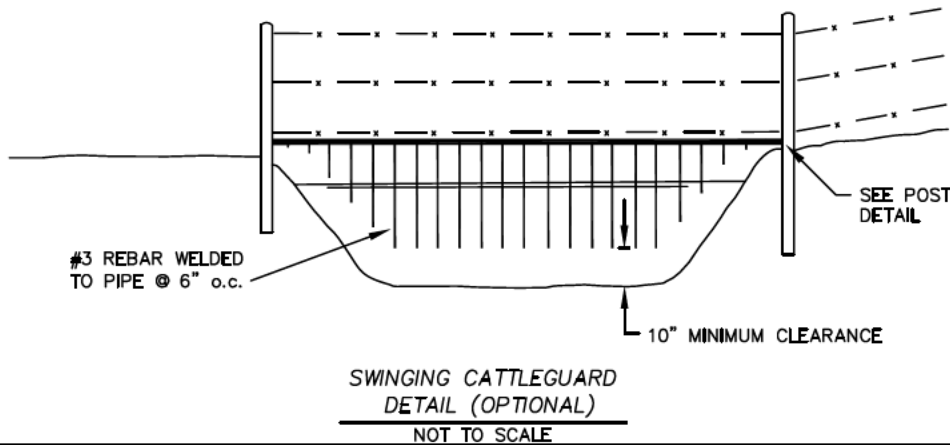
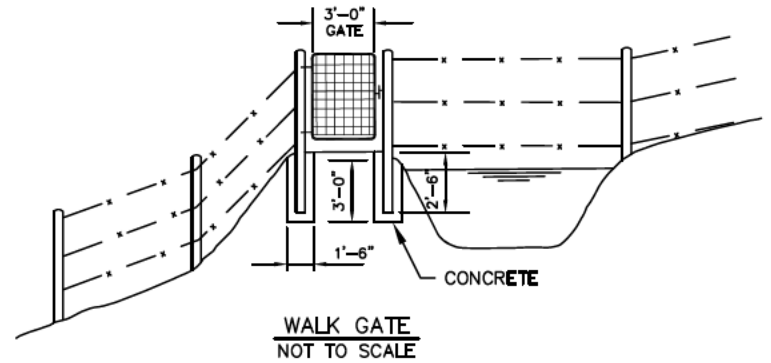
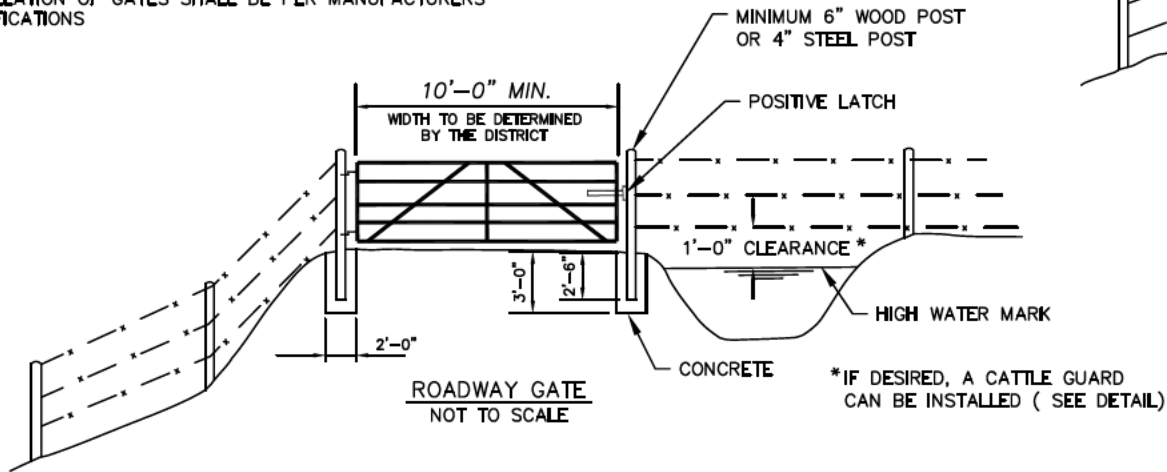
NOT TO SCALE

