

**Test of HydroMax 2” Terrace Siphonic Roof Drain to ASME 112.6.9-2005**

**Testing Body**

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CRM-HydroMax-12-Terrace Drain Revision 1.01

**Client**

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**Supervised by Test Engineer:**

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**Document History**

Rev	Date	Approving Engineer	Reason
1.00	13-Aug-12	M Wearing	Original Report issue

## 1.0 Introduction

A series of test were carried out to comply with the test procedures set out in of ASME 112.6.9-2005. The test program in ASME 112.6.9-2005 is designed:

- To determine the relationship between the flow rate entering the drain and the depth of water at the approach to the drain (i.e. the flow rating curve for the product);
- To determine the head loss coefficient (i.e. single resistance value) for the drain for use by the designer for designing the piping system in which the drain will be installed.
- To check the effectiveness of the drain at preventing entry of air and for the speed of response to sudden changes in flow rate.

Tests were undertaken on a 2 inch HydroMax Terrace drain, which was supplied to CRM 16/01/2012. There is no requirement in ASME 112.6.9-2005 to sample for the testing, as all units manufactured to normal engineering tolerances will have a similar flow performance.

## 2.0 Test Facility

The drain was placed in the centre of a circular test tank with the following specification, matching the requirements of ASME 112.6.9-2005:

- Test tank 39.4 inch (1m) radius
- Peripheral feed (fed by four inlets at quadrant points)
- Approach to drain of radius 35.4 inches (0.9m) which does not deviate by more  $\pm 3/32$  inch (4mm) from the horizontal.
- Freeboard of more than 6 inches (0.15m)
- Incoming flow rate was measured using two electromagnetic flow meters permanently installed in the laboratory pipework accurate to  $\pm 0.5\%$ .

A MAG6000 DN 80 measures flows up to 1.236 ft<sup>3</sup>/sec (35 l/s)

A MAG3000 DN 200 measures flows above 1.236 ft<sup>3</sup>/sec (35 l/s)

- Water depths were measured 19.7 inches (0.5m) from center of the drain using a water surface follower accurate to  $\pm 0.001$  inch (0.3mm).
- Pressure measurements were taken using two Sensor Technics CTE8NO1GYO  $\pm 1$  bar, 0-10v output pressure transducers connected to an Amplicon PCI 260 12 bit DAC with maximum sampling rate 312kS/s.

### **3.0 Tests**

#### **3.1 Pipework**

The drain was connected to a 118 inch (3m) length of 2.0 inch (50.8mm) ID clear extruded PVC pipework using a proprietary flexible coupling. The lower end of the standpipe had a free discharge.

#### **3.2 Flow Rating Curve**

A datum point at the lip of the drain with zero flow was established using the water surface follower. Water depths were then collected at various flow rates using the methodology set out in ASME 112.6.9-2005, section 3.5.6

#### **3.3 Single resistance value of the drain**

Two pressure transducers were installed, a minimum of 10 pipe diameters from the drain outlet, and 10 pipe diameters apart. There were no pipe joints or couplings between the pressure transducer tappings. Pressures were measured at full bore conditions using calibrated pressure transducers, capable of reading to an accuracy of  $\pm 0.1$  in. w.c. ( $\pm 2.5$  mm w.c.).

#### **3.4 Water patterns and sudden inflow into the drain**

With the drain operating at full bore conditions, flow patterns were noted, specifically any vortices and air entrainment. The water flow was switched off, and once it had fully drained, increased to full bore conditions over a period of 15 second, and peak water depth measured using methodology set out in ASME 112.6.9-2005, section 3.5.5

## 4.0 Results

### 4.1 Rating Curve

The static water depths for various flow rates are shown in the table below. Water depths are measured with respect to the drain lip, 20 inches (0.5m) from the drain center.

Flow (ft <sup>3</sup> /s)	Depth (inches)	Flow (GPM)	Depth (inches)
0.000	0.00	0.0	0.00
0.085	0.96	38.0	0.96
0.127	1.01	57.1	1.01
0.215	1.31	96.7	1.31
0.258	1.45	115.7	1.45
0.297	1.70	133.1	1.70
0.339	1.74	152.2	1.74
0.374	1.81	168.0	1.81

