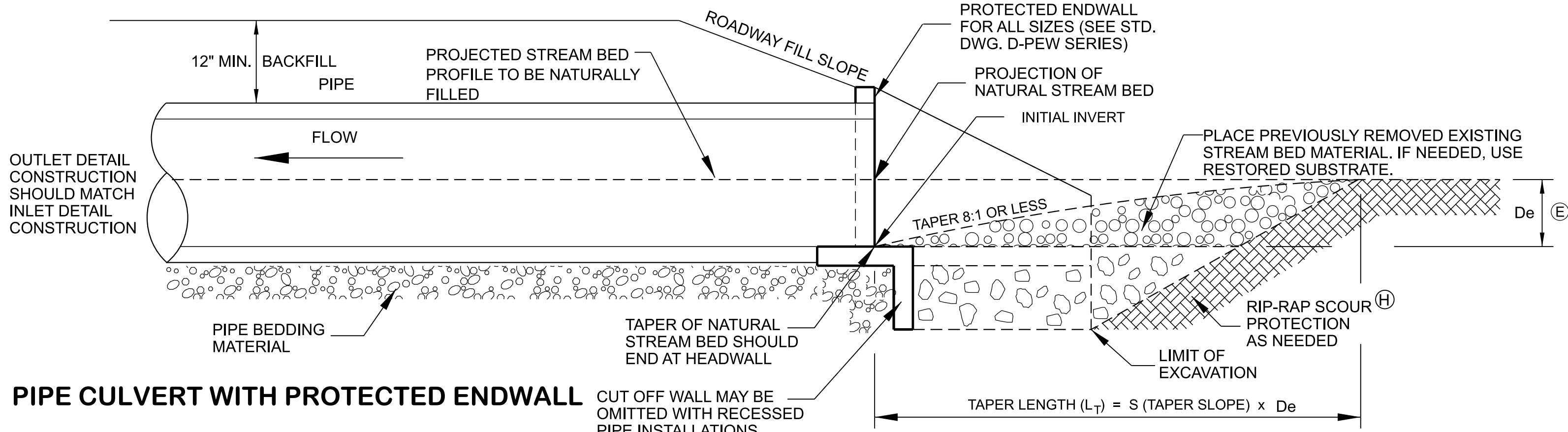
