Title:	Wingwall Design for MTO Bridges
Division:	Transportation Infrastructure Management (TIM)
Branch:	Standards and Contracts Branch (SCB)
Office:	Structures Office
Date:	April 28, 2023
Theme(s):	Design , Construction
Distribution:	☐ Internal Only ☒ Approved for External Distribution Managers, Engineering Program Delivery Heads, Structural Manager, Highway Design Office Head, Standards Management Section
Memo Number:	SCB-SO-2023-XX

Approved by:

Walter Kenedi, Manager Structures Office	Brenda Liegler, Director Standards & Contracts Branch	Alain Beaulieu, Director Design & Engineering Branch

Implementation

This memorandum is effective as of the date of issue.

Background

Wingwalls are provided to retain the roadway embankment at the approach of bridge. The length and the height of the bridge wingwall should be adequate to retain the roadway embankment with an allowable slope and to eliminate the risk of spill through of the abutment backfill. The Ministry allows alignment of the bridge wingwalls either parallel to the roadway or at any angle to the abutment. Wingwalls aligned parallel to the roadway are very common because they confine the approach roadway effectively and reduce the risk of approach settlement. This alignment is also suitable for integral abutment bridges and can be used for supporting the traffic barriers over the wingwalls.

The Ministry had implemented design aids for cantilever type wingwall design in the structural manual in 2008. These design aids demonstrate all the applicable loads for the wing wall design for ministry bridges. Since the design aids were published, wingwalls for ministry bridges are designed for resisting lateral earth pressure, live load and compaction surcharge, and traffic impact load over the traffic barrier if the traffic barrier is supported on the wingwall. Design tables for cantilever wingwalls in the MTO Structural Manual provide the required flexural reinforcement for various wing wall thickness with 50mm increment with their lengths between 1.5m to 7.0m. These design tables are based on 400W steel reinforcement and were designed for lateral earth pressure and traffic impact loading on TL4 barrier supported on the wingwall. Additionally, the Ministry developed and made available one standard structural drawing (SSD 105-02) for wingwall design with non-integral bridges.

Recently the Ministry has implemented a policy to specify 500W steel reinforcement for new structures and all future designs shall be based on steel yield strength of 500 MPa. Therefore, the current design aids have been updated for 500W steel reinforcement and to include traffic impact load for on TL5 barrier. Also, a new standard structural drawing for wingwall with integral abutment bridges seems essential to improve the wingwall design and to save time during detail design of ministry bridges.

<u>Policy</u>

To confirm appropriate geometry, loading consideration and material use in the wingwall design for ministry bridges, the following design guidelines are established.

1. Length of the wingwall

The length of a wingwall shall be measured from its interface with the abutment to its end. The length of the wingwall must be sufficient so that the slope of the approach embankment along the wingwall meets the back face of the abutment below the elevation of the bridge bearing seats. The length of the wingwall shall be rounded up with 500mm increments. When the wingwall is aligned parallel to the roadway (U shape), an additional 500mm length must be provided so that the top of the approach slope meets 500mm away from the end of the wingwall to protect against erosion. The Ministry recommends using a 1000x1000 cleat between the abutment and the wingwall to minimise concrete shrinkage cracking due to the rapid change in the wall thickness, and to facilitate placement of concrete. A typical wingwall aligned parallel to the roadway is illustrated in the Figure 1.

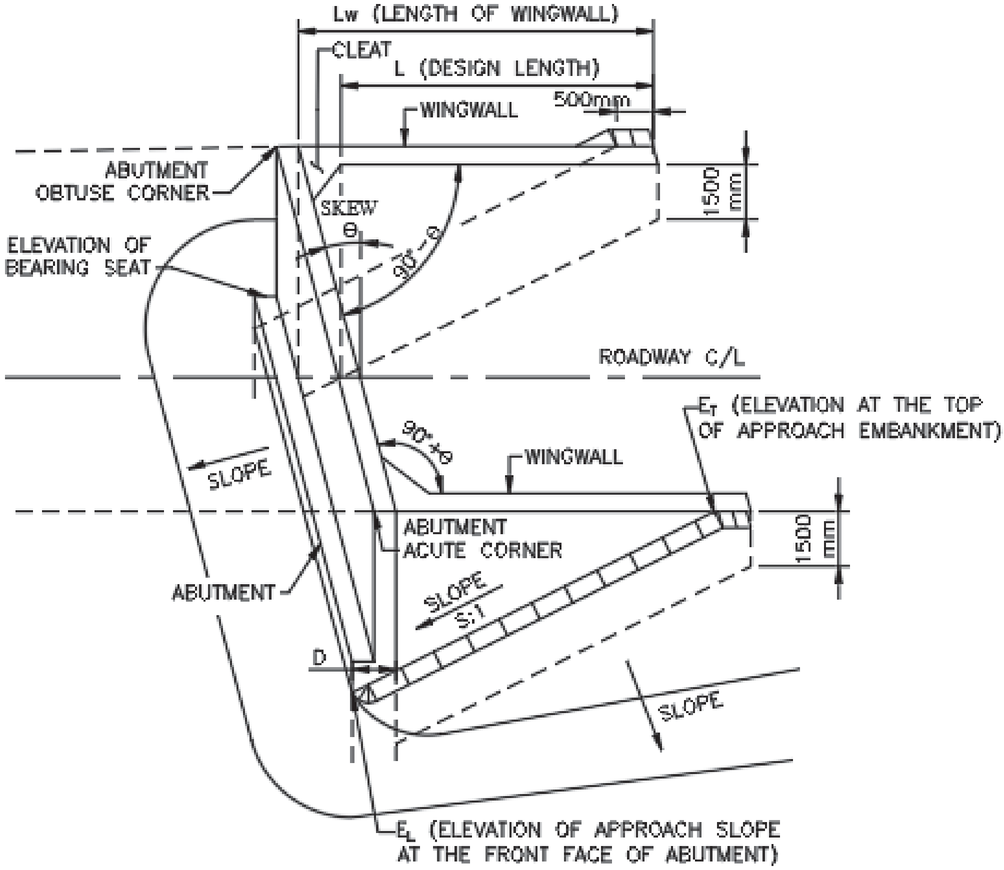


Figure 1: Geometry of U shape bridge wingwall parallel to roadway

The following equations in combination with Figure1 can be used to calculate the minimum length of the wingwall aligned parallel to the roadway:

Length of wingwall for non-skew bridges,
$\boldsymbol{L_w} = (E_T - E_L)S - D + 500mm$

Length of wingwall for skew bridges,
$\boldsymbol{L_w} = \frac{(E_T - E_L)S}{COS\ \theta} - D + 500mm$ at the abutment acute corner
$\boldsymbol{L_w} = (E_T - E_L)S - D + 500mm$ at the abutment obtuse corner

2. Height of the wingwall

The wingwall must have enough height above the ground level to retain the approach embankment and enough height below the ground level to ensure they are founded below the frost depth. Wingwalls hanging from the abutment are not susceptible to frost action at their bottom provided they are supported over free draining fill above the normal water level. However, ministry recommends providing a minimum depth of wingwall 1500mm as illustrated in Figure 1 to ensure retaining against spill of abutment backfill through the bottom of the wingwall and sufficient height to transfer the collision load from the traffic barrier supported on it.

3. Loads on wingwall

Wingwalls for ministry bridges shall be designed for lateral active earth pressure, live load surcharge and compaction surcharge. Live load surcharge shall be ignored for the bridges with approach slabs between the wingwalls. When the bridge traffic barrier is supported on the wingwall, an equivalent static lateral live load on the traffic barrier as specified in CSA S6 must be included in the wingwall design as well. Lateral earth pressure for the wingwall design shall be calculated using soil parameters provided in the Foundation Investigation Design Report. Where the soil parameters are not available, the Ministry recommends using an equivalent fluid pressure, Ka γ = 7.0 kPa in the lateral earth pressure calculation. Figure 2 Illustrates design loads on a wingwall.

