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TEST REPORT

Report Number: 1562-19022-002 **Project No.:** 29295

Report Issued: October 22, 2019

Client: Bestway Enterprise Company Limited **Contact:** Lynn Tao
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Source of Samples: The samples were sent by Bestway Inflatables & Material Corp., and received by IAPMO EGS in good condition on October 25, 2017

Date of Testing: December 5, 2017 through December 22, 2017. Test Report was reissued as per client's request.

Sample Description: Portable pool pumps

Model No.:	Type:
58381EU	Cartridge Filter (Precoated)
*58381GS	Cartridge Filter (Precoated)
58389EU	Cartridge Filter (Precoated)
*58389GS	Cartridge Filter (Precoated)
58391EU	Cartridge Filter (Precoated)

*Note: Testing represented by respective model with EU suffixes.

See photos for sample details.

Scope of Testing: The purpose of the testing was to determine if the sample tested Portable pool pump model listed above from Bestway Inflatables & Material Corp., met requirements of EN 16713-1 Issued February 2016 entitled, "Domestic Swimming pools – Water systems Part 1: Filtration Systems – Requirements and test methods."

CONCLUSION: **The samples tested of the portable pool pumps models listed above from Bestway Inflatables & Material Corp., COMPLIED with the applicable requirements of EN 16713-1 Issued February, 2016 entitled, "Domestic Swimming pools – Water systems Part 1: Filtration Systems – Requirements and test methods."**

Tested by,

Jason Tsan, Test Engineer

Reviewed by,

Tony Zhou, VP, Electrical Engineering

Standard: **EN 16713-1**

Section Tested/Evaluated:

4.1 General
4.2 Maximum filter flow rate
4.3 Filter media
4.4 Maximum operating pressure
4.5 Turbidity reduction efficiency
4.6 Retention capacity
4.7 Backwashing/replacement/cleaning criteria
4.8 Construction requirements
5.1 Pressure Resistance (pressure filter)
5.2 Static pressure resistance test
5.3 Cyclic pressure variation resistance test
5.4 Determination of the burst pressure
7.1 Test method for filtration efficiency
7.2 Turbidity reduction and contaminant retained mass
8 Instructions and operation –
8.1 General Principles
8.2 Point-of-purchase information
8.3 User's manual
8.4 Maintenance tips

Test Results: All tests and evaluations were conducted per the written procedures in the specified standard. Sections not mentioned were considered not applicable.

EN 16713-1

4 Requirements

4.1 General - FOLLOWED

All of the tests were carried out and claimed performances were conducted on new products. If air was trapped in the filter body, then it was evacuated and assembled in accordance with the assembly and commissioning manual. The electrical installation of any material related to the pool and its surrounding complied with the requirements of HD 60364-7-702 or valid national/regional requirements.

4.2 Maximum filter flow rate – COMPLIED

The filtration flow rate shall be adapted to the nature and surface area of the filter medium used in the filter. The velocity at which the water to be filtered passes through the new filter medium shall be adapted to the type of medium used.

Findings: The medium did not exceed the maximum permissible velocities. See table below for calculated velocity.

Model No.	Measured flow rate. (gal/hr)	m^3(hour)	Radius(m)	m^2(area)	Calculated velocity	Did the medium exceed the maximum permissible velocities?
58381EU Cartridge Filter	312	1.18	-	0.420	2.81	No (≤ 3 (m3/h)/m2)

58389EU Cartridge Filter	918	3.47	-	1.422	2.44	No (≤ 3 (m3/h)/m2)
58391EU Cartridge Filter	1818	6.88	-	2.642	2.60	No (≤ 3 (m3/h)/m2)

4.3 Filter media

4.3.1 General - FOLLOWED

If the filter medium being used is covered by an existing European standard this standard shall be applied (see bibliography).

Findings: The filter medium used for testing are cartridge filters provided by manufacturer.

4.3.2 Granular media – NOT APPLICABLE

The granular filter media, the type of filter media and height of filter media within the filter are some of the main aspects, which are expected to be supplied by the manufacturer. In case of multilayer filter, the specification of the media for each layer as well as the height or mass of each one shall be specified.

Findings: The filter medium used for testing are cartridge filters provided by manufacturer.

4.3.3 Sand filter media - NOT APPLICABLE

Sand filter media was silica and free from carbonates, clay and other foreign materials, which may have negative effects on the pool water quality.

