REPORT ON
LABORATORY TEST RESULTS
FOR MEBRA DRAIN MD7007

By

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1. INTRODUCTION

This report presents the tensile strength and discharge capacity test results for Mebra Drain MD7007 vertical drain specimen provided by Geotechnics Holland BV. The typical cross-section of the drain is 100 mm in width and 3 mm in thickness. The fabric used was Typar 5357 with a weight of 136 g/m^2.

2. DISCHARGE CAPACITY MEASUREMENTS

Two series of laboratory tests were conducted to measure the discharge capacity of the drain:

Series A (Straight): Discharge capacity tests for straight drains using a 100x100 mm Drain Tester; and
Series B (Buckled): Discharge capacity tests for buckled drains using a Buckling Drain Tester.

For both series, values of discharge capacity were measured at vertical pressures of 50, 100, 200, 300, and 350 kPa for hydraulic gradients ranging from 0.1 to 1.

2.1 Series A: Results Obtained From 100x100 mm Drain Tester

A 100 mm long Mebra Drain MD7007 drain specimen (with a width of 100 mm) was tested using the 100x100 mm Drain Tester. The sample was embedded horizontally in a layer of soft marine clay. The testing arrangement and procedures are detailed in a paper by Chu and Choa (1995) (a copy is attached). The test results for each measurement are presented in Table 1 and also shown in Fig. 1. The discharge capacity of the drain at hydraulic gradients of 0.1, 0.5, and 1.0 are also presented in Table 1 and shown in Fig. 2.

2.2 Series B: Results Obtained From Buckling Drain Tester

A 300 mm long Mebra Drain MD7007 drain specimen was tested using the Buckling Drain Tester. The drain buckled with a 15% vertical strain before the discharge capacity tests were started. The maximum vertical strain reached at the end of the tests was about 30%. The testing procedures are discussed in Chu and Choa (1995). The test results for all the measurements are given in Table 2 and plotted in Fig. 3. The results at hydraulic gradients of 0.1, 0.5, and 1.0 are also presented in Table 2 and shown in Fig. 4. A comparison of the discharge capacity measured for straight and buckled drains is presented in Figs. 5, 6, and 7 for hydraulic gradients of 0.1, 0.5, and 1.0 respectively.

3. TENSILE STRENGTH MEASUREMENT

The stress - elongation and tensile strength of the drain were measured using a modified triaxial compression machine. The clamps which have a jaw face of 100 mm (width) x 60 mm (length) were designed in reference to ASTM Standard: D4632-91. The specimen tested was 300 mm. The loading rate was 7.608 mm/min.. Other details are referred to Chu and Choa (1995). The drain specimens were loaded until the peak load was obtained. Any forms of rupture in the core or filter were not observed even when the strain exceeded 40%. The test data are presented in Table 3 and Fig. 8.

4. CONCLUSIONS

The discharge capacity and tensile strength properties of Mebra Drain MD7007 vertical drain specimen were measured in the laboratory. The test results from the straight and the buckling tests indicate that the values of discharge capacity at a pressure of 300 kPa are:

Hydraulic gradient	Straight	Buckled
0.1	82×10^{-6} m^3/s	77×10^{-6} m^3/s
0.5	45×10^{-6} m^3/s	40×10^{-6} m^3/s
1.0	34×10^{-6} m^3/s	25×10^{-6} m^3/s

The ultimate tensile strength of the drain is 2.06 kN which occurs at an axial strain of 40%. No ruptures in either the core or the filter were observed.