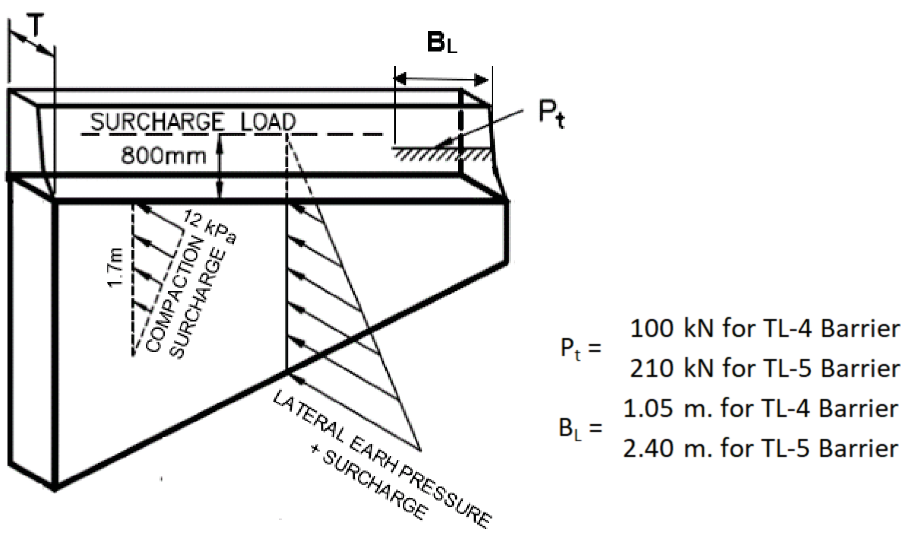


Figure 2: Design loads applied on wingwalls

4. Calculation of Flexural Moment and Shear in the Cantilever Wingwall

A cantilever type Wingwall shall be analysed as a free cantilever wall suspended from the abutment. The maximum moment and shear in the cantilever wall occur at the interface of the wall to the cleat. The equations provided in the Appendix A can be used to calculate the maximum moment and shear for cantilever wingwall design for applicable loads.

5. Standard Design Aids for Wingwall

The Ministry has developed standard design aids for cantilever type wingwall design. The design values provided in the design aids are only applicable for the particular shaped of wingwall shown in the design aids. The design aids for the wingwall are included in Appendix B1 to B6.

6. Standard Structural Drawing (SSD) for Wingwall

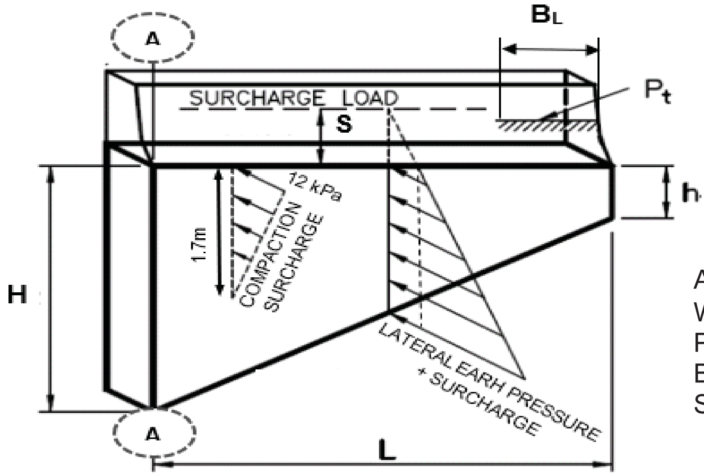
The Ministry developed a new SSD for wingwall with integral abutment bridges in addition to updating the existing SSD 105-02 for wingwall with non-integral bridges. The existing SSD for the wingwall with non-integral abutment bridges is renamed as SSD105-11 Wingwall with Non-integral Abutment, and the new SSD numbered as 105-12 Wingwall with Integral Abutment. SSD 105-11 and 105-12 are included in the appendix C1 and C2.

List of Appendices

- Appendix A: Moment and Lateral Thrust for Cantilever Wing wall
- Appendix B1: Wingwall Design table (Thickness 400mm)
- Appendix B2: Wingwall Design table (Thickness 450mm)
- Appendix B3: Wingwall Design table (Thickness 475mm)
- Appendix B4: Wingwall Design table (Thickness 500mm)
- Appendix B5: Wingwall Design table (Thickness 550mm)
- Appendix B6: Wingwall Design table (Thickness 600mm)
- Appendix C1: SSD105-11 Wingwall with Non-integral abutment
- Appendix C2: SSD105-12 Wingwall with Integral Abutment

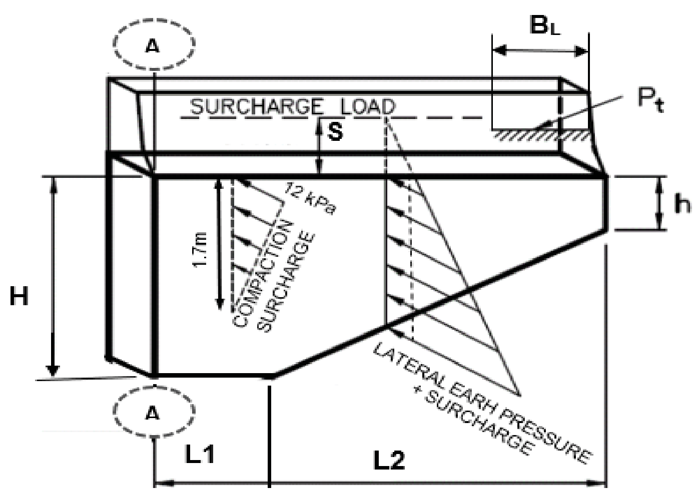
DRAFT

APPENDIX A: Moments and Lateral Thrust for Cantilever Wingwalls



A -A = Interface of the Wingwall to the Cleat
W = Equivalent Fluid Pressure, γK (kPa)
P_t = Transverse Live Load on Barriers (kN)
B_L = Distribution Length of Pt (m)
S = Surcharge Height (m)

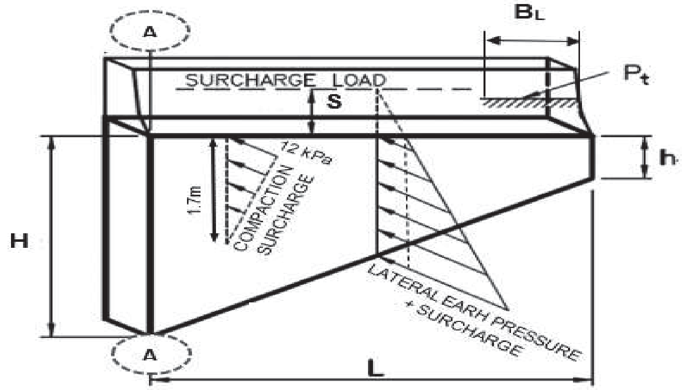
Loadings	Total Moment at A-A	Total Lateral Thrust
Lateral Earth Pressure	$M_E = \frac{WL^2}{24}(H^2 + 2Hh + 3h^2)$	$P_E = \frac{WL}{6}(H^2 + Hh + h^2)$
Surcharge	$M_S = \frac{WL^2}{6}S(H + 2h)$	$P_S = \frac{WL}{2}S(H + h)$
Compaction Surcharge	$M_{CS} = 5.1\,L^2$	$P_{CS} = 10.2\,L$
Live Load on Barrier	$M_L = P_t(L - \frac{B_L}{2})$	$P_L = P_t$



A -A = Interface of the Wingwall to the Cleat
W = Equivalent Fluid Pressure, γK (kPa)
P_t = Transverse Live Load on Barriers (kN)
B_L = Distribution Length of Pt (m)
S = Surcharge Height (m)