Findings: The filter medium used for testing are cartridge filters provided by manufacturer.

4.3.4 Alternatives to sand media – NOT APPLICABLE

Findings: The type of media used for filtering in the pump are cartridge filter provided by manufacturer.

4.4 Maximum operating pressure (MOP) - COMPLIED

The filter's MOP was greater than the maximum manometric head of the pump of the filtration unit.

Findings: Filters MOP was measured and determined to be greater than the maximum manometric head of pump.

4.5 Turbidity reduction efficiency – COMPLIED

The turbidity reduction efficiency was 50 % or greater.

Findings: See Section 7.2 for complete results.

4.6 Retention capacity – NOT APPLICABLE

The retention capacity shall be greater than or equal to the value specified by the manufacturer. The testing procedure for measuring the retention capacity has to be carried out according to Clause 7.

Findings: Testing was not considered applicable for optional retention capacity test.

4.7 Backwashing/Replacement/Cleaning Criteria - COMPLIED

4.7.1 General

The different types of filtration, different backwash conditions have to be applied, to ensure the removal of debris and other accumulated matter out of the filter. For filtration systems equipped with a clogging indicator (e. g. pressure gauge, flow meter, etc.), the cleaning differential pressure, shall be equal to the differential pressure obtained at the cleaning limit value.

Independent of the clogging indicator, or if there is no clogging indicator installed, the filter shall be designed so that backwashing regularly to prevent blocking and contamination is possible.

Any backwash water shall be discharged into an appropriate drain close to the filter and the water disposed according to local regulations.

Backwash pipework fitted with a system (e. g. viewing glass) allows the operator to properly gauge the efficiency of the backwash. If there is no such system, a minimum cleaning/backwash procedure shall be specified by the manufacturer.

Findings: Instruction for replacement, and cleaning criteria are located in owner’s manual.

4.7.2 Specific backwash conditions – NOT APPLICABLE

For single or multilayer filters with sand, crushed glass or other graded aggregated filter material, the backwash rate should be as specified by the manufacturer for the filter taking into account the filter media specifications in use.

The filter media loading shall allow the media to expand freely during backwash operation; for instance, a minimum expansion of 10 % is required for sand.

For single or multilayer filters with sand, crushed glass or other graded aggregated filter material, the bed expansion of each efficient filter layer has to be min. 10 % during backwash.

Findings: Instruction for specific backwash conditions is not applicable for this product type.

4.7.2.2 Cartridge filter – COMPLIED

Cartridge filters can be cleaned automatically or manually. The duration of the cleaning process is until the visible debris on the surface is washed away or in accordance with the manufacturer's recommendations.

Findings: Recommendations for cartridge filter cleaning are located in owner’s manual.

4.7.2.3 Pre-coat filtration using diatomaceous earth (DE) – NOT APPLICABLE

A pre-coat media-type filter shall be designed so that wash water, dislodged filter aid, and dirt may be removed from the filter tank to a suitable drain. The cleaning process could be done by backwash or by manual cleaning of cartridge filters. After the cleaning process, fresh DE shall be added.

A complementary system shall be added to collect the diatomaceous earth after the backwash operation.

Findings: Pre-coat filtration using diatomaceous earth (DE) is not applicable to filter.

4.7.2.4 Other filtration systems – NOT APPLICABLE

Finding – Other filtration system were not evaluated.

4.8 Construction requirements - COMPLIED

Both the inside and the outside of the filter body is easy accessible for maintenance and inspection reasons. The material used for the filter body, piping and other filter components that are in contact with water is suitable with respect to not encourage bacterial growth, corrosion, and dissolving into or otherwise influencing the pool water quality.

The geometry of the filter body may vary (e. g. cylindrical shaped, rectangular shaped). The effective filter layer is geometrically uniform to gain maximum filtration efficiency.

Findings: The device under test complied with the noted construction requirement. The inside and outside of filter body was easily accessible. The materials used in device under test were determined suitable for intended application and the effective filter later was geometrically uniform to gain max filtration efficiency.

5 Pressure resistance (pressure filter)

5.1 General – FOLLOWED

Filter vessels were tested in accordance with 5.2, 5.3 and 5.4.