NID SD30



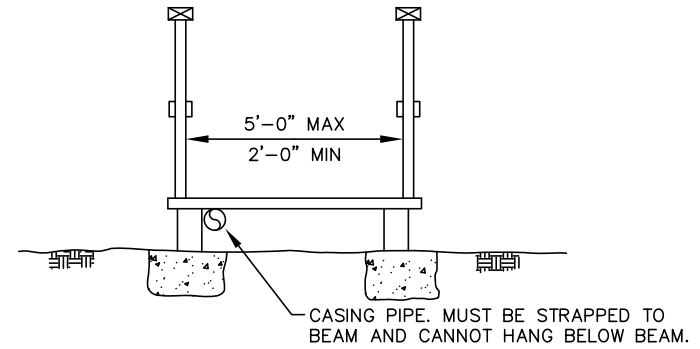
**NOTES:**

1. GATES SHALL BE ALUMINUM CHANNEL FARM GATES OR STEEL GATES MADE OF 1 3/8" O.D. GALVANIZED STEEL FRAME #9 GAUGE GALVANIZED STEEL FABRIC WITH 2" x 2" MESH.
2. GATES SHALL SWING FREELY, BE OFF THE GROUND, AND REMAIN OPEN WHEN OPENED.
3. IF YOU DESIRE TO LOCK YOUR GATE, A CHAIN WILL BE REQUIRED SO A DISTRICT LOCK CAN BE LINKED WITH YOUR LOCK. PLEASE CONTACT YOUR SERVICE WORKER AFTER INSTALLATION FOR DISTRICT LOCK.
4. INSTALLATION OF GATES SHALL BE PER MANUFACTURERS SPECIFICATIONS