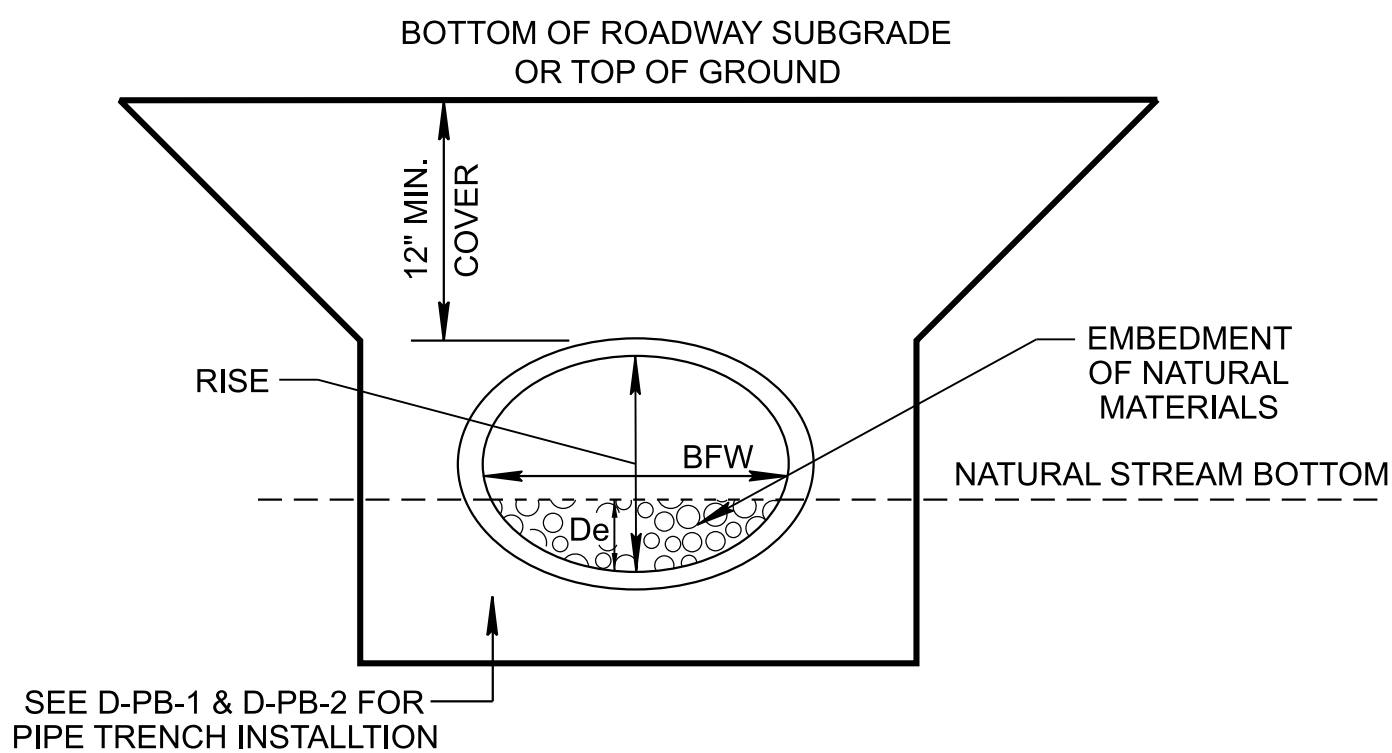