Loads	Total Moment at A-A	Total Lateral Thrust
Lateral Earth Pressure	$M_E = \frac{W}{24}\{6L_1^2H^2 + 4L_1L_2(H^2 + Hh + h^2) + L_2^2(H^2 + 2Hh + 3h^2)\}$	$P_E = \frac{W}{6}(3L_1H^2 + L_2(H^2 + Hh + h^2)$
Surcharge	$M_S = \frac{W}{6}S(3L_1^2H + 3L_1L_2(H + h) + L_2^2(H + 2h)$	$P_S = \frac{W}{2}S\{2L_1H + L_2(H + h)\}$
Compaction Surcharge	$M_{CS} = 5.1\,(L_1 + L_2)^2$	$P_{CS} = 10.2\,(L_1 + L_2)$
Live Load on Barrier	$M_L = P_t(L_1 + L_2 - \frac{B_L}{2})$	$P_L = P_t$

Appendix B1 **WINGWALL DESIGN TABLE (THICKNESS=400mm)**



T= 400mm

f'c = 30 MPa
Concrete Cover = 70 mm
fy = 500 MPa

P_t = 100 kN for TL-4 Barrier
210 kN for TL-5 Barrier

B_L = 1.05 m. for TL-4 Barrier
2.40 m. for TL-5 Barrier

Equivalent Fluid Pressure, W = ɤ k = 7 kPa

SHEAR AND MOMENT AT A-A

$$M_{A-A} = \left\{ \frac{WL^2}{24}(H^2 + 2Hh + 3h^2) + \frac{WL^2}{6} S(H + 2h) + 5.1L^2 \right\} \alpha_E + P_t \left(L - \frac{B_L}{2} \right) \alpha_L$$

$$P_{A-A} = \left\{ \frac{WL}{6}(H^2 + Hh + h^2) + \frac{WL}{2} S(H + h) + 10.2\, L \right\} \alpha_E + P_t\, \alpha_L$$

TL-4 Barrier on Wingwall

L (m)	**Vf** at A-A (kN/m)	**Mf** at A-A (kN.m/m)	**Sr** (mm)				
			15M	20M	25M	30M	35M
2.00	104	133	200	300			
2.50	105	171	150	225			
3.00	108	207	125	175	300		
3.50	112	244	100	150	250		
4.00	116	282		125	225	300	
4.50	121	320		100	200	275	
5.00	127	360		100	175	225	
5.50	133	402			150	200	300
6.00	140	446			125	175	250
6.50	147	492			100	150	225
7.00	155	541			100	150	200

TL-5 Barrier on Wingwall

L (m)	**Vf** at A-A (kN/m)	**Mf** at A-A (kN.m/m)	**Sr** (mm)				
			15M	20M	25M	30M	35M
2.00	178	147	175	275			
2.50	173	217	125	175	300		
3.00	170	281		125	225		
3.50	169	341		100	175	250	
4.00	169	399			150	200	300
4.50	171	454			125	175	250
5.00	173	509			100	150	225
5.50	177	564			100	125	200
6.00	181	620				125	175
6.50	186	677	Use Thicker Wingwall				
7.00	192	735	Use Thicker Wingwall				

L Length of wingwall

Vf The factored shear force due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Mf The factored moment due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Sr Spacing of Principal Reinforcement (mm)

TL-4, TL-5 Traffic barrier test level

P_t Transverse traffic loads

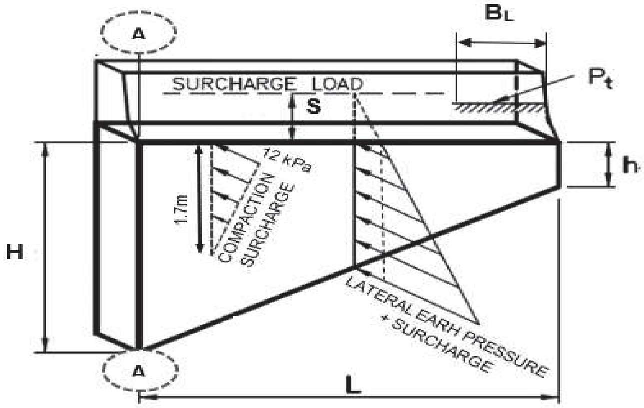
B_L Barrier Length for $P_{t\ force}$

α_E^{ULS} = 1.25 α_L =1.70

NOTES: THIS TABLE TO BE READ IN CONJUNCTION WITH DRAWING NUMBER SS105-**

Appendix B2 **WINGWALL DESIGN TABLE (THICKNESS=450mm)**

T= 450mm



f'c = 30 MPa
Concrete Cover = 70 mm
fy = 500 MPa

P_t = 100 kN for TL-4 Barrier
210 kN for TL-5 Barrier

B_L = 1.05 m. for TL-4 Barrier
2.40 m. for TL-5 Barrier

Equivalent Fluid Pressure, W = 8 k = 7 kPa

SHEAR AND MOMENT AT A-A

$$M_{A-A} = \left\{\frac{WL^2}{24}(H^2 + 2Hh + 3h^2) + \frac{WL^2}{6}S(H + 2h) + 5.1L^2\right\}\alpha_E + P_t\left(L - \frac{B_L}{2}\right)\alpha_L$$

$$P_{A-A} = \left\{\frac{WL}{6}(H^2 + Hh + h^2) + \frac{WL}{2}S(H + h) + 10.2\,L\right\}\alpha_E + P_t\,\alpha_L$$

TL-4 Barrier on Wingwall

L	Vf at A-A	Mf at A-A	Sr (mm)				
(m)	(kN/m)	(kN.m/m)	15M	20M	25M	30M	35M
2.00	104	133	225				
2.50	105	171	175	275			
3.00	108	207	150	225			
3.50	112	244	125	175	300		
4.00	116	282	100	150	275		
4.50	121	320		125	225		
5.00	127	360		125	200	275	
5.50	133	402		100	175	250	
6.00	140	446		100	150	225	
6.50	147	492			150	200	275
7.00	155	541			125	175	250

TL-5 Barrier on Wingwall

L	Vf at A-A	Mf at A-A	Sr (mm)				
(m)	(kN/m)	(kN.m/m)	15M	20M	25M	30M	35M
2.00	178	147	200				
2.50	173	217	125	200			
3.00	170	281	100	150	275		
3.50	169	341		125	225	300	
4.00	169	399		100	175	250	
4.50	171	454			150	225	300
5.00	173	509			125	200	275
5.50	177	564			125	175	250
6.00	181	620			100	150	200
6.50	186	677			100	125	200
7.00	192	735				125	175

L Length of wingwall

Vf The factored shear force due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Mf The factored moment due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Sr Spacing of Principal Reinforcement (mm)

