MARINO CELL HYDRAULIC DESIGN FACT SHEET

This fact sheet is intended to provide engineers and designers with flow and discharge information to incorporate Marino Cells into the design and analysis of their stormwater system. Note that the detention and conveyance configurations considered here use either a single or double stack of Marino Cells. The data may need to be modified for specific design scenarios within the wide range of possible Marino Cell configurations.

DETENTION APPLICATIONS

When Marino Cells are used in flat or very low slope installations to detain stormwater runoff and attenuate peak flow rates:

STAGE-STORAGE-DISCHARGE

The depth-storage-discharge relationship for a double stack of Marino Cells at 0% slope, with adequate cell to cell connectivity and with no tailwater restrictions (free outfall), is shown in Table 1. This data represents the maximum discharge that can be expected from a flat, double stack Marino Cell installation.

- If an external flow control structure is used, it may be more appropriate to use discharge relationships for that outlet pipe or orifice configuration in lieu of the Table 1 data.
- Storage values are for a simple stack of two Marino Cells and should be multiplied as necessary to estimate the total storage volume of the design configuration.

Table 1. Depth-storage-discharge for a double stack of Marino Cells

Stored Water Depth		Storage Volume		Outflow	
feet	meters	ft^3	m^3	cfs	lps
0.00	0.000	0.00	0.000	0.00	0.0
0.04	0.012	0.14	0.044	0.00	0.0
0.10	0.030	0.36	0.110	0.08	2.3
0.20	0.061	0.72	0.221	0.25	7.1
0.30	0.091	1.09	0.331	0.45	12.7
0.40	0.122	1.45	0.442	0.63	17.8
0.50	0.152	1.81	0.552	0.78	22.1
0.60	0.183	2.17	0.662	1.02	28.9
0.70	0.213	2.54	0.773	1.31	37.1
0.80	0.244	2.90	0.883	1.63	46.2
0.90	0.274	3.26	0.994	1.91	54.1
0.98	0.299	3.55	0.101	2.10	59.5

This depth-storage-discharge data can be used as input for standard model platforms, as appropriate.

CONVEYANCE APPLICATIONS

When Marino Cells are used in series to convey runoff (i.e., as a trench drain or pipe replacement):

MAXIMUM CONVEYANCE CAPACITY

The total flow rate that can be conveyed by a single stack of Marino Cells arranged in series with no tailwater restrictions (such as free outfall into a drop inlet) is presented in Table 2. Because head loss increases with the number of cells, more flow can be conveyed in shorter runs without surcharging at the upstream end.

Table 2. Maximum conveyance for a single stack of Marino Cells

Longitudinal Slope		Number of Single Stack Marino Cells in Series		
%	units	5	10	15
0.5	cfs	0.36	0.26	0.23
	lps	10.2	7.4	6.5
1.0	cfs	0.46	0.35	0.28
	lps	13.0	9.9	7.9

EQUIVALENT PIPE GEOMETRY FOR MODELING AND ANALYSIS

A double stack of Marino Cells in series can be incorporated into standard hydraulic models using a rectangular pipe with a span of 0.62 feet (190 mm), a rise of 0.98 feet (300 mm), and a Manning's n value of 0.05. This pipe provides a close approximation of the hydraulic grade line over a range of flows. Alternatively, a double stack of Marino Cells in series at maximum flow can be approximated by a 12-inch diameter circular pipe with a Manning's n value of 0.085. However, the approximation of the Marino Cell hydraulic grade line does not hold for intermediate or lower flows; thus, the box pipe comparison is generally preferred. These pipe approximations are valid for double stacks of Marino Cells in series with slopes ranging from 0.5% to 1.0% where surcharge conditions are not expected and there are no tailwater restrictions (free outfall).

DeepRoot Canada Corp
www.deeproot.com
info@deeproot.com

Updated: May 2025

Source: Balance Hydrologics