RIP-RAP SIZING FOR EMERGENCY SPILLWAY OF TEMPORARY SEDIMENT BASIN 1

Project #: 60549-001
Date June 23, 2025

Rip-rap sizing calculations based on procedures outlined in Chapter 5 of the MTO Drainage Manual.

Outlet Channel Characteristics

Flow Through Rip Rap Channe l= 0.136 m^3/s
Mannings 'n' (rock rip rap D_{50}>300) = 0.078

NOTE: obtained using Rational Method with an intensity equal to a 4hr Chicago distribution of a 25mm storm.
(As described in MOE- SWM Manual 4)

RIP-RAP APRON HYDRUALIC CHARACTERISTICS

Consider a cross-section through the rip-rip apron immediately downstream of the overflow weir:

Bottom width (m) =	5.0
Long. Slope (%) =	25.00%
Side slope H:V =	3:1
Mannings 'n' =	0.078
Flow rate (m^3/s) =	0.136
Analysis results from Flowmaster:	
Depth of flow (m) =	0.038
Flow velocity (m/s) =	0.716
Area of flow (m^2) =	0.20
Wetted Perim. (m) =	5.10
Hydraulic Radius (m) =	0.037

DETERMINE SHEAR STRESS ON CHANNEL BED AND BANK

Unit weight of water (γ) N/m^3 = 9810

Mean boundary shear stress (τ_o) :

$\tau_o = \gamma \cdot R \cdot S =$ 9810 x 0.037 x (25.00/100) = **91 N/m^2**

Shear stress on channel bottom (τ_d) :

$\tau_b = K_b \cdot \tau_o =$ 1.30 x 91 = **118 N/m^2** (governs)

Shear stress on channel bank (τ_s) :

$\tau_s = K_{ss} \cdot \tau_o =$ 1.15 x 391 = **104 N/m^2**

Note: K_b & K_{ss} from Design Charts 2.11 and 2.12 of the MTO Drainage Manual

DETERMINE RIP-RAP SIZING

Based on Equation 5.31 (MTO drainage manual), the critical shear stress on a particle on the channel bed can be determined by:

$\tau_{cb} = 0.0642 \times D_{50} \times 9.81$

For D_{50} = 300 mm ----> $\tau_{cb} = 0.0642 \times 300 \times 9.81 =$ **189 N/m^2** OK

Based on Equation 5.31 (MTO drainage manual), the critical shear stress on a particle on the channel sides can be determined by:

$\tau_{cs} = K_{ss} * \tau_{cb}$

K_{ss} = (Design Chart 2.14)

Angle of Repose=	42.5	degrees	(per Design Chart 2.13)
Degree of Side Slope=	3:1		
=	18.4	degrees	deg. = $\tan^{-1}$(1/3)
K_{ss} =	0.90		(per Design Chart 2.14)

For D_{50} = 150 mm ----> $\tau_{cs} = 0.90 \times 189 =$ **170 N/m^2** OK

Therefore, use D_{50} = 300 mm (Rip Rap size to be 300mm)

RIP-RAP SIZING FOR EMERGENCY SPILLWAY OF TEMPORARY SEDIMENT BASIN 2

Project #: 60549-001
Date June 23, 2025

Rip-rap sizing calculations based on procedures outlined in Chapter 5 of the MTO Drainage Manual.

Outlet Channel Characteristics

Flow Through Rip Rap Channe l= 0.261 m^3/s 100-yr ex. Flow (2.65 ha, Rational Method)
Mannings 'n' (rock rip rap D_{50}>300) = 0.078

RIP-RAP APRON HYDRUALIC CHARACTERISTICS

Consider a cross-section through the rip-rip apron immediately downstream of the overflow weir:

Bottom width (m) =	5.0
Long. Slope (%) =	25.00%
Side slope H:V =	3:1
Mannings 'n' =	0.078
Flow rate (m^3/s) =	0.261
Analysis results from Flowmaster:	
Depth of flow (m) =	0.056
Flow velocity (m/s) =	0.927
Area of flow (m^2) =	0.30
Wetted Perim. (m) =	5.10
Hydraulic Radius (m) =	0.055

DETERMINE SHEAR STRESS ON CHANNEL BED AND BANK

Unit weight of water (γ) N/m^3 = 9810

Mean boundary shear stress (τ_o) :

$\tau_o = \gamma \cdot R \cdot S =$ 9810 x 0.055 x (25.00/100) = **135 N/m^2**

Shear stress on channel bottom (τ_d) :