TL-4, TL-5 Traffic barrier test level

P_t Transverse traffic loads

B_L Barrier Length for $P_{t\ force}$

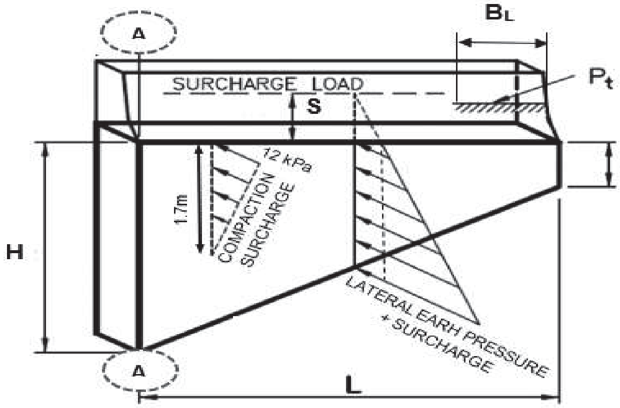
α_E^{ULS} = 1.25 α_L =1.70

NOTES: THIS TABLE TO BE READ IN CONJUNCTION WITH DRAWING NUMBER SS105-**

DRAFT

Appendix B3 **WINGWALL DESIGN TABLE (THICKNESS=475mm)**

T= 475mm



f'c = 30 MPa

Concrete Cover = 70 mm

fy = 500 MPa

P_t = 100 kN for TL-4 Barrier; 210 kN for TL-5 Barrier

B_L = 1.05 m. for TL-4 Barrier; 2.40 m. for TL-5 Barrier

Equivalent Fluid Pressure, W = γ k = 7 kPa

SHEAR AND MOMENT AT A-A

$$M_{A-A} = \left\{\frac{WL^2}{24}(H^2 + 2Hh + 3h^2) + \frac{WL^2}{6}S(H + 2h) + 5.1L^2\right\}\alpha_E + P_t\left(L - \frac{B_L}{2}\right)\alpha_L$$

$$P_{A-A} = \left\{\frac{WL}{6}(H^2 + Hh + h^2) + \frac{WL}{2}S(H + h) + 10.2\,L\right\}\alpha_E + P_t\,\alpha_L$$

TL-4 Barrier on Wingwall

L	Vf at A-A	Mf at A-A	Sr (mm)				
(m)	(kN/m)	(kN.m/m)	15M	20M	25M	30M	35M
2.00	104	133	250				
2.50	105	171	200	300			
3.00	108	207	150	225			
3.50	112	244	125	200			
4.00	116	282	100	175	275		
4.50	121	320	100	150	250		
5.00	127	360		125	225	300	
5.50	133	402		100	200	275	
6.00	140	446		100	175	250	
6.50	147	492			150	225	300
7.00	155	541			125	200	275

TL-5 Barrier on Wingwall

L	Vf at A-A	Mf at A-A	Sr (mm)				
(m)	(kN/m)	(kN.m/m)	15M	20M	25M	30M	35M
2.00	178	147	225				
2.50	173	217	150	225			
3.00	170	281	100	175	275		
3.50	169	341		125	225		
4.00	169	399		100	200	275	
4.50	171	454		100	175	225	
5.00	173	509			150	200	300
5.50	177	564			125	175	250
6.00	181	620			125	150	225
6.50	186	677			100	150	200
7.00	192	735			100	125	200

L Length of wingwall

Vf The factored shear force due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Mf The factored moment due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Sr Spacing of Principal Reinforcement (mm)

TL-4, TL-5 Traffic barrier test level

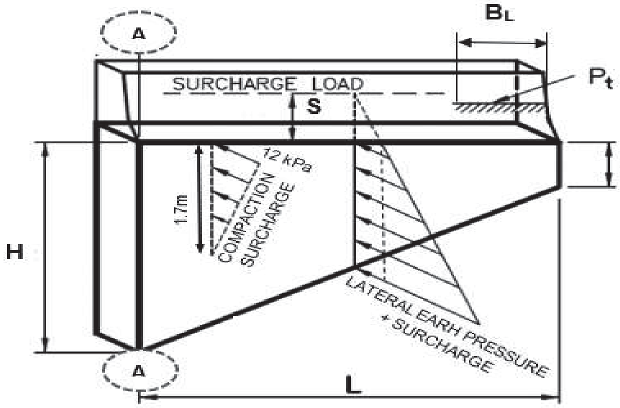
P_t Transverse traffic loads

B_L Barrier Length for $P_{t\,force}$

α_E^{ULS} = 1.25 α_L =1.70

NOTES: THIS TABLE TO BE READ IN CONJUNCTION WITH DRAWING NUMBER SS105-**

T= 500mm



f'c = 30 MPa

Concrete Cover = 70 mm

fy = 500 MPa

P_t = 100 kN for TL-4 Barrier; 210 kN for TL-5 Barrier

B_L = 1.05 m. for TL-4 Barrier; 2.40 m. for TL-5 Barrier

Equivalent Fluid Pressure, W = 8 k = 7 kPa

SHEAR AND MOMENT AT A-A

$$M_{A-A} = \left\{\frac{WL^2}{24}(H^2 + 2Hh + 3h^2) + \frac{WL^2}{6}S(H + 2h) + 5.1L^2\right\}\alpha_E + P_t\left(L - \frac{B_L}{2}\right)\alpha_L$$

$$P_{A-A} = \left\{\frac{WL}{6}(H^2 + Hh + h^2) + \frac{WL}{2}S(H + h) + 10.2\,L\right\}\alpha_E + P_t\,\alpha_L$$

TL-4 Barrier on Wingwall

L (m)	Vf at A-A (kN/m)	Mf at A-A (kN.m/m)	Sr (mm) 15M	20M	25M	30M	35M
2.00	104	133	275				
2.50	105	171	200	300			
3.00	108	207	175	250			
3.50	112	244	125	200			
4.00	116	282	125	175	300		
4.50	121	320	100	150	275		
5.00	127	360		125	225		
5.50	133	402		125	200	300	
6.00	140	446		100	175	250	
6.50	147	492		100	175	225	
7.00	155	541			150	200	300

TL-5 Barrier on Wingwall

L (m)	Vf at A-A (kN/m)	Mf at A-A (kN.m/m)	Sr (mm) 15M	20M	25M	30M	35M
2.00	178	147	250				
2.50	173	217	150	250			
3.00	170	281	125	175	300		
3.50	169	341	100	150	250		
4.00	169	399		125	200	300	
4.50	171	454		100	175	250	
5.00	173	509		100	150	225	
5.50	177	564			150	200	275
6.00	181	620			125	175	250
6.50	186	677			100	150	225
7.00	192	735			100	150	200

L Length of wingwall

Vf The factored shear force due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Mf The factored moment due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Sr Spacing of Principal Reinforcement (mm)

TL-4, TL-5 Traffic barrier test level

P_t Transverse traffic loads

B_L Barrier Length for $P_{t\ force}$

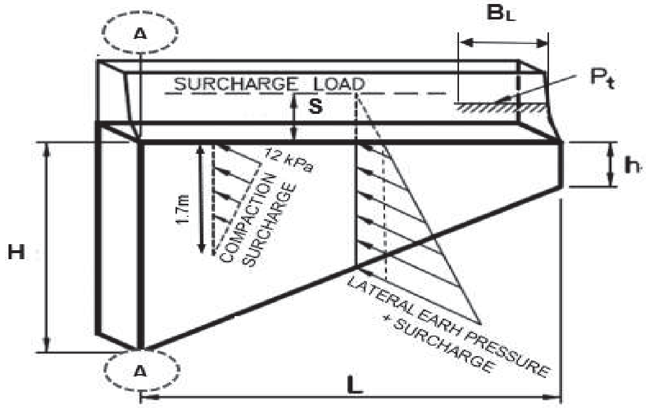
α_E^{ULS} = 1.25 α_L =1.70

NOTES: THIS TABLE TO BE READ IN CONJUNCTION WITH DRAWING NUMBER SS105-**

DRAFT

Appendix B5 **WINGWALL DESIGN TABLE (THICKNESS=550mm)**

T= 550mm



f'c = 30 MPa

Concrete Cover = 70 mm

fy = 500 MPa

P_t = 100 kN for TL-4 Barrier; 210 kN for TL-5 Barrier

B_L = 1.05 m. for TL-4 Barrier; 2.40 m. for TL-5 Barrier

Equivalent Fluid Pressure, W = 8 k = 7 kPa

SHEAR AND MOMENT AT A-A

$$M_{A-A} = \left\{\frac{WL^2}{24}(H^2 + 2Hh + 3h^2) + \frac{WL^2}{6}S(H + 2h) + 5.1L^2\right\}\alpha_E + P_t\left(L - \frac{B_L}{2}\right)\alpha_L$$

$$P_{A-A} = \left\{\frac{WL}{6}(H^2 + Hh + h^2) + \frac{WL}{2}S(H + h) + 10.2\,L\right\}\alpha_E + P_t\,\alpha_L$$

