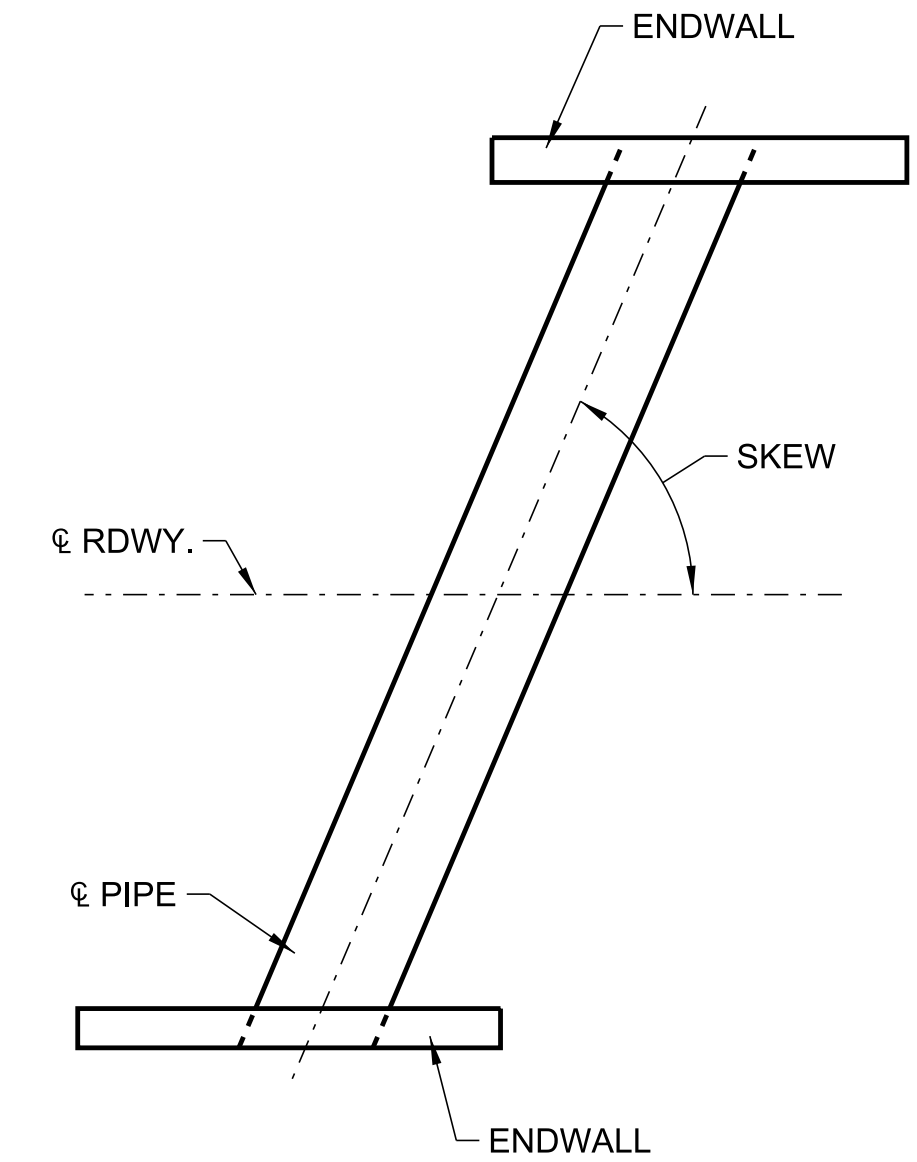


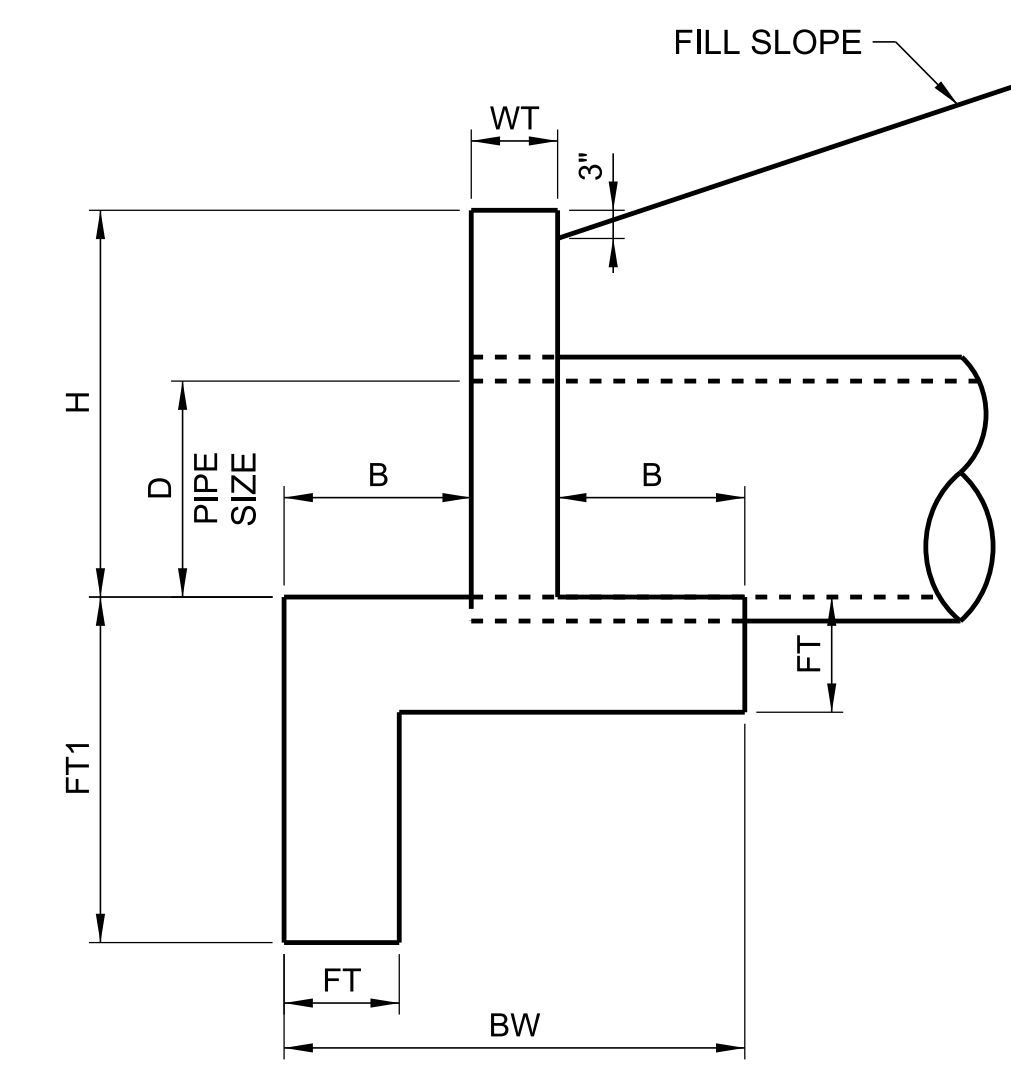
PLAN

FRONT ELEVATION

**STRAIGHT TYPE ENDWALL**

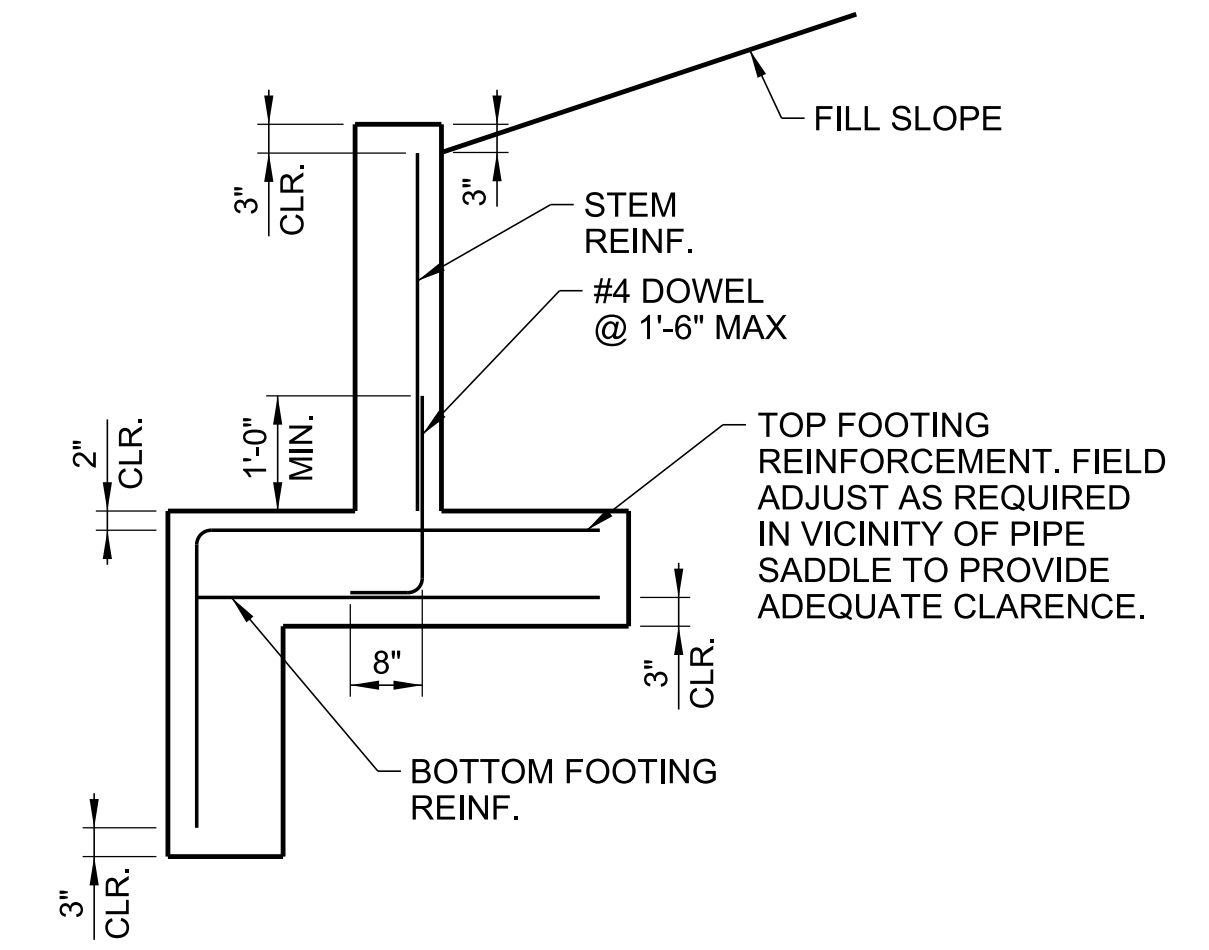


PLAN (SHOWING SKEW)



SECTION A-A \*\*

(ENDWALL SHOWING DIMENSION LABELS)



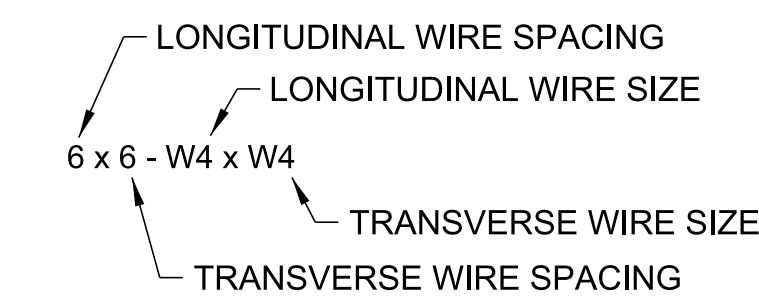
SECTION A-A \*\*

(ENDWALL SHOWING REINFORCEMENT DETAILS)

DIMENSIONS AND ESTIMATED QUANTITIES FOR ROUND CONCRETE PIPES													
DIAM. D	DIMENSIONS							REINFORCING STEEL			QUANTITIES		