5.2 Static pressure resistance test - COMPLIED

The filter body is subjected to increases in line pressure following the closing of valves, the starting of a pump on a closed valve, or the clogging of the filter element or medium. The purpose of this test is to determine the capacity of a swimming pool filter body to resist high static pressure, and to determine, if appropriate, its failure mode.

Findings: When subjected to a static pressure resistance test, the filter body did not exhibit any visible and persistent sign of leakage or deformation that may compromise its proper operation. See Table 1 below for individual results.

5.3 Cyclic pressure variation resistance test – COMPLIED

In service, the filter body is exposed to pressure fluctuations following the closing/opening of valves and the starts/stops of pumps which vary the line pressure. The purpose of the test is to vary the pressure upstream of the filter body several times in order to simulate its fatigue during its normal service life. The operating protocol of Section 5.3 was followed.

Findings: When subjected to a cyclic pressure variation test, the filter body did not exhibit any visible and persistent sign of leakage or deformation that may compromise its proper operation. See Tables 2-4 below for individual results.

5.4 Determination of the burst pressure - COMPLIED

The static pressure test was performed as defined in 5.2 on a new filter with the continuance of increasing the pressure while recording the pressure upstream of the filter in steps of 20 kPa (0,2 bar) maintained for 30 s until the pressure drops or stabilizes (increase by less than 5 kPa (0,05 bar) or until a leak occurs outside of the filter.

Findings: The burst pressure was greater than that specified (1.43 x MOP or other greater value specified by the manufacturer) and there was no leaking of the test liquid 30s after the specified pressure is reached. See Tables 5-7 below for individual results.

7 Test methods for filtration efficiency

7.1 Principle

7.2 Turbidity reduction and contaminant retained mass - FOLLOWED

The purpose, principle and equipment and products noted in 7.2.1 to 7.2.3 were reviewed and followed.

7.2.4 Turbidity reduction test – COMPLIED

The testing protocol of Section 7.2.4 was followed. Record the test flow rate (Qe), the water temperature (23°3) C, the upstream pressure and the differential pressure (ΔP) at the terminals of the filter and take a sample upstream of the test filter to measure its turbidity every 2 cycles at minimum for a duration of 20 cycles, or until the filter is clogged (whichever comes first).

Findings: See Table 8 below for individual results.

7.2.5 Simplified 20 cycles retention test (dp20) - COMPLIED

The testing protocol of Section 7.2.5.1- to 7.2.5.3 were followed. This test is based on the measurement of the differential pressure vs. the injected mass of contaminant. It consists of a partial retention capacity evaluation of the filter to be tested after a continuous injection of contaminant during 20 recirculation cycles at the constant nominal flow rate. This test shall be done with new filter media. At the end of the test, the differential pressure $\Delta P2$, the retained mass of contaminant injected mR, the net differential pressure $\Delta(\Delta P)$ and the test time are recorded. The end pressure applied on the filter body shall not exceed the maximum pressure specified / allowed by the manufacturer for this test. If the maximum allowed pressure is reached before the 20 recirculation cycles, this should be recorded. This test is only applicable if the acceptance criteria of the turbidity reduction test were achieved. If during this test, the filter shows ruptures that may compromise its proper operation, then the test is considered as failed.

Findings: See table 9 below for individual results.

7.2.5.4 Determination of the retained mass of contaminant - COMPLIED

The testing protocol of Section 7.2.5.4 was followed. Depending of the filter technology, the determination of the retained mass of contaminant was achieved either by the determination of suspended solids method either by a method of mass.

Findings: See table 10 below for individual results.

7.2.6 Expression and presentation of results – FOLLOWED

Findings: Expression and curves are presented below in Tables 7 and 8.

7.2.7.2 Information about filter media – FOLLOWED

Findings:

Model No.	Type of filter media	Height and weight of filter media within the filter
58381EU	Cartridge Filter	3 7/8” / 85.1 g

58389EU	Cartridge Filter	8” / 220.6 g
58391EU	Cartridge Filter	10 1/8” / 422.6 g

8 Instructions and operation

8.1 General principles - COMPLIED

The person responsible for placing the filter or filtration unit on the market supplied an installation and operating manual, safety instructions specific to each piece of equipment, and if appropriate, a maintenance guide. All of the documents provided the information noted in 8.1.

Findings: Owner’s manual contained all of the required information.

