



**ENGINEERING LABORATORY  
TEST REPORT**

**Location of Testing:** NSF International  
789 Dixboro Road  
Ann Arbor, MI 48105

**Report Number:** J-00067411

**Client:** Ms. Diane Jacob  
Paddock Pool Equipment Co.,  
P.O. Box 11676  
Rock Hill, SC 29731

**Description of Test Sample:** 24" by 24" Suction Outlet Cover and Sump  
Model # 2424PCFC with 18" x 18" ESMD

**Date of Receipt of Test Sample:** December 1, 2008

**Date(s) of Test:** December 2 – December 11, 2008

**Test Standard:** ASME A112.19.8a-2008 "Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs"

**Conclusion:** The sample tested successfully completed all applicable portions of the physical testing, and hair, finger, limb, and body entrapment testing, resulting in an NSF certified flow rate of 915 gallons per minute for both wall and floor installation. No violations were noted during an evaluation of the sample to the material, packaging and marking requirements of the standard.

**Report Date:** December 11, 2008

**Report Status** **PASS**

Technical Responsibility \_\_\_\_\_  
Sal Aridi, P.E., Manager, Engineering Lab

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## Scope of Test Report

This report consists of an evaluation of a Paddock suction fitting, model number 2424PCFC, to the pertinent clauses of ASME A112.19.8a-2008, Sections 1, 2, 3, 4, 5, 6, and 7.

## 1 General

### 1.1.2 – Definition

The suction fitting is defined as all components, including the sump and/or body cover/grate, and hardware. The information and test results contained in this report apply only to the components and assembly that was tested:

Sump Model:	18" x 18" Entrapment Safe Main Drain
Suction Fitting Model:	24" x 24" Paddock Certified Grate Cover
Fasteners:	8-32 x 1/2" Pan Head Phillips #2 316L SS

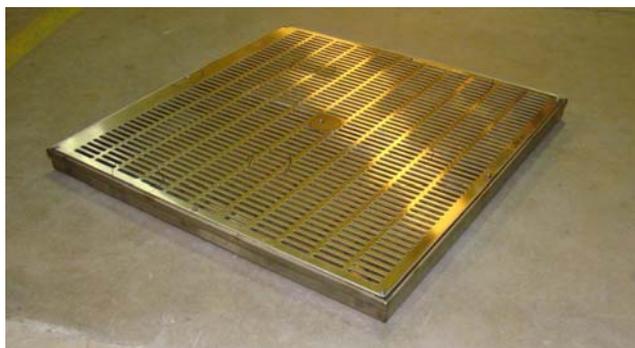


Figure 1 - 2424PCFC Suction Fitting



Figure 2 – Fasteners



Figure 3 – 1818ESMD

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Figure 4 - Assembled Sample

### 1.1.6 – Types of Suction Fittings

The sample tested is a Submerged Suction Outlet, as defined in section 1.1.6.5 of the referenced standard.

### 1.1.7 – Single or Multiple Usage

The sample tested is permanently marked as the following (per the manufacture’s option):

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**Table 1 - Single or Multiple Usage**

For Single or Multiple Drain Use	
For Single Drain Use	
For Multiple Drain Use Only	<b>X</b>

## **2 Fitting Design, Assembly, and Material Requirements**

### 2.1 – General Requirements

The requirements of Section 2.1 are located below in Table 2 (note: *italic* text indicates noncompliance).

**Table 2 - Fitting Design, Assembly, and Material Requirements: General**

Clause	Requirement	Compliance
2.1.1	Are fasteners required for assembly?	Yes
	Are tools required for disassembly?	Yes
	Drive type (standard slotted screws not permitted):	Pan Head Phillips #2
	Fastener material	SS-316L
	Material corrosion resistance equivalent to SS316?	Yes
2.1.1.1	Number of fastener threads engaged when installed (min. 3):	11.5 – 12
2.1.1.2	Fastener torque specification:	19.8 in.-lbs.
	After 15 insertions of fasteners to the specified torque, did the fasteners strip or cross-thread?	No
2.1.1.3	Are self-tapping screws used?	No
	Is sump designed to accommodate re-drilling and insertion of a threaded insert in a stripped hole?	N/A
2.1.1.4	Are threaded inserts used?	No
	Threaded insert material	N/A
	Is material chosen to preclude corrosion with provided fasteners?	N/A
2.1.2	Does sump connection mate with standard threaded or socket PVC fitting?	Yes, 8” Flange
2.1.3	Are any sharp edges that constitute a hazard accessible?	No
2.1.4	Distance the fitting protrudes from the installed surface:	< 0.25 inch

### 2.2 Fitting Exposure

The suction fitting that was evaluated was not constructed of a polymeric material, and thus was exempt from the ultra-violet light exposure test as defined in Section 3.2 of the referenced standard.