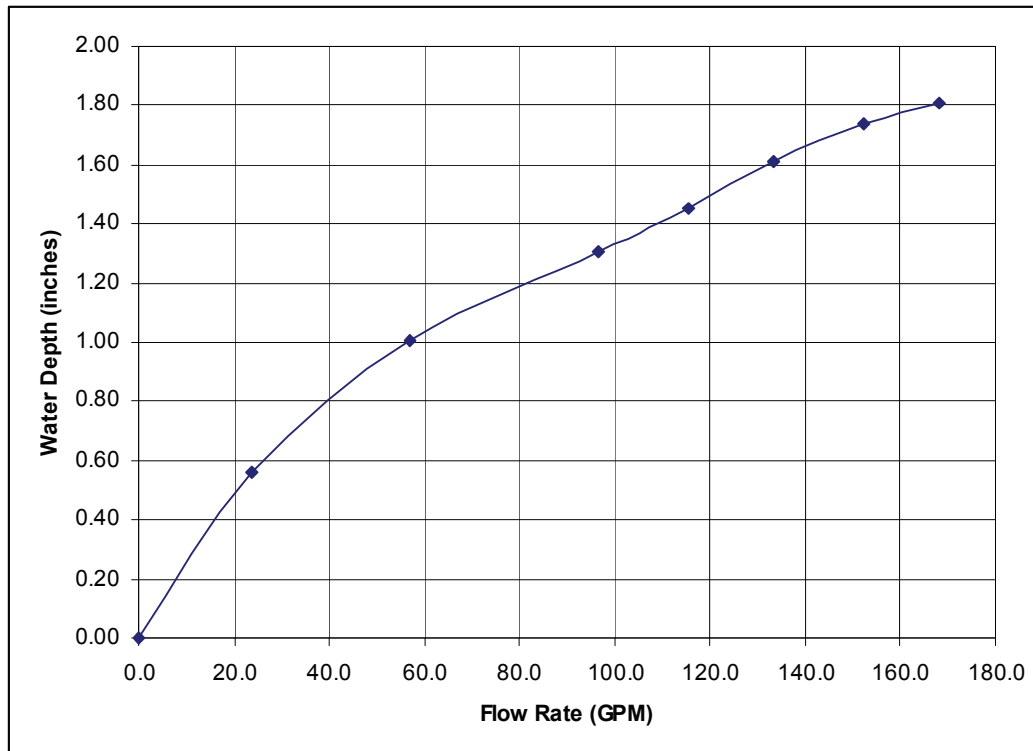


Figure 1, Rating curve (GPM format)

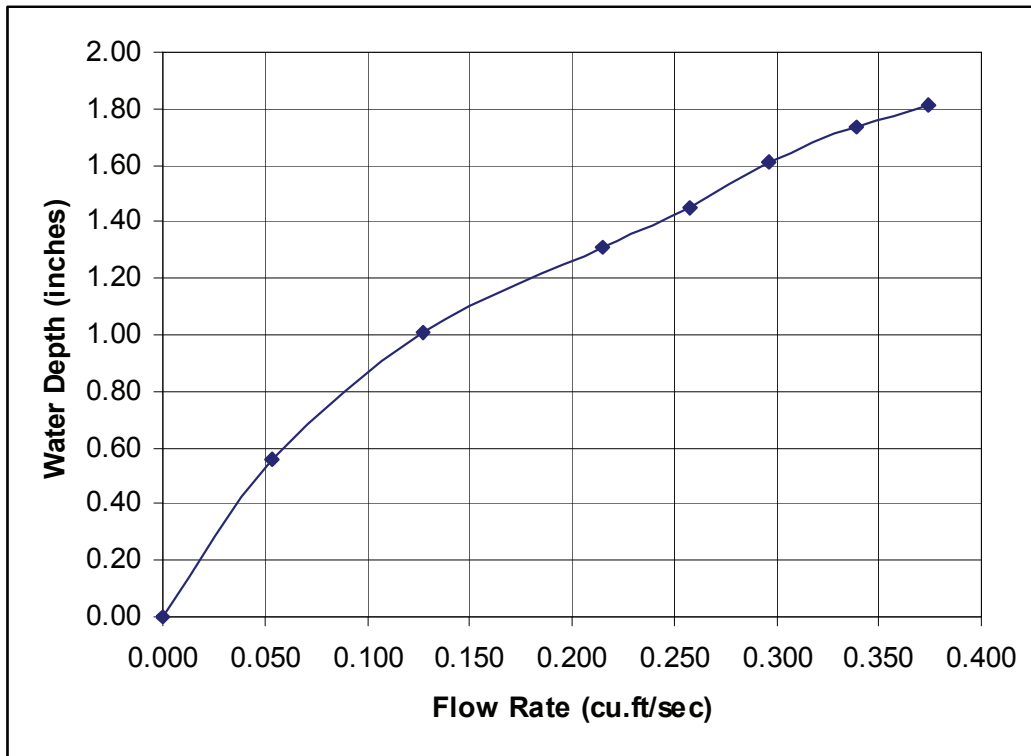


Figure 2, Rating curve (ft<sup>3</sup>/s format)

#### 4.2 Single Resistance Testing

Flow rate during test,	0.374 ft <sup>3</sup> /s (10.6 l/s)
Steady water level, d,	1.81 inches (0.046 m)
Pipe roughness,	0.00118 inches (0.03 mm)
Pipe diameter (ID)	2 inches (50.8mm)
Drain diameter (ID)	2. inches (50.8mm)
Average pressure at upper gauge (PH)	-55.94 inches (-1.421m)
Average pressure at lower gauge (PJ)	-46.69 inches (-1.186m)

By Calculation

Single resistance calculated from Gauge H and Gauge J are both 0.20

#### 4.2 Water patterns and sudden inflow into the drain

The drain was run its steady operating level of 0.374 ft<sup>3</sup>/s (10.6 l/s), and observations made of any air entrainment or vorticity. In both regards the drain performed well, with very little air entrainment, and no visible signs of vorticity.

During the sudden inflow test the drain filled the pipe within the 15 second period, and so there was no overshoot recorded. The priming of the pipe was regular, smooth and progressive

I hereby certify that the above report accurately details tests undertaken on the specified product, and that the results show that the HydroMax 2 inch Terrace drain conforms to the testing requirements of ASME 112.6.9-2005.

Signed

A black and white image of a handwritten signature, appearing to be 'MW', on a dark background.

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Supervising Test Engineer