8.2 Point-of-purchase information - COMPLIED

In order to allow the buyer to make a choice, the following information was available at the point-of-purchase and indicated as follows:

- voltage, frequency and input power for electric components (if needed),
- type of filter medium,
- The specification of the media according to 4.3 shall be accessible to the user, either for the first installation as well as for further replacements.
- Turbidity reduction efficiency *TBR* (%),
- retained mass in g (DP20 test);
- retention capacity (*C*RΔP expressed in g of ISO CTD), only if this optional test was carried out according to 7.3: filtration rating at 80% of efficiency and the average filtration efficiency at 45 μm, only if this optional test was carried out according to 7.3
- manufacturer's specification for the limit cleaning value;
- filter or filtration unit nominal flow rate (in m3/h to the nearest 0,5 m3/h);
- characteristics of the fittings.

Findings: Point-of-purchase information provided contains all information that is required.

8.3 User's manual

8.3.1 Installation - COMPLIED

The installation contained all of the information required (list of all parts and description of the install phases in chronological order, list of tools necessary for assembly and installation recommendation) for correct and complete installation.

Findings: Information regarding installation was located in owner’s manual.

8.3.2 Operation – COMPLIED

The operating manual contained all of the information required (winterizing and long term storage; cleaning/backwashing according to the criteria defined by the manufacturer; filtration recommendations) for correct and complete operation:

Findings: Information regarding operation was located in owner’s manual.

8.4 Maintenance tips - COMPLIED

The following recommendation appeared on the name plate and/or on the technical data sheet and/or in manual: "It is essential to change any damaged element or set of elements as soon as possible. Use only parts approved by the person responsible for placing the product on the market".

All filters and filter media are to be inspected regularly to ensure that there is not a build-up of detritus thus preventing good filtration. The disposal of any used filter media should also be in accordance with applicable regulations/legislation.

Findings: Information regarding maintenance was provided in owner's manual.

Section 5.2 Static pressure resistance test

Table 1

Model No.	GPM	Operating Pressure(PSI)	Maximum Operating Pressure (PSI)	Static Pressure (PSI)	Test Verdict
58381EU	5.2 (19.7 lpm)	0.7	2.4	3.4	Acceptable
58389EU	15.3 (57.91 lpm)	2.6	4.0	5.7	Acceptable
58391EU	30.3 (114.7 lpm)	6.2	11.1	15.9	Acceptable

5.3 Cyclic pressure variation resistance test – Tables 2-4

Table 2: Model No. 58381EU

Testing laboratory:	IAPMO EGS
Test date:	December 11, 2017
Operator:	Jason Tsan
Test product code	-
Manufacturer:	Bestway Inflatables & Material Corp.
Reference no.:	Model No.: 58381EU
Operating conditions	See below pressure cycle curve
Test fluid	Tap water
Temperature (°C)	28.5°C
Upstream pressure at the start of test (psi)	3.4 psi
Upstream pressure at the end of test (psi)	3.4 psi
Number of cycles specified	10,000 cycles
Number of cycles applied	10,000 cycles
Frequency of cycles	6 seconds
Observations	-
Breakage (Y/N)	No
Location	N/A