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## 2.3 Specific Design Requirements

### *2.3.1 – Field Fabricated Outlets*

“Field Fabricated Outlets” shall refer to all installations of the tested suction fitting in which the manufacturer’s recommended sump and hardware (listed above in section 1.1.2) are not used.

#### *2.3.1.6 – Sump*

NSF requires that, per the referenced standard, all field fabricated outlets must have a sump below or behind the cover/grate of a design specified by a Registered Design Professional.

#### *2.3.1.7 – Design*

NSF requires that, as stated in ASME A112.19.8a-2008, all field fabricated outlets shall be further specified by the Registered Design Professional so as to fully address the considerations of cover/grate loadings, durability, hair, finger and limb entrapment issues, cover/grate secondary layer of protection, related sump design, as well as features particular to the site.

### *2.3.4 – Submerged Suction Outlet*

The NSF certified flow rate for the suction fitting tested is only applicable when used with the manufacturer’s recommended sump (Paddock PN 1818ESMD), and supplied hardware installed to the manufacturer’s recommended torque (19.8 in-lbs).

*Note: Per ASME A112.19.8a-2008, the use of the suction fitting with a sump built in accordance with Figure 2 of that standard shall be permitted when specified and designed by a Registered Design Professional as stated in section 2.3.1.*

## **3 Physical Testing**

### 3.3 Vertical Load and Deformation Test

A load of 300 pounds was applied to multiple locations of six suction fitting samples using the procedure and equipment defined in section 3.3.1 of ASME A112.19.8a-2008.

#### 3.3.2 Performance Requirement

The acceptance criterion of this test requires that the suction fittings shall not permanently deform, crack, or lose any material. The results of this test are located below in Table 3.

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Table 3 - Vertical Load and Deformation Test

Sample	Permanent Deformation, Cracking, or Material Loss
1	No
2	No
3	No
4	No
5	No
6	No

### 3.5 Point Load to Excess Test

A load of 600 pounds was applied to six suction fitting samples using the procedure and equipment outlined in 3.5.1 of ASME A112.19.8a-2008.

### 3.5.2 Performance Requirement

The acceptance criterion of this test requires that the suction fittings shall not sustain any loss of material, however, permanent deformation is not considered a failure. The results of this test are located below in Table 4.

Table 4 - Point Load to Excess Test

Sample	Cracking or Permanent Deformation (Y/N)	Loss of Material (Y/N)
1	Slight Deformation	No
2	Slight Deformation	No
3	Slight Deformation	No
4	Slight Deformation	No
5	Slight Deformation	No
6	Slight Deformation	No

### 3.6 Shear Load Test

The sample provided was exempt from the Shear Load Test. The suction fitting does not protrude half of an inch from the mounting plane.

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### 3.7 Vacuum and Point Impact Test

The Vacuum and Point Impact Test was not performed on the samples provided. The sample cannot be blocked by the 99% percentile torso as defined in Table 1 of the referenced standard. The impact test of 36 foot-pounds, as outlined in section 3.7 of the referenced standard, is for polymeric materials and has a negligible effect on the material of construction (304 SS).

### 3.8 Pull Load Test

The sample provided was exempt from the Pull Load Test. There were no openings with dimensions 0.375 inches or more on the fitting that afforded a finger grip (i.e. the first joint of the articulation probe specified in Figures 14 and 15 of the referenced standard could not be made to pass through any of the openings of the fitting).

### 3.9 Mold Stress Relief Distortion

The sample provided was exempt from the Mold Stress Relief Distortion Test. It was not constructed of a polymeric material

## **4 Hair Entrapment**

### 4.1.2 Sample Types (Hair)

The following types of hair were used during the hair entrapment tests.