PIPE CULVERT WITH TYPE "U" OR SEW CROSS DRAIN ENDWALL

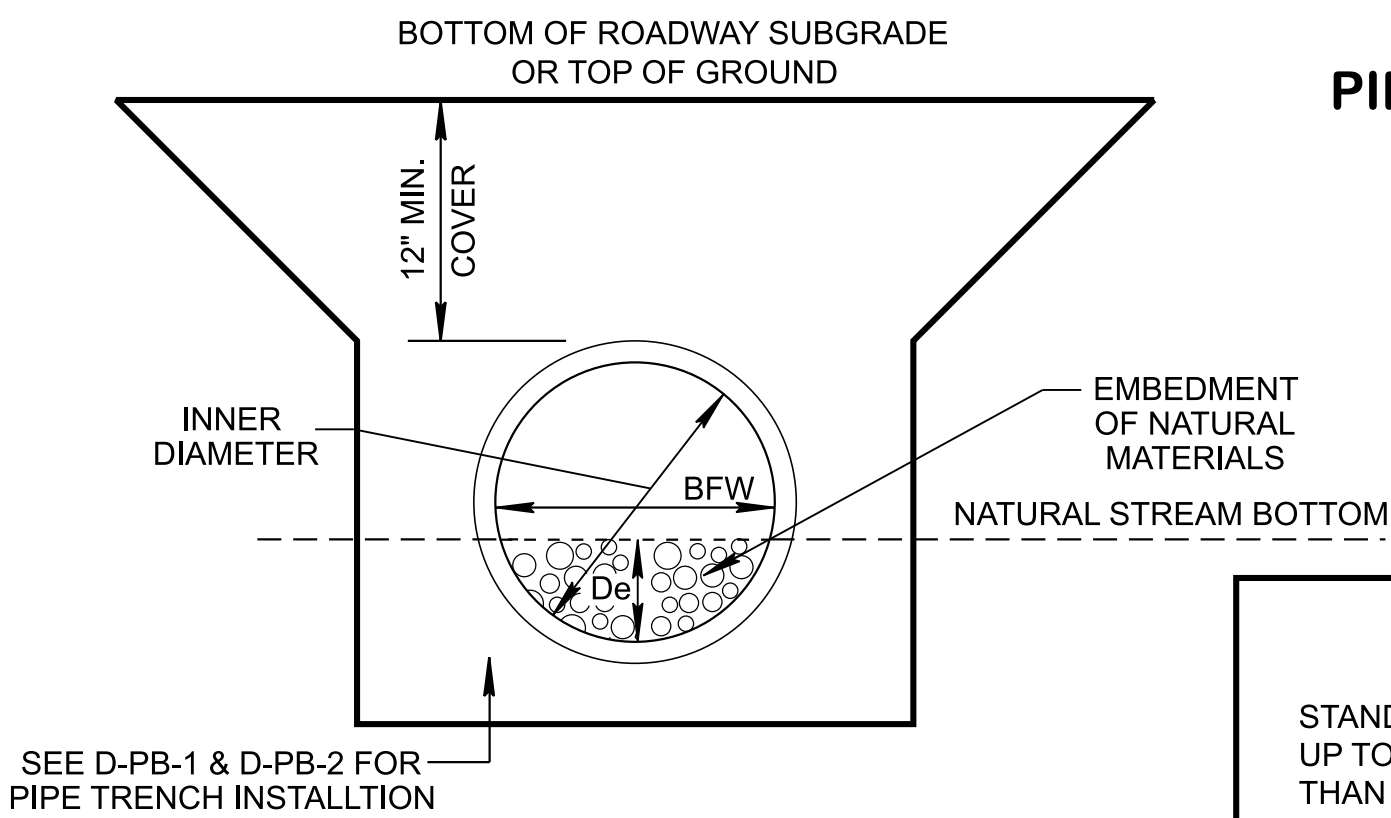


PIPE CULVERT WITH PROTECTED ENDWALL

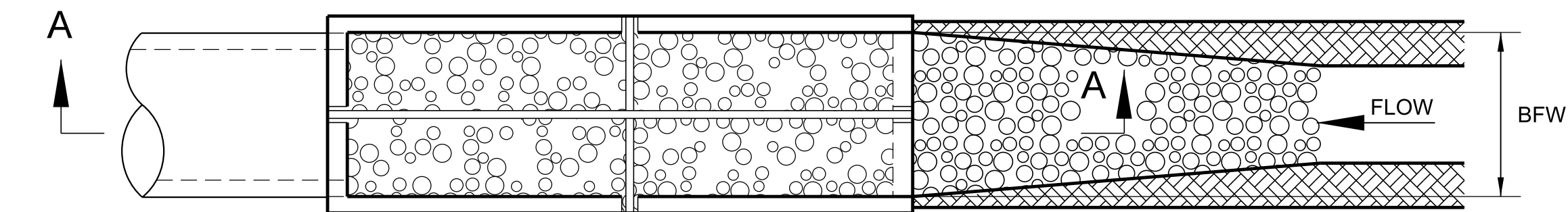


OVAL PIPE CULVERT SECTION (OPTIONAL)