	WT	H	FT (Fig.)	FT1 (Apron)	L	B	BW	SKEW	STEM REINF.	BOTTOM FOOTING REINF.	TOP FOOTING REINF.	STEEL REINF. (LBS)*	CONC. CU. YDS.
18"	6"	2'-0"	9"	1'-6"	8'-6"	1'-3"	3'-0"	90°	WWR @ 0.03 IN <sup>2</sup> /FT	WWR @ 0.03 IN <sup>2</sup> /FT	WWR @ 0.04 IN <sup>2</sup> /FT	29	1.13
					8'-8"			75°				29	1.15
					8'-10"			60°				30	1.17
					9'-0"			45°				30	1.17
24"	6"	3'-0"	9"	2'-0"	13'-0"	1'-3"	3'-0"	90°	WWR @ 0.08 IN <sup>2</sup> /FT	WWR @ 0.03 IN <sup>2</sup> /FT	WWR @ 0.06 IN <sup>2</sup> /FT	68	2.14
					13'-6"			75°				70	2.23
					14'-0"			60°				73	2.30
					14'-6"			45°				75	2.36
30"	6"	3'-6"	9"	2'-6"	15'-6"	1'-3"	3'-0"	90°	WWR @ 0.12 IN <sup>2</sup> /FT	WWR @ 0.04 IN <sup>2</sup> /FT	WWR @ 0.07 IN <sup>2</sup> /FT	109	2.88
					16'-0"			75°				112	2.98
					16'-6"			60°				115	3.05
					17'-0"			45°				118	3.11

\* UNIFORM LONGITUDINAL AND TRANSVERSE WIRE SIZE AND SPACING ASSUMED FOR CALCULATION OF STEEL REINFORCEMENT WEIGHTS. OTHER WWR SIZES AND/OR GRID SPACING MAY BE UTILIZED TO OBTAIN THE REQUIRED AREA OF STEEL REINFORCEMENT.