4.1.2.1 Type 1: A full head of natural, straight, blonde, human hair. The mass of hair used was  $5.5 \pm 0.5$  ounces and had a length of 16 inches.

4.1.2.2 Type 2:  $2 \pm 0.11$  ounces of straight, brown, human hair having a length of 16 inches, affixed to a 1 inch diameter dowel, 12 inches in length.

### 4.2 Procedure

The procedure used during testing is defined in Section 4.2 of the referenced standard.

### 4.3 Performance Requirement

Hair entrapment testing was performed with the suction fitting installed horizontally (floor), and repeated with the fitting installed vertically (wall), thus providing two, orientation specific flow rates. The data from the testing is located below in Tables 5 and 6.

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Fitting Orientation: Horizontal (Floor Mount)

**Table 5 - Hair Entrapment Test Results**

Trial	Test Flow Rate (lbs)	# Pulls	# Pulls $\geq$ 5 lbs.	Max Pull Force (lbs)	Hair Type
1	1150	10	0	2.58	I
2	1150	10	0	0.42	II

Fitting Orientation: Vertical (Wall Mount)

**Table 6 - Hair Entrapment Test Results**

Trial	Test Flow Rate (lbs)	# Pulls	# Pulls $\geq$ 5 lbs.	Max Pull Force (lbs)	Hair Type
1	1150	10	0	4.55	I
2	1150	10	0	0.91	II

Per Section 4.3, the highest passing flow rate was divided by 1.25 to determine the maximum allowable rating of the fitting. The maximum allowable ratings of the fitting under Section 4 are:

- Horizontal (Floor) Mount: 920 gpm
- Vertical (Wall) Mount: 920 gpm

**Body Entrapment**

**5.1.3 Test Equipment**

A “body block” was used to simulate a human torso during the body entrapment test. The body block element was a section of closed-cell foam having a compression-deflection value of 1.5 – 3.0 psi at 25% deflection, 2 inches thick, measuring 18 inches by 23 inches, and attached to a wood backing with sufficient weight added to the wood backing to make the element neutrally buoyant. The size of the body block was the largest size listed in Table 1 of ASME A112.19.8a-2008.

**5.2 Test Method**

The test procedure used to perform the body entrapment test is defined in Section 5.2 of the referenced standard.

**5.3 Performance Requirement**

Body entrapment testing was performed with the suction fitting installed horizontally (floor mount). Per Table 1 of the referenced standard, the maximum allowable removal effort of the body block was 120 pounds. The data from the testing is located below in Table 7.

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**Table 7 - Body Entrapment Test Results**

Trial	Test Flow Rate (lbs)	Removal Force (lbs)		
		#1	#2	#3
1	1400	>228.20*		
2	1000	108.25	111.25	130.95
3	970	87.40	108.60	141.90
4	950	96.85	126.75	
5	940	127.15		
6	900	101.05	85.50	85.15
7	920	121.45		
8	910	99.50	99.50	109.35
9	915	95.75	115.80	99.90

\* - The pump needed to be turned off to remove the body block

The maximum allowable rating of the fitting under Section 5 is 915 gpm.

**6 Finger and Limb Entrapment**

An articulate probe with dimensions equivalent to those shown in Figures 12 and 13 of ASME A112.19.8a-2008 was used to evaluate the fitting to the requirements listed under Section 6.3. The results are shown below in Table 8.

**Table 8 - Finger and Limb Entrapment**

Presence of large aperture(s)?	Yes <u>          X          </u>	No <u>                  </u>
2 <sup>nd</sup> articulation joint passes an edge/pinch point?	Yes <u>                  </u>	No <u>          X          </u>
Force applied to probe:	<u>          3.10          </u> lbs	<u>                  </u>
Admittance of 1" cylinder?	Yes <u>                  </u>	No <u>          X          </u>
Force applied to probe:	<u>          3.10          </u> lbs	<u>                  </u>
Presence of small aperture(s)?	Yes <u>                  </u>	No <u>          X          </u>
If the 1st joint can pass beyond an edge/pinch point of a small aperture:		
Width of edge/pinch point measured parallel to aperture opening	<u>          n/a          </u> in.	
If present, height of molding lines, engraved test, and symbols within apertures	<u>          n/a          </u> in.	