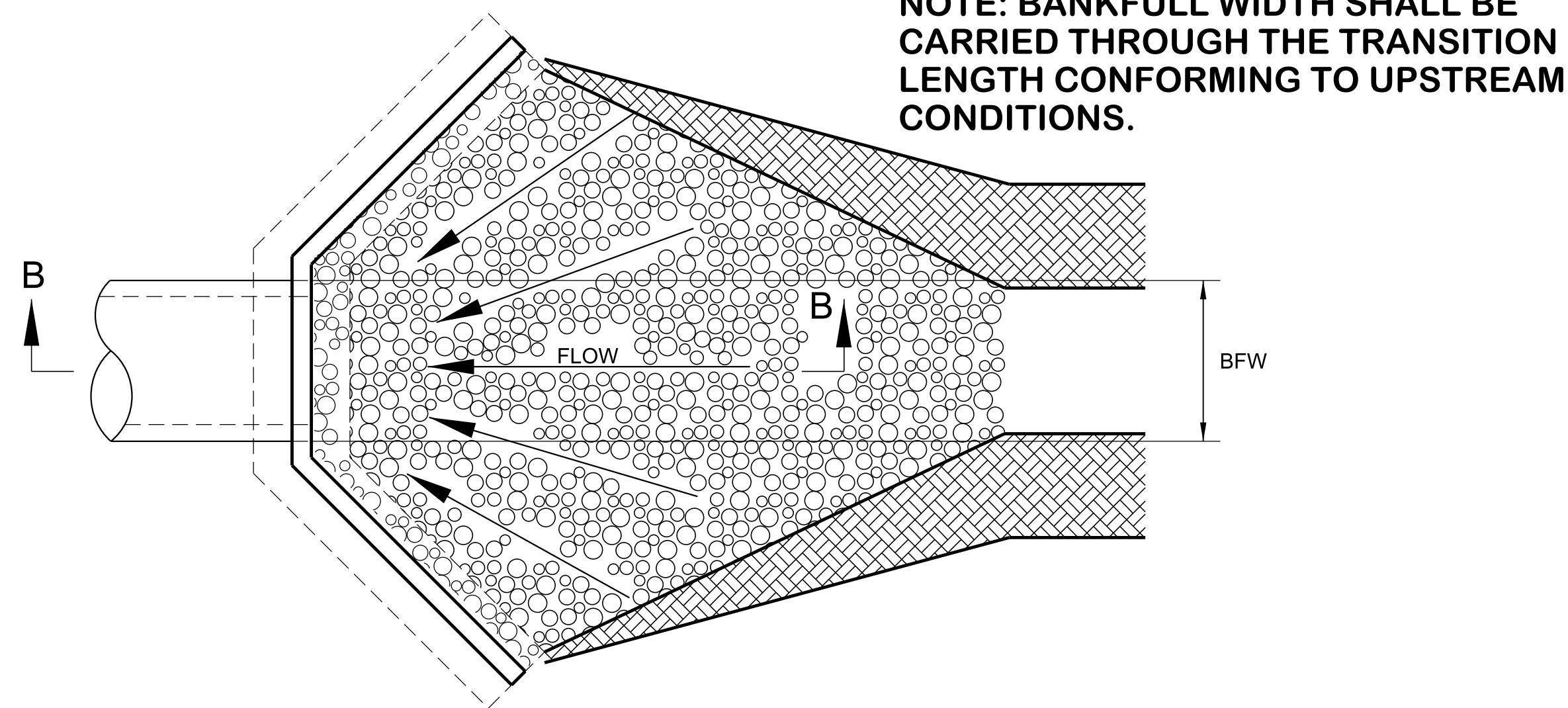
(NO STANDARD HEADWALL FOR OVAL PIPE, A SPECIAL DETAIL IS NEEDED)



CIRCULAR PIPE CULVERT SECTION



PIPE CULVERT WITH TYPE "U" OR SEW CROSS DRAIN ENDWALL



PIPE CULVERT WITH PROTECTED ENDWALL

HEADWALL NOTES

STANDARD PRE-CAST SAFETY ENDWALLS ARE AVAILABLE FOR ONLY ROUND PIPE SIZES UP TO 48" FOR PARALLEL (D-SEW-SERIES) OR CROSS DRAINS (D-PE-SERIES). WHEN LARGER THAN 48" PIPE SIZE PROPOSED, DESIGNER SHOULD REFER TO "PROTECTED ENDWALL" STANDARDS. THOSE MUST BE INSTALLED CAST-IN-PLACE AND SHOULD RECEIVE A ROADSIDE SAFETY BARRIER TREATMENT (GR OR CONCRETE BARRIER) IF HEADWALL IS PLACED IN THE CLEAR ZONE AS DEFINED BY S-CZ-SERIES.