TL-4 Barrier on Wingwall

L (m)	Vf at A-A (kN/m)	Mf at A-A (kN.m/m)	Sr (mm) 15M	20M	25M	30M	35M
2.00	104	133	300				
2.50	105	171	225				
3.00	108	207	175	275			
3.50	112	244	150	250			
4.00	116	282	125	200			
4.50	121	320	125	175	300		
5.00	127	360	100	150	275		
5.50	133	402	100	150	225		
6.00	140	446		125	200	300	
6.50	147	492		100	200	275	
7.00	155	541		100	175	250	

TL-5 Barrier on Wingwall

L (m)	Vf at A-A (kN/m)	Mf at A-A (kN.m/m)	Sr (mm) 15M	20M	25M	30M	35M
2.00	178	147	275				
2.50	173	217	175	275			
3.00	170	281	125	200			
3.50	169	341	100	175	275		
4.00	169	399	100	150	250		
4.50	171	454		125	200	300	
5.00	173	509		100	175	250	
5.50	177	564		100	150	225	
6.00	181	620			150	200	300
6.50	186	677			125	175	275
7.00	192	735			125	175	250

L Length of wingwall

Vf The factored shear force due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Mf The factored moment due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

S Spacing of Principal Reinforcement (mm)

TL-4, TL-5 Traffic barrier test level

P_t Transverse traffic loads

B_L Barrier Length for $P_{t\ force}$

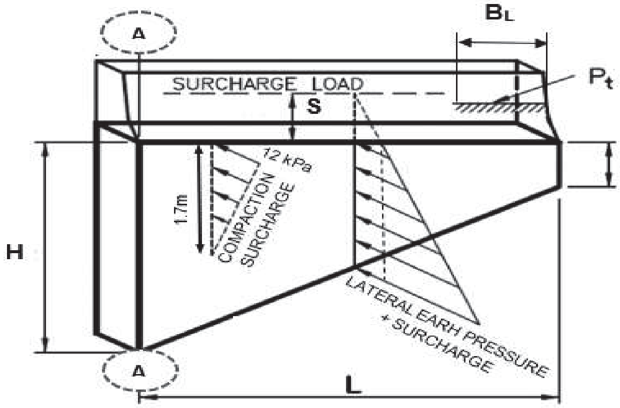
α_E^{ULS} = 1.25 α_L =1.70

NOTES: THIS TABLE TO BE READ IN CONJUNCTION WITH DRAWING NUMBER SS105-**

DRAFT

Appendix B6 **WINGWALL DESIGN TABLE (THICKNESS=600mm)**

T= 600mm



f'c = 30 MPa
Concrete Cover = 70 mm
fy = 500 MPa

P_t = 100 kN for TL-4 Barrier
210 kN for TL-5 Barrier

B_L = 1.05 m. for TL-4 Barrier
2.40 m. for TL-5 Barrier

Equivalent Fluid Pressure, W = 8 k = 7 kPa

SHEAR AND MOMENT AT A-A

$$M_{A-A} = \left\{\frac{WL^2}{24}(H^2 + 2Hh + 3h^2) + \frac{WL^2}{6}S(H + 2h) + 5.1L^2\right\}\alpha_E + P_t\left(L - \frac{B_L}{2}\right)\alpha_L$$

$$P_{A-A} = \left\{\frac{WL}{6}(H^2 + Hh + h^2) + \frac{WL}{2}S(H + h) + 10.2\,L\right\}\alpha_E + P_t\,\alpha_L$$

TL-4 Barrier on Wingwall

L	Vf at A-A	Mf at A-A	Sr (mm)				
(m)	(kN/m)	(kN.m/m)	15M	20M	25M	30M	35M
2.00	104	133					
2.50	105	171	250				
3.00	108	207	200				
3.50	112	244	175	275			
4.00	116	282	150	225			
4.50	121	320	125	200			
5.00	127	360	125	175	300		
5.50	133	402	100	150	275		
6.00	140	446	100	150	225		
6.50	147	492		125	200	300	
7.00	155	541		100	200	275	

TL-5 Barrier on Wingwall

L	Vf at A-A	Mf at A-A	Sr (mm)				
(m)	(kN/m)	(kN.m/m)	15M	20M	25M	30M	35M
2.00	178	147	300				
2.50	173	217	200	300			
3.00	170	281	150	225			
3.50	169	341	125	175			
4.00	169	399	100	150	275		
4.50	171	454		125	225		
5.00	173	509		125	200	300	
5.50	177	564		100	175	250	
6.00	181	620		100	175	225	
6.50	186	677			150	200	300
7.00	192	735			125	200	275

L Length of wingwall

Vf The factored shear force due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Mf The factored moment due to lateral pressure from earth and traffic loads at the fixed end (U.L.S) per unit height of the wall

Sr Spacing of Principal Reinforcement (mm)