**7 Packaging and Installation Instructions**

Tables 9 and 10, located below, list compliance of the tested sample to the marking and packaging requirements of Section 7 of ASME A112.19.8a-2008. Text in *italic* indicates noncompliance with the referenced standard.

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**Table 9 - Marking of Suction Fittings**

7.1 MARKINGS		
Clause	Requirement	Compliance
7.1.1	Text size (minimum of 0.1 inches tall):	0.125"
7.1.1	Are all markings visible in the installed position?	Yes
7.1.1 (b)(1)	Is ASME standard designation present?	Yes
7.1.1 (b)(2)	Single/Multiple Drain Use statement:	Multiple Drain Use Only
7.1.1 (b)(3)	Is rated flow rate present?	Yes
7.1.1 (b)(4)	Type of fitting per paragraph 1.1.6:	Submerged Suction Outlet
7.1.1 (b)(5)	Indicated life of fitting components:	Yes
7.1.1 (b)(6)	Indicated installation position(s):	Yes
7.1.1 (b)(7)	Is the manufacturer's name or registered trademark present?	Yes
7.1.1 (b)(8)	Is the model designation present?	Yes

**Table 10 - Packaging of Suction Fittings**

7.2 PACKAGING		
Clause	Requirement	Compliance
7.2.1 (a)(1)	Type of fitting per paragraph 1.1.6 present?	Suction Outlet
7.2.1 (a)(2)	Instructions present not to locate fitting on seating areas or backrests?	Present
7.2.1 (a)(3)	Statement present that multiple fittings installed on the same suction line must be separated by 3 ft. or must be on different planes?	Present
7.2.1 (a)(4)	Statement present that if one suction outlet is blocked, the remaining outlets shall have a flow rating capable of the full flow of the system?	Present
7.2.1 (a)(5)	Maximum flow rating with head loss curve present?	Present
7.2.1 (a)(6)	Acceptable connection pipe size(s) present?	Present
7.2.1 (a)(7)	Mounting positions present?	Present
7.2.1 (a)(8)	Suction outlet part or model numbers present?	Present, 2424PCFC
7.2.1 (a)(8)	If applicable, are detailed field built sump design specifications present?	Not applicable – user is directed to contract a design professional
7.2.1 (a)(9)	Part number/ description list with life span for all parts present?	Present
7.2.1 (a)(10)	Tools required present?	Present
7.2.1 (a)(11)	Service and winterizing instructions present?	Present
7.2.1 (b)	Cautionary note not to exceed maximum allowable flow rate present?	Present
7.2.1 (c)	Note that fitting and fasteners should be observed for damage or tampering before each use of the facility present?	Present
7.2.1 (d)	Statement that missing, broken, or cracked fittings shall be replaced before using the facility present?	Present
7.2.1 (e)	Statement that loose fittings shall be reattached before using the facility present?	Present

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7.2.1 (f)	Statement "Read, then keep these instructions for future reference" present?	Present
7.2.1 (g)	Cautionary note about increasing flow by increasing pump size present?	Present

**Head Loss Curve**

A head loss curve for the provided sample was generated by measuring the pressure/vacuum at a location on the suction side of a circulation pump with, and without, the suction fitting installed, and calculating the difference. The location of the pressure/vacuum measurements, and the flow rates at which pressure/vacuum measurements were recorded were identical for both cases (with and without the fitting installed). The head loss data is shown below in Table 11.

**Table 11 - 2424PCDC Head Loss Data**

Flow Rate (gpm)	229	458	686	915
Total Head Loss (psi)	0.10	0.20	0.10	0.10

**Report Summary**

As a result of the hair, body, finger, and limb entrapment testing, the NSF certified flow rate of the tested suction fitting is 915 gallons per minute for both the horizontal and vertical orientations. The NSF certified flow rate is applicable only to those fittings in installations that include the manufacturer’s recommended sump and installation hardware, and comply with all installation requirements of ASME A112.19.8a-2008 and of the manufacturer. The provided sample also complied with the packaging, marking, and material requirements of ASME A112.19.8a-2008.

The overall status of this report is a PASS.

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