EXAMPLE WWR



THIS EXAMPLE HAS 0.04 SQ. IN. WIRES SPACED AT 6 IN. BOTH DIRECTIONS. ITS USE WOULD PROVIDE 0.08 SQ. IN. PER FOOT OF REINFORCING EACH WAY.

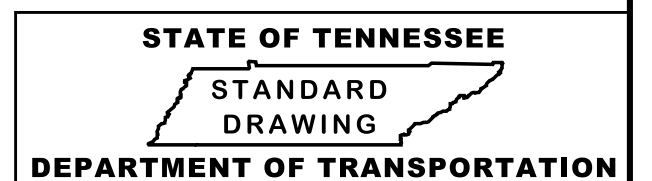
**STRUCTURAL DESIGN ASSUMPTIONS**

- ACTIVE EARTH PRESSURE ON FILL SIDE
- UNIT WEIGHT OF BACKFILL = 120 POUNDS PER CUBIC FOOT
- INTERNAL ANGLE OF FRICTION = 28 DEGREES
- COEFFICIENT OF FRICTION BETWEEN BASE AND SUBGRADE = 0.40
- NOMINAL BEARING RESISTANCE = 6000 POUNDS PER SQ. FOOT
- SOIL ON TOE SIDE OF FOOTING TO REMAIN UNDISTURBED

\*\* SECTION IS FOR BOTH ROUND AND OVAL PIPES

**GENERAL NOTES**

- SPECIFICATIONS: STANDARD ROAD AND BRIDGE SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION. (CURRENT EDITION).
- DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9<sup>TH</sup> EDITION, 2020.
- CONCRETE: TO BE CLASS "A" EXCEPT MINIMUM 28-DAY COMPRESSIVE STRENGTH, F<sub>C</sub>=4000 PSI.
- REINFORCING STEEL: TO BE ASTM A615 GRADE 60. STANDARD CRSI HOOK DETAILS APPLY. SPACING DIMENSIONS ARE CENTER TO CENTER UNLESS OTHERWISE NOTED.
- WELDED WIRE REINFORCEMENT: TO BE AASHTO M221, ASTM A1064. MINIMUM YIELD STRENGTH TO BE 60 KSI. REFER TO STRUCTURAL WELDED WIRE REINFORCEMENT MANUAL OF STANDARD PRACTICE FOR DESIGN AND DETAILING CRITERIA.
- PAYMENT FOR ENDWALLS WILL BE MADE AS FOLLOWS:  
ITEM 611-07.01 CLASS "A" CONCRETE (PIPE ENDWALLS) PER CUBIC YARD  
ITEM 611-07.02 STEEL BAR REINFORCING (PIPE ENDWALLS) PER POUND
- FOUNDATION SHOWN IS FOR PLACEMENT ON SOIL. IF WALL IS PLACED ON SOLID ROCK FOUNDATION, ALTERNATIVE DESIGNS MAY BE SUBMITTED TO THE DEPARTMENT FOR APPROVAL.
- 4" DIAMETER WEEP HOLES AT MAXIMUM 10'-0" CENTER-TO-CENTER ARE TO BE PLACED AT THE LOWEST POINT PRACTICAL FOR PROPER DRAINAGE. THE ENGINEER WILL DETERMINE BOTH HORIZONTAL AND VERTICAL SPACING OF WEEP HOLES. PIPE IS TO BE PAID FOR UNDER THE PRICE BID FOR OTHER ITEMS OF CONSTRUCTION.
- FOR PROTECTED ENDWALLS ON SKEWS OR FILL SLOPES OTHER THAN THOSE DETAILED, ROUNDING/WARPING OF THE FILL SLOPES NEAR THE ENDWALLS IS PERMISSIBLE.
- PRECASTING IS ALLOWED.
- PROTECTED ENDWALLS MAY NOT BE USED INSIDE THE CLEAR ZONE UNLESS SHIELDED BY GUARDRAIL OR OTHER SAFETY DEVICE.
- DIMENSIONAL AND REINFORCING TOLERANCES WILL BE AS SHOWN IN STANDARD OPERATING PROCEDURE (SOP) 5-3.
- THE CONTRACTOR MAY ELECT TO SUBSTITUTE AN APPROVED ALTERNATE DESIGN.



**PROTECTED STRAIGHT ENDWALLS**  
(PIPE SIZES 18" TO 30" & EQUIVALENT OVAL PIPES)

09-15-21

D-PEW-4