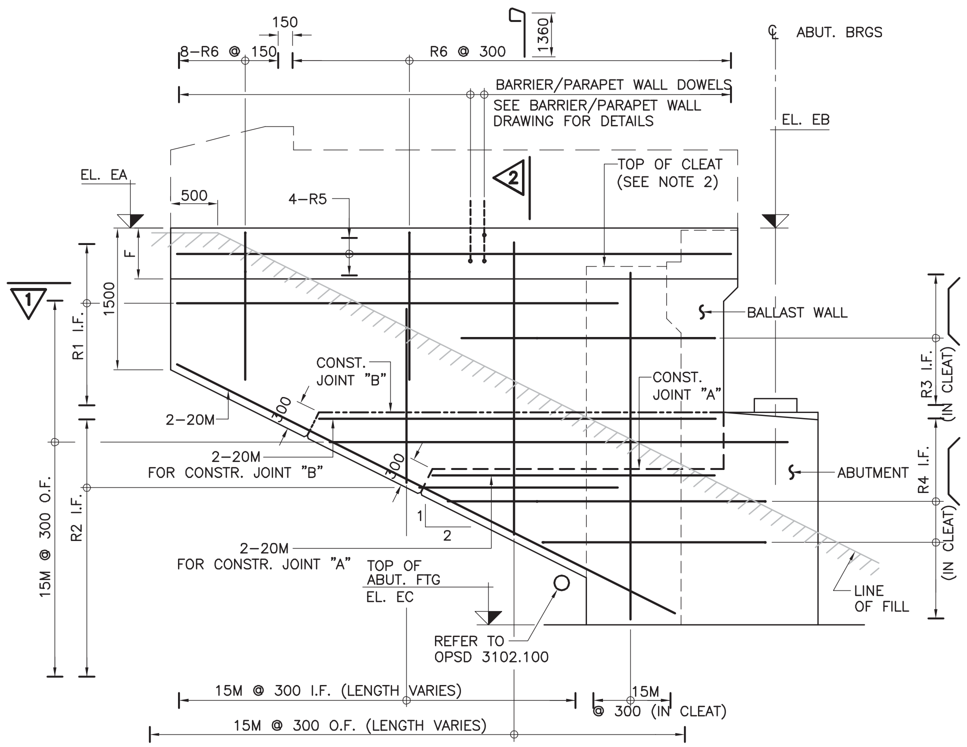
TL-4, TL-5 Traffic barrier test level

P_t Transverse traffic loads

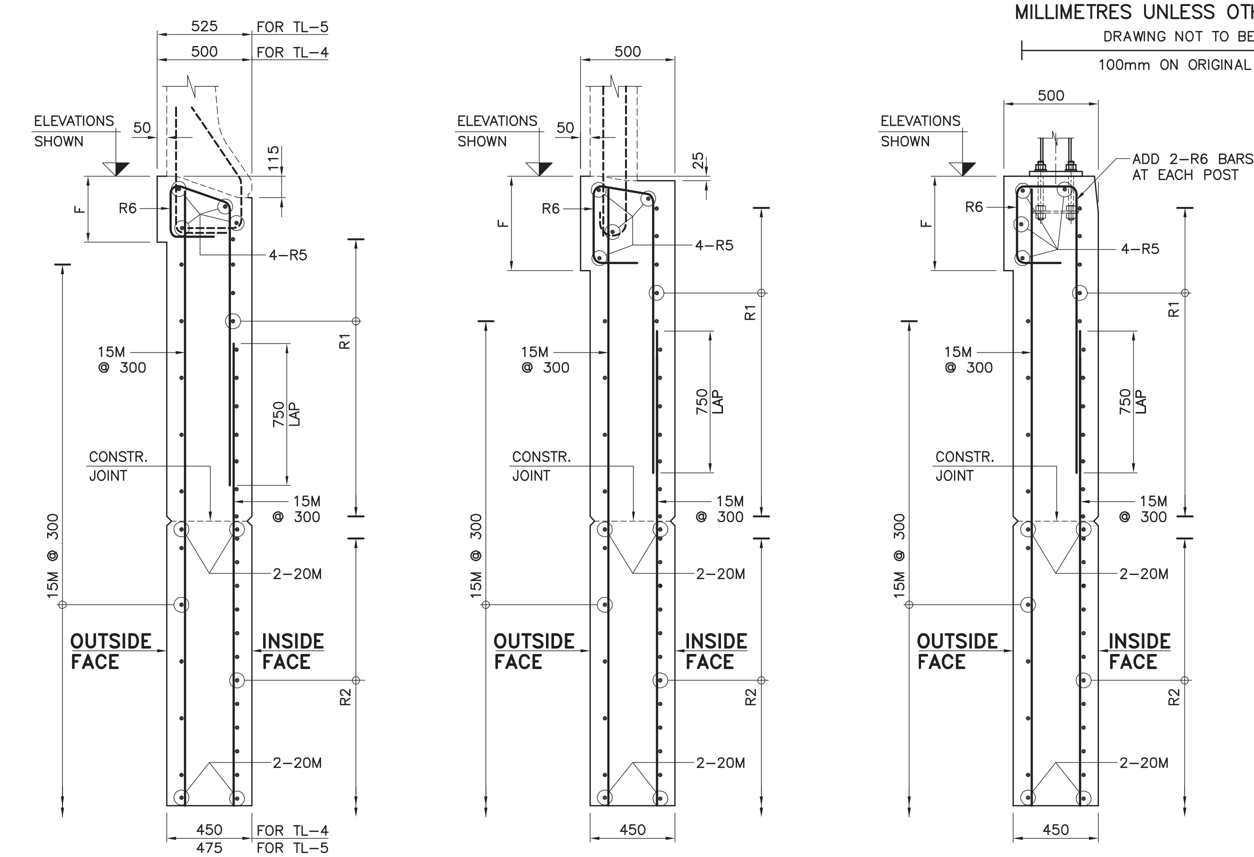
B_L Barrier Length for $P_{t\ force}$

α_E^{ULS} = 1.25 α_L =1.70

NOTES: THIS TABLE TO BE READ IN CONJUNCTION WITH DRAWING NUMBER SS105-**



ELEVATION OF WINGWALL WITH NON-INTEGRAL ABUTMENT



WINGWALL WITH BARRIER WALL

WINGWALL WITH PARAPET WALL

WINGWALL WITH CURB

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN
DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

Ontario Ministry of Transportation

CONT	–
WP	–

PROJECT NAME

WINGWALL WITH NON-INTEGRAL ABUTMENT

SHEET –

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ABUTMENT AND BARRIER/PARAPET WALL DRAWINGS.
2. TOP OF CLEAT TO BE CAST 35mm BELOW APPROACH SLAB LEDGE.
3. REINFORCING STEEL SHALL BE GRADE 500W UNLESS OTHERWISE SPECIFIED. STAINLESS STEEL BARS SHALL BE TYPE 316LN OR DUPLEX 2205 WITH A MINIMUM YIELD STRENGTH OF 500 MPa.

LEGEND:

* DESIGNER SHALL DECIDE ON TYPE OF STEEL
O.F. DENOTES OUTSIDE FACE
I.F. DENOTES INSIDE FACE
E.F. DENOTES EACH FACE
EL. DENOTES ELEVATION
U/S DENOTES UNDERSIDE

TABLE 1–DIMENSIONS AND ELEVATIONS

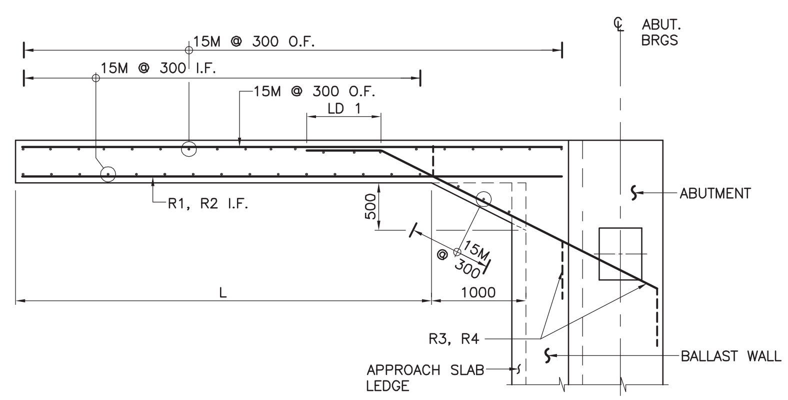
LOCATION	DIMENSIONS (mm)		ELEVATIONS (m)		
	L	F	EA	EB	EC
———	——	——	———	———	———
———	——	——	———	———	———
———	——	——	———	———	———
———	——	——	———	———	———

TABLE 2–REINFORCEMENT

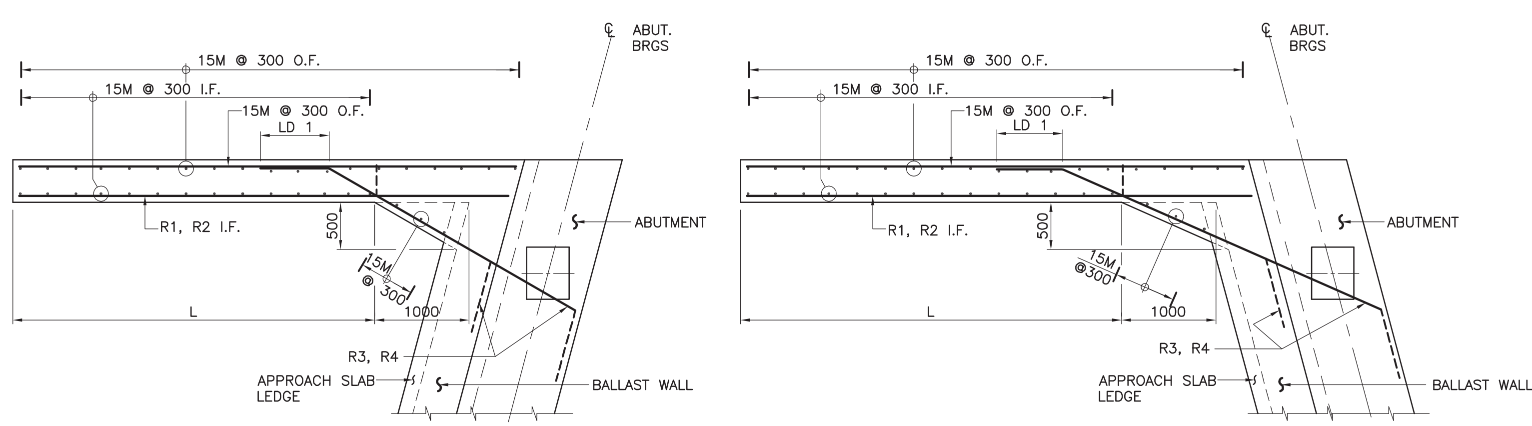
BAR MARK	SIZE	SPACING (mm)
R1	---	---
R2	---	---
R3	---	---
R4	---	---
R5	15M/S15M	AS SHOWN
R6	15M/S15M	AS SHOWN