$\tau_b = K_b \cdot \tau_o =$ 1.30 x 135 = **175 N/m^2** (governs)

Shear stress on channel bank (τ_s) :

$\tau_s = K_{ss} \cdot \tau_o =$ 1.15 x 135 = **155 N/m^2**

Note: K_b & K_{ss} from Design Charts 2.11 and 2.12 of the MTO Drainage Manual

DETERMINE RIP-RAP SIZING

Based on Equation 5.31 (MTO drainage manual), the critical shear stress on a particle on the channel bed can be determined by:

$\tau_{cb} = 0.0642 \times D_{50} \times 9.81$

For D_{50} = 300 mm ----> $\tau_{cb} = 0.0642 \times 300 \times 9.81 =$ **189 N/m^2** OK

Based on Equation 5.31 (MTO drainage manual), the critical shear stress on a particle on the channel sides can be determined by:

$\tau_{cs} = K_{ss} * \tau_{cb}$

K_{ss} = (Design Chart 2.14)

Angle of Repose=	42.5	degrees	(per Design Chart 2.13)
Degree of Side Slope=	3:1		
=	18.4	degrees	deg. = $\tan^{-1}$(1/3)
K_{ss} =	0.90		(per Design Chart 2.14)

For D_{50} = 150 mm ----> $\tau_{cs} = 0.90 \times 189 =$ **170 N/m^2** OK

Therefore, use D_{50} = 300 mm (Rip Rap size to be 300mm)

Worksheet for Trapezoidal Channel -SB-1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.078
Channel Slope	0.250 m/m
Left Side Slope	0.330 H:V
Right Side Slope	0.330 H:V
Bottom Width	5.000 m
Discharge	0.136 m^3/s
Results	
Normal Depth	0.038 m
Flow Area	0.2 m^2
Wetted Perimeter	5.1 m
Hydraulic Radius	0.037 m
Top Width	5.025 m
Critical Depth	0.042 m
Critical Slope	0.174 m/m
Velocity	0.716 m/s
Velocity Head	0.026 m
Specific Energy	0.064 m
Froude Number	1.177
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.000 m
Length	0.0 m
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.000 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.038 m
Critical Depth	0.042 m
Channel Slope	0.250 m/m
Critical Slope	0.174 m/m

Worksheet for Trapezoidal Channel -SB-2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.078
Channel Slope	0.250 m/m
Left Side Slope	0.330 H:V
Right Side Slope	0.330 H:V
Bottom Width	5.000 m
Discharge	0.261 m^3/s
Results	
Normal Depth	0.056 m
Flow Area	0.3 m^2
Wetted Perimeter	5.1 m
Hydraulic Radius	0.055 m
Top Width	5.037 m
Critical Depth	0.065 m
Critical Slope	0.152 m/m
Velocity	0.927 m/s
Velocity Head	0.044 m
Specific Energy	0.100 m
Froude Number	1.253
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.000 m
Length	0.0 m
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.000 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.056 m
Critical Depth	0.065 m
Channel Slope	0.250 m/m
Critical Slope	0.152 m/m

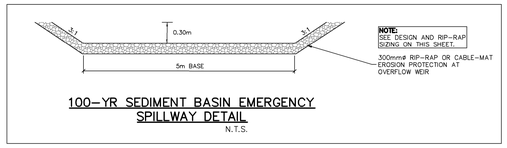
EROSION & SEDIMENT CONTROL
SEDIMENT BASIN SIZING & CONSTRUCTION INFORMATION

Prologis Meadowvale Distribution Centre
Mississauga, Ontario

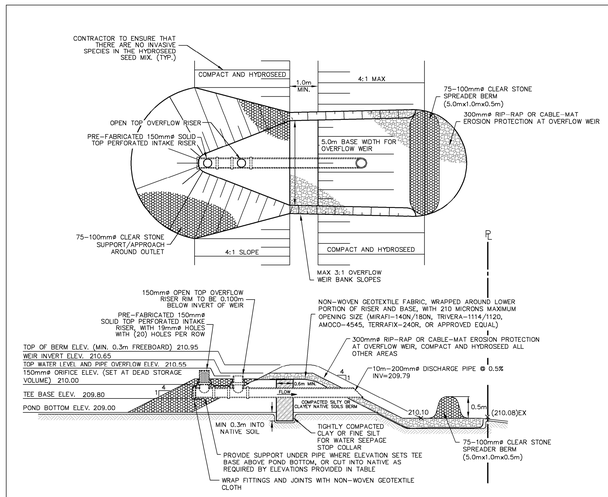
Date: June 23, 2025
Project Number: 50649-001
Design By: NZR