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Table 1 Test Results of Mebra Drain MD7007 using 100x100 mm Straight Drain Tester

Vertical Pressure (kPa)	Hydraulic Gradient i	Flow Rate 10^{-6} (m^3/s)	Discharge Capacity (m^3/s)	Discharge Capacity at		
				i = 0.1 (m^3/s)	i = 0.5 (m^3/s)	i = 1.0 (m^3/s)
50	0.08	9.44	118E-6	115E-6	80E-6	62E-6
	0.24	23.1	96E-6			
	0.47	38.1	81E-6			
	0.72	51.8	72E-6			
	1.05	65.1	62E-6			
100	0.08	8.4	105E-6	102E-6	64E-6	50E-6
	0.37	26.3	71E-6			
	0.52	32.8	63E-6			
	0.84	46.2	55E-6			
	1.02	50.1	49E-6			
200	0.10	9.3	93E-6	93E-6	58E-6	40E-6
	0.44	26.1	59E-6			
	0.61	31.7	52E-6			
	0.81	37.3	46E-6			
	1.03	40.2	39E-6			
300	0.10	8.2	82E-6	82E-6	45E-6	34E-6
	0.41	20.5	50E-6			
	0.50	23.1	46E-6			
	0.78	29.6	38E-6			
	1.05	71.3	32E-6			
350	0.09	6.75	75E-6	75E-6	42E-6	32E-6
	0.28	14.6	52E-6			
	0.50	21.5	43E-6			
	0.8	28.8	36E-6			
	1.03	31.9	31E-6			

(Measurements were made at an average temperature of 26° C)

Table 2 Test Results of Mebra Drain MD7007 using Buckling Drain Tester

Vertical Pressure (kPa)	Hydraulic Gradient i	Flow Rate 10^{-6} (m^3/s)	Discharge Capacity (m^3/s)	Discharge Capacity at		
				i = 0.1 (m^3/s)	i = 0.5 (m^3/s)	i = 1.0 (m^3/s)
50	0.08	20.4	106E-6	105E-6	65E-6	48E-6
	0.21	49.4	86E-6			
	0.45	58.6	68E-6			
	0.82	70.2	50E-6			
	1.08	81.6	46E-6			
100	0.08	19.0	99E-6	96E-6	55E-6	34E-6
	0.24	42.6	74E-6			
	0.50	48.9	54E-6			
	0.85	60.8	37E-6			
	1.05	66.6	33E-6			
200	0.10	13.1	85E-6	85E-6	48E-6	29E-6
	0.33	35.1	58E-6			
	0.62	44.2	40E-6			
	0.92	55.8	30E-6			
	1.12	60.3	27E-6			
300	0.10	13.8	77E-6	77E-6	40E-6	25E-6
	0.39	32.8	47E-6			
	0.55	39.7	38E-6			
	0.72	49.2	30E-6			
	1.05	52.5	24E-6			
350	0.09	11.0	68E-6	68E-6	38E-6	21E-6
	0.30	29.9	50E-6			
	0.61	34.4	31E-6			
	0.89	41.6	23E-6			
	1.08	46.3	20E-6			

(Measurements were made at an average temperature of 26° C)