TABLE 3–BAR EXTENSIONS

MARKING	EXTENSION LENGTH (mm)
LD 1	———



1 FOR NON-SKEW BRIDGES



ACUTE CORNER

OBTUSE CORNER

1 FOR SKEWED BRIDGES

NOTES TO DESIGNER:

1. FILL IN TABLE 1 ACCORDING TO BRIDGE GEOMETRY. THIS STANDARD IS INTENDED FOR WINGWALL LENGTHS OF UP TO 7.0m FROM BACK FACE OF THE ABUTMENT.
2. REFER TO DESIGN AIDS TO COMPLETE TABLE 2 AND TABLE 3.
3. DETERMINE WHICH SECTIONS APPLY, AND DELETE THOSE THAT DO NOT APPLY.
4. DESIGNER SHALL USE STAINLESS STEEL FOR REINFORCEMENT R5 AND R6 INSIDE THE CURB PORTION OF THE WINGWALL CONSIDERING CORROSION PROTECTION GUIDELINES IN THE MTO STRUCTURAL MANUAL.
5. CONSTRUCTION JOINTS:
   "A" REFERS TO POST-TENSIONED STRUCTURES
   "B" REFERS TO SLAB-ON-GIRDER STRUCTURES
6. DETERMINE AND MODIFY AS REQUIRED THE SHAPE OF R3 AND R4 BAR ENDS IN THE ABUTMENT. DELETE THOSE WHICH DO NOT APPLY.
7. THE 'NOTES TO DESIGNER' SHALL BE DELETED FROM THIS DRAWING PRIOR TO ISSUING OF THE CONTRACT.

APPLICABLE STANDARD DRAWINGS:

OPSD 3102.100 WALLS. ABUTMENT BACKFILL DRAIN
OPSD 3950.100 JOINTS. CONCRETE EXPANSION AND CONSTRUCTION ON STRUCTURE

STANDARD DRAWING NOVEMBER 2022 — SS105-11
WINGWALL DETAILS FOR BRIDGES

DRAFT

DESIGN	STD	CHK	–	CODE	CHBDC-19	LOAD	CL-625-ONT	DATE	–
DRAWN	–	CHK	–	SITE	–			DWG	–

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN
DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