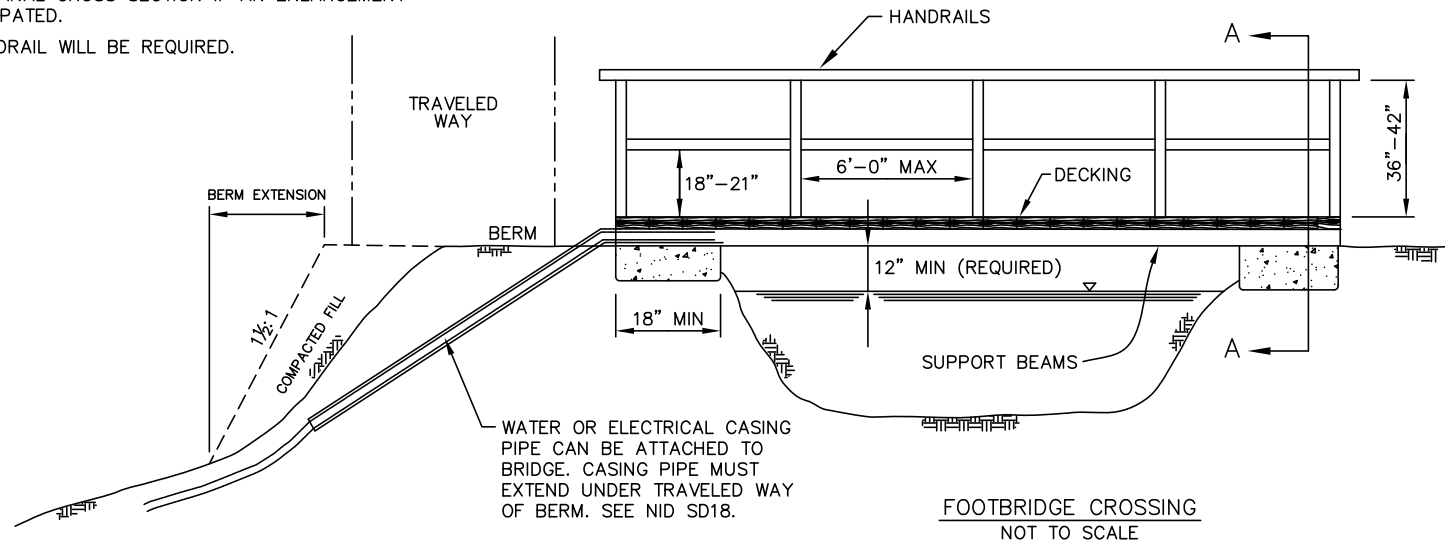


**NOTES:**

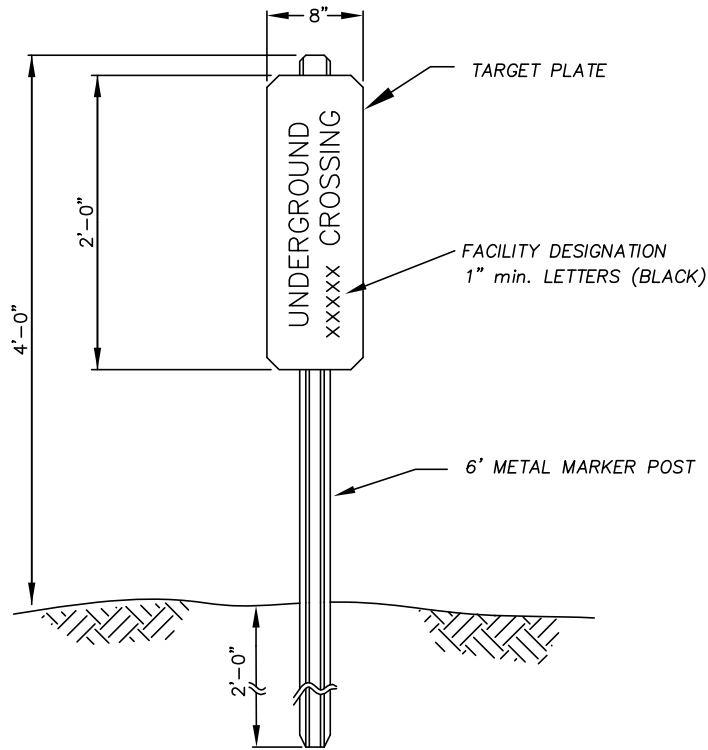
1. THIS DRAWING ILLUSTRATES GENERAL FEATURES OF A TYPICAL FOOTBRIDGE. DESIGN DRAWINGS SHOULD BE SUBMITTED TO THE DISTRICT FOR REVIEW. CONSIDERATION WILL BE GIVEN DURING REVIEW PROCESS AS TO SIZE OF CANAL, ETC., IN DETERMINING ACTUAL REQUIREMENTS.
2. SUPPORT BEAMS MUST BE ON CONCRETE FOOTINGS AND NOT IN CONTACT WITH GROUND. DECKING, SUPPORT BEAMS AND OTHER BRIDGE FEATURES MAY BE MADE OF METAL AND/OR WEATHER PROTECTED WOOD.
3. WATER OR ELECTRICAL CROSSINGS MAY BE ATTACHED TO THE UNDERSIDE OF THE BRIDGE. SUCH CROSSINGS MUST BE ENCASED. SEE NID SD18.
4. A MINIMUM OF 12" MUST BE MAINTAINED FROM THE HIGH WATER MARK OF THE CANAL AND THE LOWEST PART OF THE BRIDGE OR ANY ATTACHMENTS. NOTHING MUST EXTEND BELOW THE TOP OF THE BERM UNLESS DISTRICT APPROVAL IS GIVEN.
5. THE BERM MUST BE WIDENED IN THE AREA OF THE BRIDGE TO PROVIDE THE SAME UNEMCUMBERED WIDTH THAT THE DISTRICT ENJOYED PRIOR TO BRIDGE INSTALLATION. THIS REQUIREMENT MAY BE WAIVED BY THE DISTRICT.
6. THE LENGTH OF THE BRIDGE MAY BE REQUIRED TO BE EXTENDED BEYOND THE PRESENT CANAL CROSS SECTION IF AN ENLARGEMENT OF THE CANAL IS ANTICIPATED.
7. A MINIMUM OF ONE HANDRAIL WILL BE REQUIRED.



**SECTION A-A**  
NOT TO SCALE



**FOOTBRIDGE CROSSING**  
NOT TO SCALE



FACILITY DESIGNATION :

WATERLINE  
ELECTRICAL  
SEWER  
STORM WATER

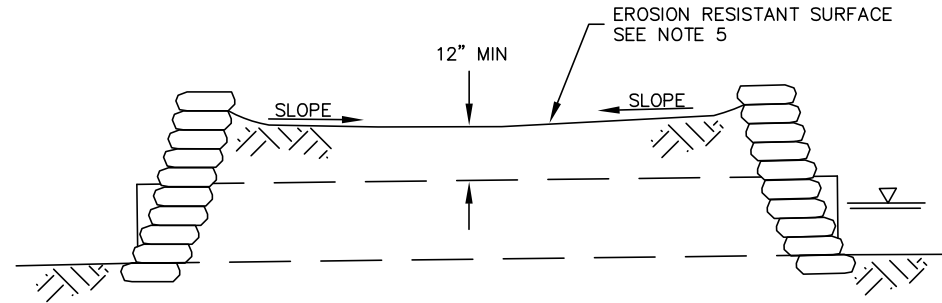
GUIDE MARKER DETAIL

NOTES:

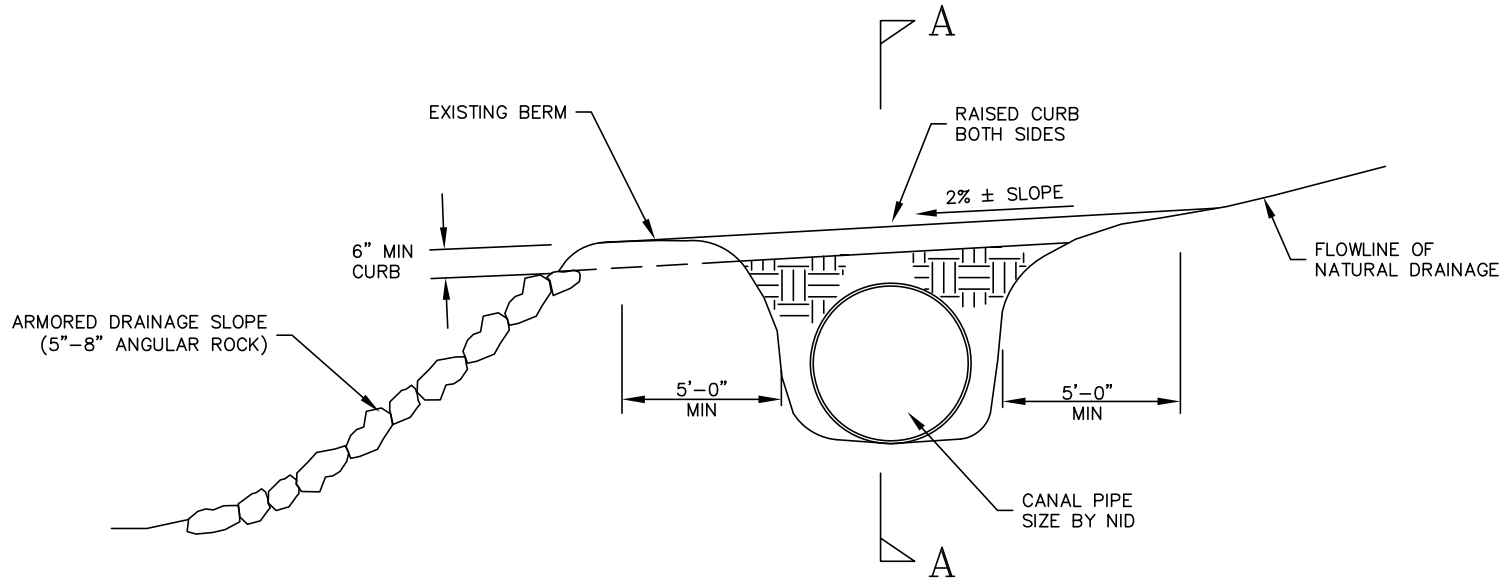
1. ALL MATERIALS AND INSTALLATIONS SHALL CONFORM TO THE SPECIFICATIONS.
2. GUIDE MARKERS SHALL BE FURNISHED AND INSTALLED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE DISTRICT ENGINEER.
3. POSTS SHALL BE TYPE 'M' AND SHALL CONFORM TO CALTRANS SECTION 82.
4. ALL NUMBERS AND LETTERS SHALL BE BLOCK STYLE AND STENCILED IN BLACK ON A WHITE BACKGROUND.
5. ALL UNDERGROUND ENCROACHMENTS SHALL BE MARKED PER DISTRICT STANDARDS.

NOTES:

1. THE CROSSING SHALL ALLOW STORM WATER FLOWS TO PASS OVER A PIPED SECTION OF CANAL.
2. STORM WATER SHALL BE DIRECTED AS NEAR AS PRACTICABLE TO FLOW IN ITS HISTORICAL PATH OF DRAINAGE.
3. POSITIVE DRAINAGE ACROSS CANAL SHALL BE MAINTAINED.
4. INSTALLATION OF CANAL PIPE SHALL MEET NID STANDARD DETAIL SD25 A/B.
5. SURFACE OVER CANAL SHALL BE OF SUCH MATERIAL TO ELIMINATE EROSION. SUCH AS ANGULAR ROCK, ANCHORED FILTER FABRIC, ESTABLISHED VEGETATION. CONCRETE OR IMPERVIOUS SURFACES BY DISTRICT APPROVAL ONLY.



SECTION A-A



CANAL STORM WATER CROSSING

NOT TO SCALE

NID SD34

BOARD REVIEW: 03/08/2017