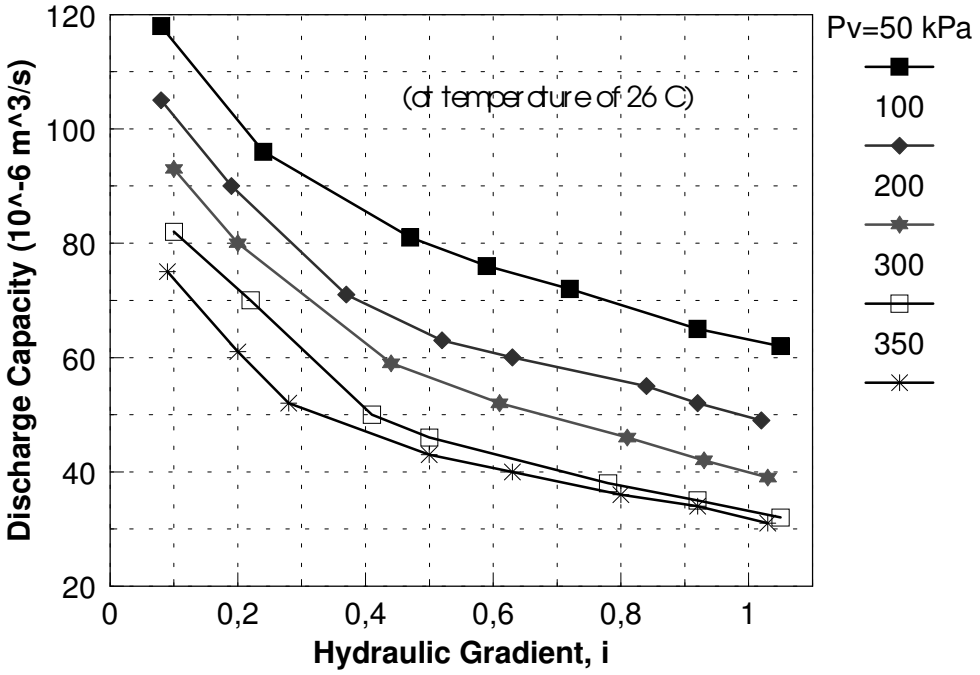

Fig 1 Test Results for MD7007 by 100x100 Tester

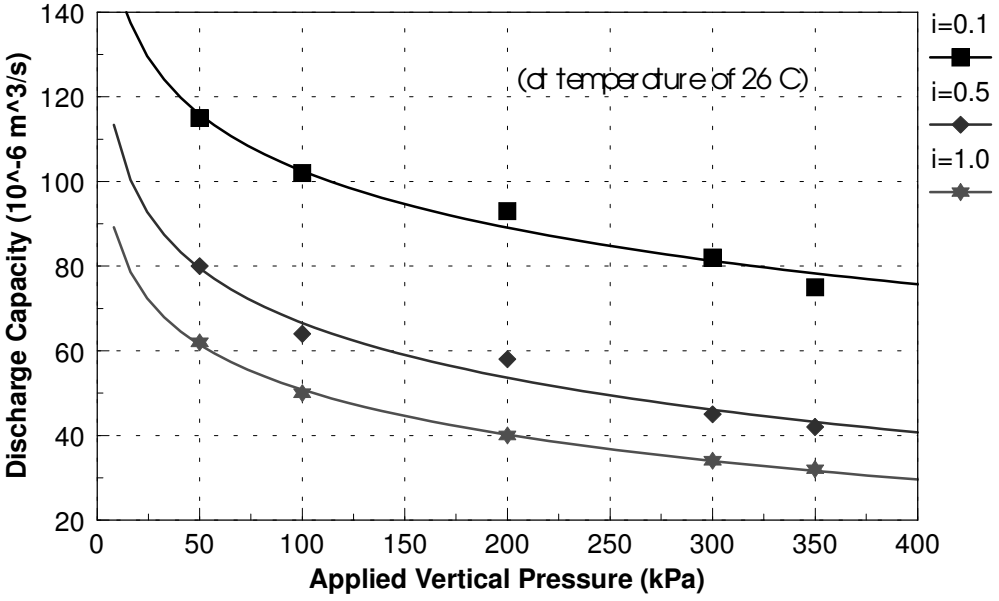

Fig 2 Test Results for MD7007 by 100x100 Tester