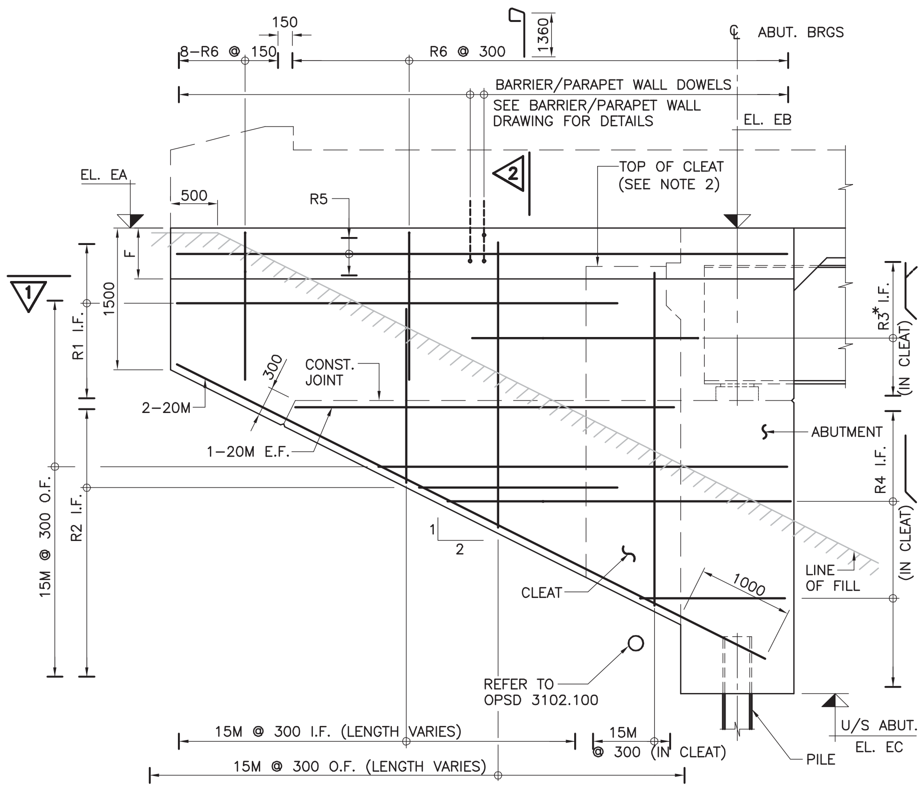
Ontario Ministry of Transportation

CONT	–
WP	–

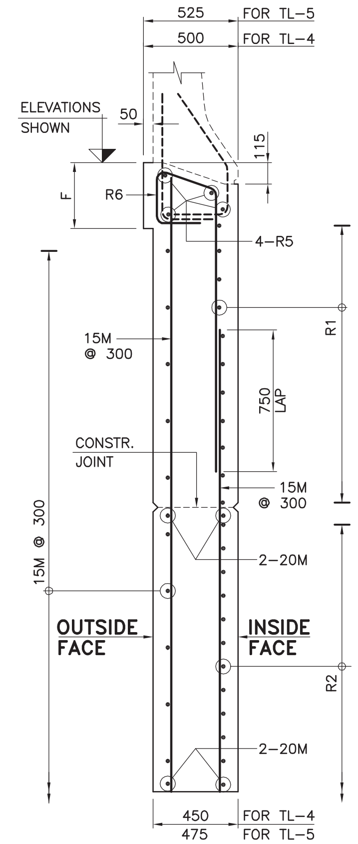
PROJECT NAME

WINGWALL WITH INTEGRAL ABUTMENT

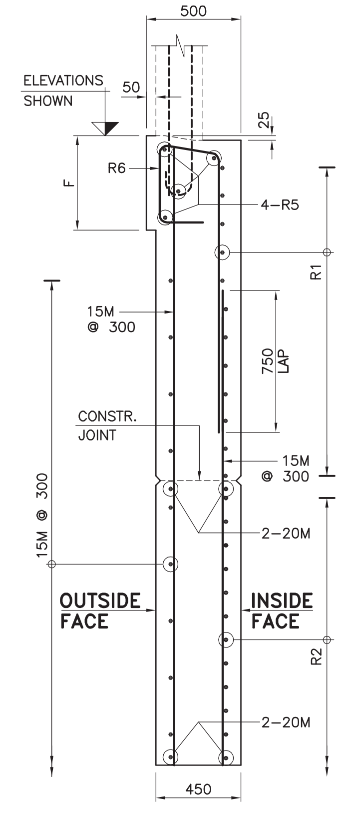
SHEET –



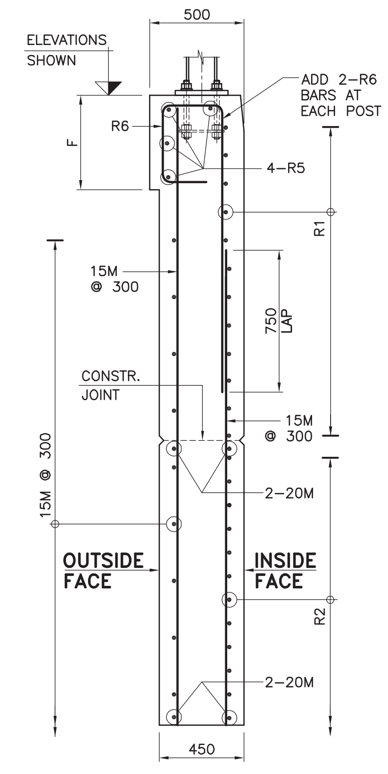
ELEVATION OF WINGWALL
*SEE NOTE 4



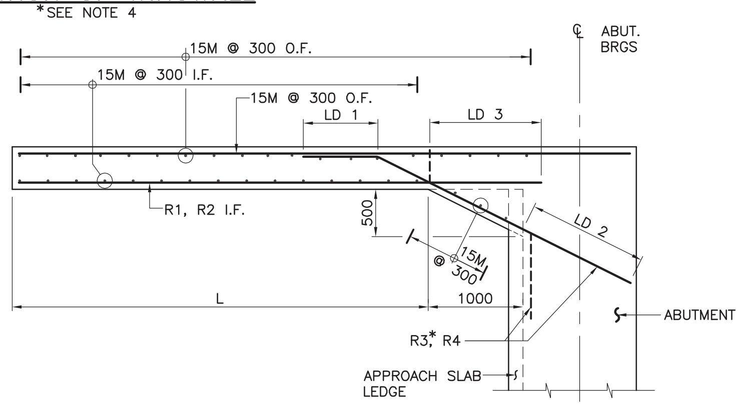
WINGWALL WITH BARRIER WALL



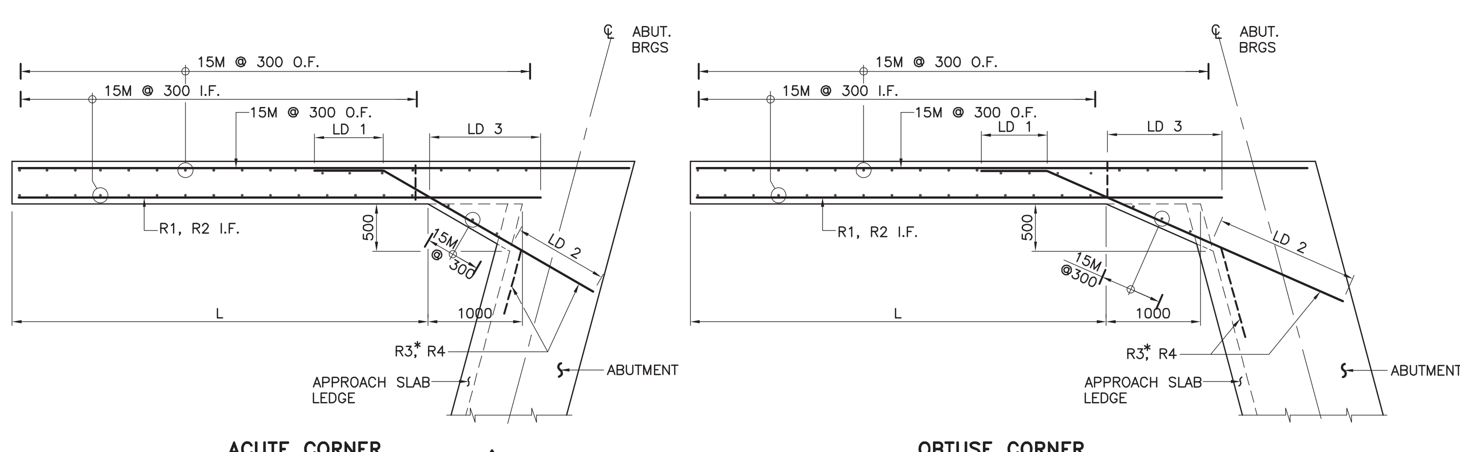
WINGWALL WITH PARAPET WALL



WINGWALL WITH CURB



FOR NON–SKEW BRIDGES
*SEE NOTE 4



FOR SKEWED BRIDGES
*SEE NOTE 4

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ABUTMENT AND BARRIER/PARAPET WALL DRAWINGS.
2. TOP OF CLEAT TO BE CAST 35mm BELOW APPROACH SLAB LEDGE.
3. REINFORCING STEEL SHALL BE GRADE 500W UNLESS OTHERWISE SPECIFIED. STAINLESS STEEL BARS SHALL BE TYPE 316LN OR DUPLEX 2205 WITH A MINIMUM YIELD STRENGTH OF 500 MPa.
4. REINFORCING R3 SHALL BE BENT ALONG THE BACK FACE OF THE ABUTMENT IF THE ENDS OF THE GIRDERS OVER THE ABUTMENT CREATE OBSTRUCTION TO EXTEND R3 BARS INTO THE ABUTMENT.

LEGEND:

* DESIGNER SHALL DECIDE ON TYPE OF STEEL
O.F. DENOTES OUTSIDE FACE
I.F. DENOTES INSIDE FACE
E.F. DENOTES EACH FACE
EL. DENOTES ELEVATION
U/S DENOTES UNDERSIDE
TL–4, TL–5 DENOTES TYPE OF BARRIER

TABLE 1–DIMENSIONS AND ELEVATIONS

LOCATION	DIMENSIONS (mm)		ELEVATIONS (m)		
	L	F	EA	EB	EC
–––––	–––	–––	–––––	–––––	–––––
–––––	–––	–––	–––––	–––––	–––––
–––––	–––	–––	–––––	–––––	–––––
–––––	–––	–––	–––––	–––––	–––––

TABLE 2–REINFORCEMENT

BAR MARK	SIZE	SPACING (mm)
R1	–––	–––
R2	–––	–––
R3	–––	–––
R4	–––	–––
R5	15M/S15M	AS SHOWN
R6	15M/S15M	AS SHOWN

TABLE 3–BAR EXTENSIONS

MARKING	EXTENSION LENGTH (mm)
LD 1	–––
LD 2	–––
LD 3	–––

NOTES TO DESIGNER:

1. FILL IN TABLE 1 ACCORDING TO BRIDGE GEOMETRY. THIS STANDARD IS INTENDED FOR WINGWALL LENGTHS OF UP TO 7.0m FROM BACK FACE OF THE ABUTMENT.
2. REFER TO DESIGN AIDS TO COMPLETE TABLE 2 AND TABLE 3.
3. DETERMINE WHICH SECTIONS APPLY, AND DELETE THOSE THAT DO NOT APPLY.
4. DESIGNER SHALL USE STAINLESS STEEL FOR REINFORCEMENT R5 AND R6 INSIDE THE CURB PORTION OF THE WINGWALL CONSIDERING CORROSION PROTECTION GUIDELINES IN THE MTO STRUCTURAL MANUAL.
5. THE 'NOTES TO DESIGNER' SHALL BE DELETED FROM THIS DRAWING PRIOR TO ISSUING OF THE CONTRACT.

APPLICABLE STANDARD DRAWINGS:

OPSD 3102.100 WALLS. ABUTMENT BACKFILL DRAIN
OPSD 3950.100 JOINTS. CONCRETE EXPANSION AND CONSTRUCTION ON STRUCTURE

STANDARD DRAWING NOVEMBER 2022 — SS105–12
WINGWALL DETAILS FOR BRIDGES

DRAFT

DESIGN	STD	CHK	–	CODE	CHBDC–19	LOAD	CL–625–ONT	DATE	–
DRAWN	–	CHK	–	SITE	–			DWG	

MINISTRY OF TRANSPORTATION OF ONTARIO STRUCTURAL ANSI D FRAME 2020–05

FILE NAME: C:\USERS\PODLUSKIAN\ONEDRIVE – GOVERNMENT OF ONTARIO\DOCUMENTS\D\2022 PROJECTS\STD SS105–03 WINGWALL.DWG
MODIFIED: 2022–12–06 14:22