

NOTES TO DESIGNER:

The designer shall ensure that the following checks are undertaken to ensure the suitability of the standard box culvert and wingwall designs to a particular site.

General:

The designer shall review the site investigation results and material testing to confirm the site exposure and environment is within the scope of these standards. This includes highly saline environments, maritime environments including splash zones and other aggressive chemicals.

Box Culverts:

The designer shall review the geometry and applied loading of the proposed site to ensure that the design is within the scope of these standards.

AASHTO Crack Control Criteria, Article 5.7.3.4, is ignored.

Wingwalls:

The standard wingwall designs do not allow for increased earth pressure loads due to seismic effects.

The designer shall ensure that the overall slip circle stability and wall deflections are checked in accordance with Section 11.6.2 of AASHTO LRFD.

The designer shall ensure the friction angle for founding stratum, ϕ_{found} , is a minimum of 32 degrees for 2:1 Slope Wingwalls and 34 degrees for 1.5:1 Slope Wingwalls. Where the founding stratum is a cohesive soil, the designer shall ensure that the sliding stability of the wall is verified.

Where the designer proposes to improve the foundation strata to allow the use of the standard wingwall designs, the designer shall ensure that additional sliding and bearing pressure checks are carried out at the base of the improved soil layer.

In locations where it is not practical to provide the back of wall drainage system as indicated on the drawings, the designer shall re-check the wingwall designs taking into account the site groundwater conditions. Special consideration of groundwater conditions may also be required in locations where the watercourse is prone to rapid and significant changes in water level, including seepage effects where appropriate.

The designer shall calculate the nominal bearing resistance of the foundation material using the semi-empirical approach given in AASHTO LRFD Section 10.6.3.1.3 using the width of footing at the low and high ends of the wingwall, dimensions N1 and N2, for the footing width B. The designer shall check that the factored bearing resistance at each end of the wall, qR , is greater than the minimum values given in the table below. Where the factored bearing resistance is below the minimum values given in the table the designer shall re-design the wall based on an increased footing width or provide improvement to the foundation bearing resistance such that its bearing resistance exceeds the minimum values.

2:1 Slope Wingwalls Type I

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	0.85	9'-0"	3.92
3'-6"	1.11	9'-6"	3.99
4'-0"	1.27	10'-0"	4.07
4'-6"	1.71	11'-0"	4.28
5'-0"	2.03	12'-0"	4.36
5'-6"	2.36	12'-6"	4.46
6'-0"	2.70	13'-0"	4.56
6'-6"	3.05	14'-0"	4.56
7'-0"	3.10	14'-6"	4.66
7'-6"	3.45	15'-0"	4.99
8'-0"	3.51	15'-6"	5.10
8'-6"	3.86		

2:1 Slope Wingwalls Type II

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	0.48	8'-0"	4.13
4'-0"	1.40	8'-6"	4.16
4'-6"	1.71	9'-0"	4.21
5'-0"	2.03	9'-6"	4.43
5'-6"	2.36	10'-0"	5.19
6'-0"	2.70	10'-6"	5.23
6'-6"	3.05	11'-0"	5.61
7'-0"	3.10	12'-0"	5.40
7'-6"	3.76	13'-0"	5.55

1.5:1 Slope Wingwalls Type I

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	1.02	8'-6"	3.44
3'-6"	1.15	9'-0"	3.57
4'-0"	1.50	9'-6"	3.71
4'-3"	1.68	10'-0"	4.10
4'-6"	1.88	11'-6"	4.28
4'-9"	2.08	12'-0"	4.42
5'-0"	1.98	12'-6"	4.55
5'-6"	2.40	13'-6"	4.60
6'-0"	2.53	15'-0"	4.95
6'-6"	2.65	15'-6"	5.32
7'-0"	2.78	16'-0"	5.70
7'-6"	3.18	16'-6"	6.11
		17'-6"	6.15

1.5:1 Slope Wingwalls Type II

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	0.55	8'-0"	4.26
4'-0"	1.50	8'-6"	4.35
4'-3"	1.68	9'-0"	4.64
4'-6"	1.88	9'-6"	4.93
4'-9"	2.08	10'-0"	5.04
5'-0"	2.28	10'-6"	5.49
5'-3"	2.49	11'-0"	5.83
5'-6"	2.71	11'-6"	5.93
5'-9"	2.93	12'-0"	6.04
6'-0"	3.15	12'-6"	6.16
6'-6"	3.61	13'-0"	6.28
7'-0"	3.70	13'-3"	6.51
7'-6"	4.17	14'-0"	6.53
		15'-0"	6.48

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

SPECIFICATION REFERENCE	<p>NOTES TO DESIGNER</p> <p>BOX CULVERTS AND WINGS</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	 <p>ROAD AND BRIDGE STANDARDS</p>	
		REVISION DATE	SHEET 1 OF 1
		07/12	1000.05