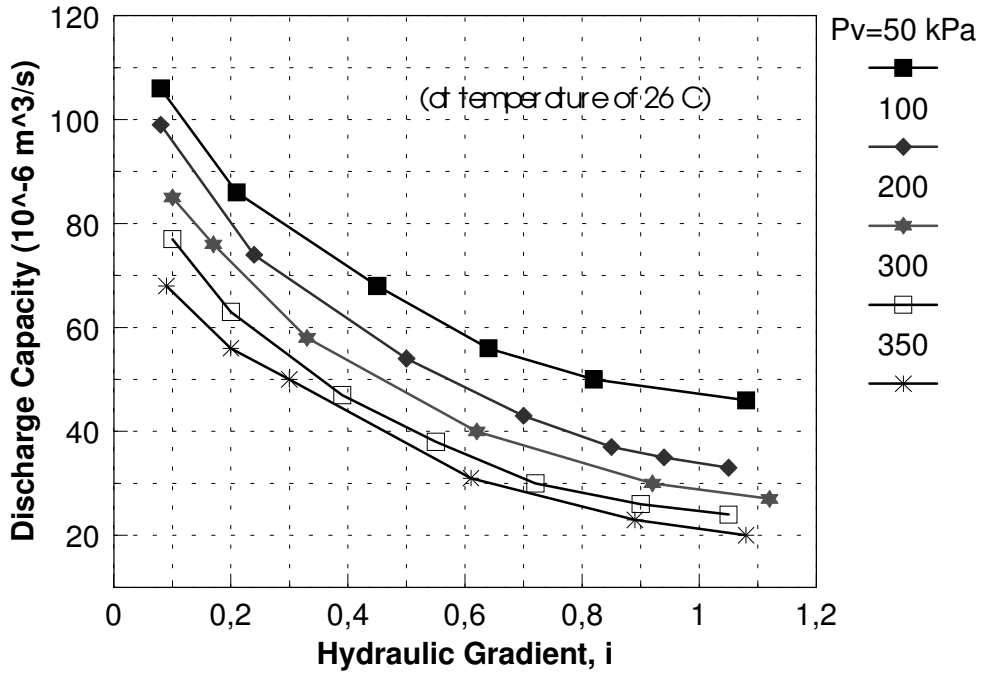

Fig 3 Test Results for MD7007 by Buckling Drain Tester

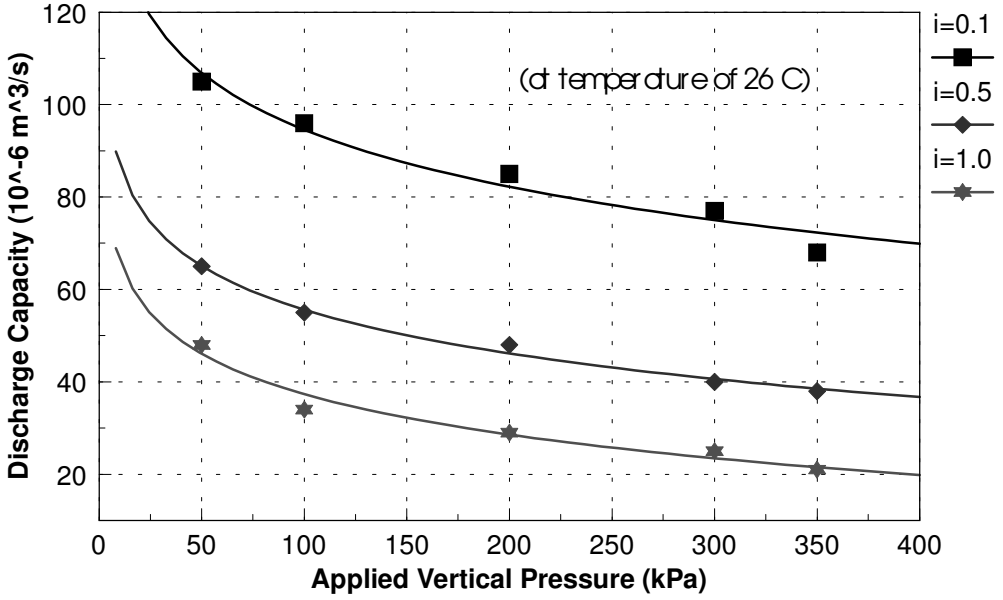

Fig 4 Test Results for MD7007 by Buckling Drain Tester