ID Tag	Basin Area	Sediment Basin Design Volume (1)			Bottom Area	Bottom of Basin	Bottom Elevation	Tee Base Elevation	Orifice Plate		Top Water Level & Overflow Pipe		Weir Invert	Top Berm Elevation	Orifice Diameter	Maximum Orifice Flow	Live Storage Drawdown Time
		Dead	Live	Total					Elevation	Dead Volume	Elevation	Total Volume					
	ha	m^3	m^3	m^3	m^2	*flat/sloped*	*m*	*m*	*m*	m^3	*m*	m^3	*m*	*m*	*mm*	m^3/s	*hrs*
SB-1	13.40	2,479	1,675	4,154	2198	flat	209.0	209.80	210.0	2601	210.55	4,393	210.65	210.95	150	0.0340	41.5
SB-2	2.65	490	331	822	430	flat	208.0	208.70	208.9	506	209.25	877	209.35	209.65	75	0.0074	29.5

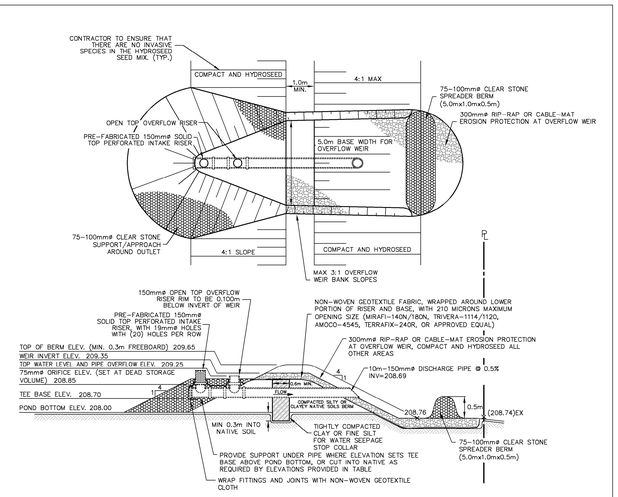
(1) Dead Storage is based upon minimum 185 m^3 volume per ha drainage area due to drawdown time being less than 48 hours; Live Storage is based upon minimum 125 m^3 volume per ha drainage area.



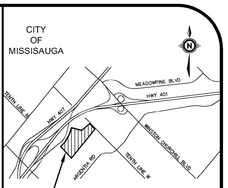
100-YR SEDIMENT BASIN EMERGENCY SPILLWAY DETAIL
N.T.S.



TEMPORARY SEDIMENT BASIN 1(SB–1) AND BERM OUTLET DETAIL
N.T.S.



TEMPORARY SEDIMENT BASIN 2(SB–2) AND BERM OUTLET DETAIL
N.T.S.



KEY PLAN N.T.S.

GEODETIC BENCHMARK ELEV. = 208.076m

ELEVATIONS ARE REFERRED TO THE CITY OF MISSISSAUGA BENCHMARK No. 1045, LOCATED AT THE BASE OF A 750mm∅ CONCRETE TRAFFIC POLE AT THE SOUTH–WEST CORNER OF ARGENTIA ROAD AND PLAZA ENTRANCE (WALMART), HAVING A PUBLISHED ELEVATION OF 208.076 METRES.

SITE BENCHMARK ELEV. = m

SEE GEODETIC BENCHMARK

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	YYYY-MM-DD
8.			
7.			
6.			
5.			
4.			
3.			
2.	ISSUED FOR SPA	RDZ	2025-08-08
1.	ISSUED FOR GRADING PERMIT	RDZ	2025-06-30

MTE
Engineers, Scientists, Surveyors
905-639-2552

LICENSED PROFESSIONAL ENGINEER
2025-08-08
R.D.ZHOU
100567167
PROVINCE OF ONTARIO

NOT FOR CONSTRUCTION

CLIENT
PETROFF PARTNERSHIP ARCHITECTS
10 AVIVA WAY SUITE 400 MARKHAM

PROJECT
PROLOGIS MEADOWVALE DISTRIBUTION CENTRE
7564 TENTH LINE WEST MISSISSAUGA

DRAWING
ESC DETAILS PLAN

Project Manager	R.ZHOU	Job No.	60549_001
Design By	NZR	Checked By	RDZ
Drawn By	AXG	Checked By	NZR
Surveyed By	Others	Drawing No.	C1.3
Date	Apr.15/25	Sheet	3 of 9
Scale	AS NOTES		