GENERAL NOTES

- Ⓐ THIS STANDARD MAY BE USED WITH 60" OR LESS PIPE SIZES WITH RECESSED PIPE CULVERT AOP DESIGN.

Ⓑ SEE STANDARD DRAWINGS D-PB-1, D-PB-2, AND DRAINAGE MANUAL CHAPTER 12 FOR DETAILS REGARDING PIPE INSTALLATION.

Ⓒ IN ORDER TO ACHIEVE CORRECT EMBEDMENT DEPTH, CONTRACTOR SHALL INSTALL PIPES WITH INVERTS RECESSED TO A DEPTH "D_e" BELOW NATURAL STREAM BOTTOM. THIS METHOD SHOULD BE USED FOR ALL CIRCULAR OR ELLIPTICAL PIPE CULVERTS ON PERENNIAL AND INTERMITTENT STREAMS.

Ⓓ THE MATERIAL AND PLACEMENT OF NATURAL STREAM BED MATERIAL OR CHANNEL SUBSTRATE AND ALL INCIDENTALS INCLUDING THE PRACTICE OF LIMITING PERMEABILITY WILL BE PAID UNDER THE FOLLOWING ITEM NUMBERS,

203-20.01,
203-20.02,

CHANNEL SUBSTRATE,
NATURAL STREAMBED MATERIAL
(REMOVAL-STORAGE-PLACEMENT),

C.Y.
C.Y.
- Ⓔ THE DESIGNER SHALL USE HY-8, OR EQUIVALENT TDOT APPROVED SOFTWARE, AND FOLLOW THE PROCEDURE DETAILED IN TDOT DRAINAGE MANUAL CHAPTER 12 TO DETERMINE THE RECESSED DEPTH (D_e).

Ⓕ IT IS DESIRED TO HAVE A 6" LAYER OF NATIVE STREAM BED MATERIAL. AT LOCATIONS WHERE USING NATIVE MATERIAL IS NOT POSSIBLE, REFER TO DRAINAGE MANUAL SECTION 12.04.

Ⓖ DESIGNER SHOULD PROVIDE ADDITIONAL HYDRAULIC DATA INCLUDING THE RECESSED OR ULTIMATE EMBEDMENT DEPTH WITH THE PROPOSED PIPE INLET AND OUTLET INVERT ELEVATIONS, AOP DESIGN INFORMATION: BANK FULL WIDTH, AND VELOCITY. SEE DRAINAGE MANUAL SECTION 12.05 FOR DOCUMENTATION PROCEDURES.

Ⓗ CROSSING SHOULD BE ANALYZED AS AN EMBEDDED STRUCTURE FOR SHEAR STRESS REQUIREMENTS. THE APPROPRIATE RIP-RAP CLASS FOR THE SHEAR STRESS SHOULD BE USED AT THE INLET AND OUTLET OF THE STRUCTURE FOR SCOUR PROTECTION AND SHALL BE PLACED BELOW NATURAL STREAM BED OR RESTORED SUBSTRATE.

TABLE A [Ⓔ]	
BFW (INCH)	CIRCULAR PIPE SIZE (D) (INCH)
22 OR LESS	30
23 - 28	36
29 - 34	42
35 - 39	48
40 - 45	54
46 - 50	60
51 AND MORE	72" BOX CULVERT

MATERIAL SHOWN ARE ONLY A GRAPHICAL REPRESENTATION AND DO NOT DEPICT THE ACTUAL DEPTH OR QUANTITY OF MATERIALS TO APPROPRIATELY CONSTRUCT OR STABILIZE THE CHANNEL.

STATE OF TENNESSEE
STANDARD
DRAWING
DEPARTMENT OF TRANSPORTATION

AOP DESIGN
RECESSED
PIPE CULVERTS