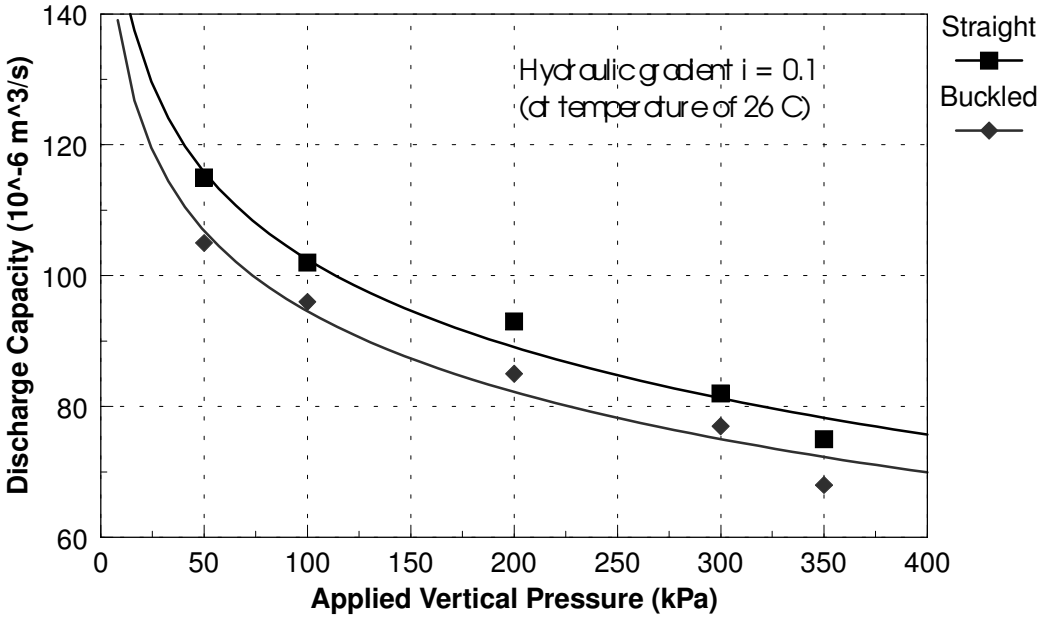

Fig 5 Test Results for MD7007 at i=0.1

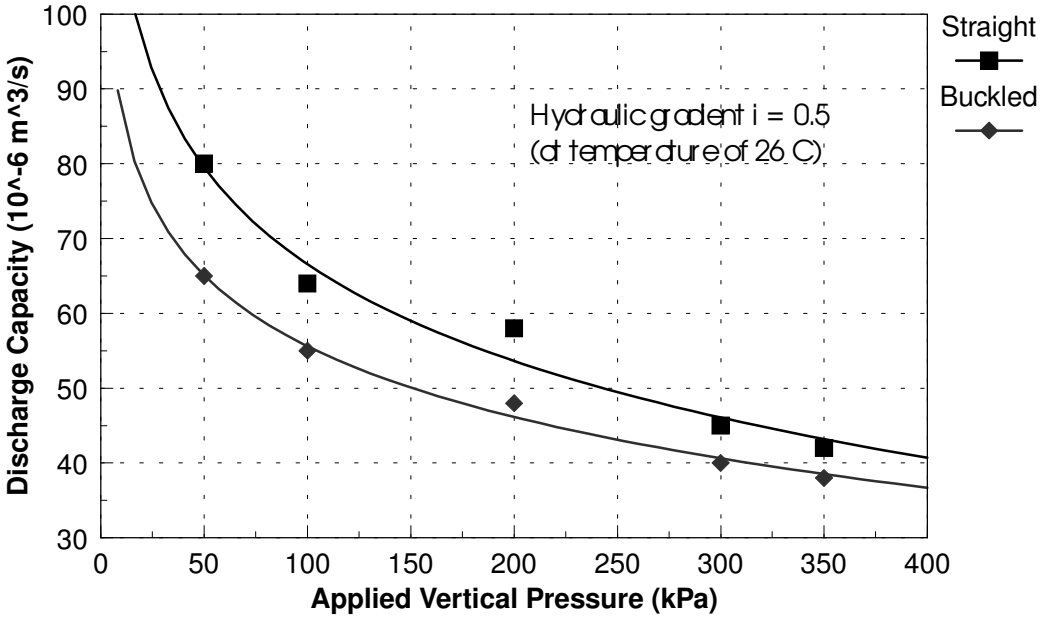

Fig 6 Test Results for MD7007 at i=0.5

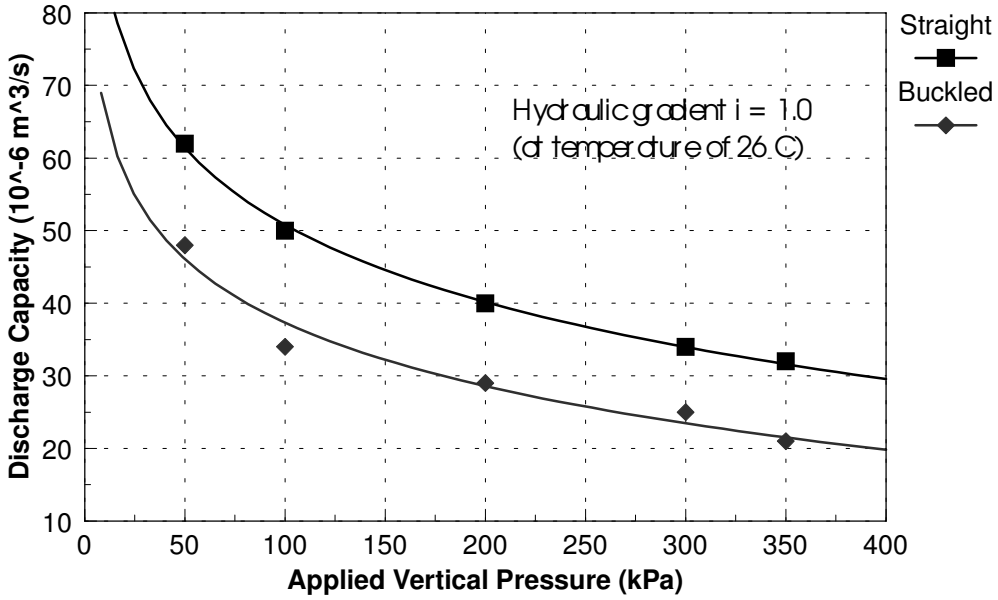

Fig 7 Test Results for MD7007 at i=1.0

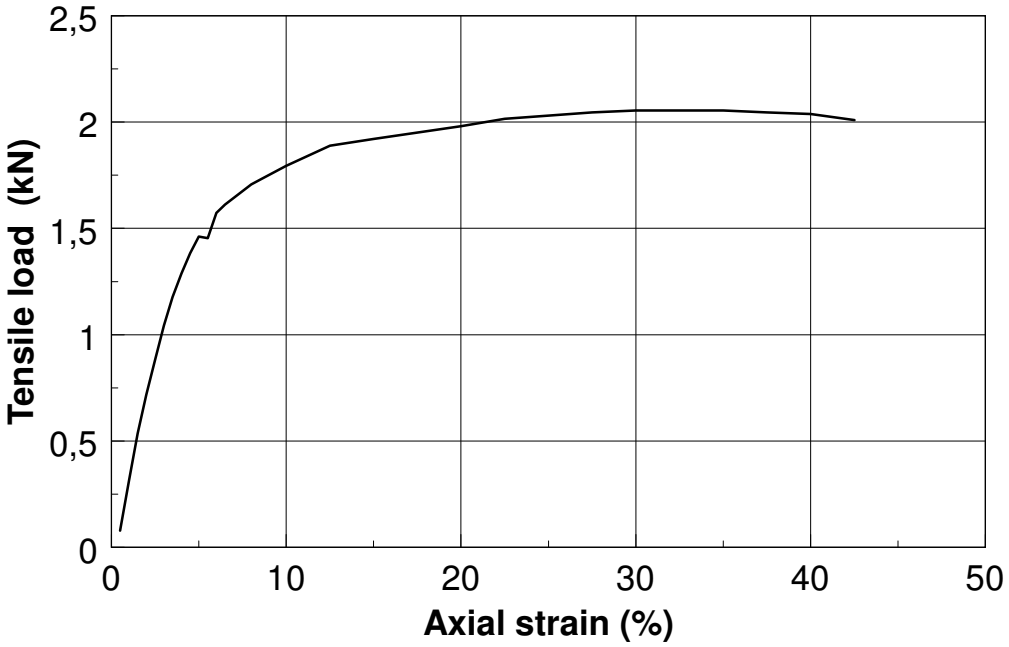

Fig 8 Tensile Strength Test Result for MD7007