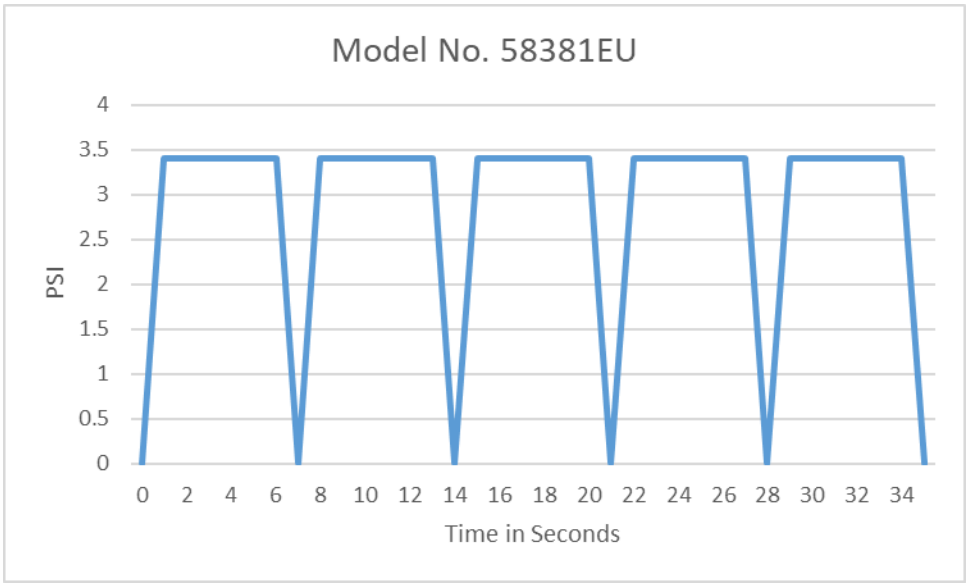
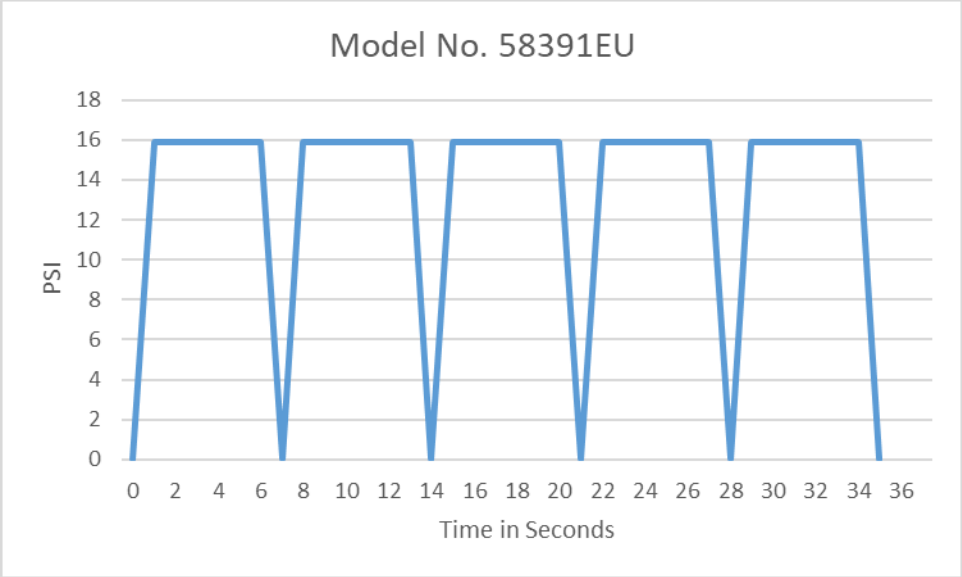


Table 3: Model No. 58389EU

Testing laboratory:	IAPMO EGS
Test date:	December 13, 2017
Operator:	Jason Tsan
Test product code	-
Manufacturer:	Bestway Inflatables & Material Corp.
Reference no.:	Model No.: 58389EU
Operating conditions	See below pressure cycle curve
Test fluid	Tap water
Temperature (°C)	28.4°C
Upstream pressure at the start of test (psi)	5.7 psi
Upstream pressure at the end of test (psi)	5.7 psi
Number of cycles specified	10,000 cycles
Number of cycles applied	10,000 cycles
Frequency of cycles	6 seconds
Observations	-
Breakage (Y/N)	No
Location	N/A

Table 4: Model No. 58391EU

Testing laboratory:	IAPMO EGS
Test date:	December 15, 2017
Operator:	Jason Tsan
Test product code	-
Manufacturer:	Bestway Inflatables & Material Corp.
Reference no.:	Model No.: 58391EU
Operating conditions	See below pressure cycle curve
Test fluid	Tap water
Temperature (°C)	28.2°C
Upstream pressure at the start of test (psi)	15.9 psi
Upstream pressure at the end of test (psi)	15.9 psi
Number of cycles specified	10,000 cycles
Number of cycles applied	10,000 cycles
Frequency of cycles	6 seconds
Observations	-
Breakage (Y/N)	No
Location	N/A



5.4 Determination of the burst pressure – Table 5-7

Table 5: Model No.: 58381EU

Testing Laboratory:	IAPMO EGS
Operator:	Jason Tsan
Test Date:	December 11, 2017
Manufacturer:	Bestway Inflatables
Product Code:	Model No.: 58381EU
Test Temperature:	28.2°C
Specified Pressure:	2.9 psi
Final Upstream Pressure (burst pressure)	9.9 psi
Pressure rise curve as a function of time	See chart below
Failure Type(s)	Leak occurred between lid and filter body.

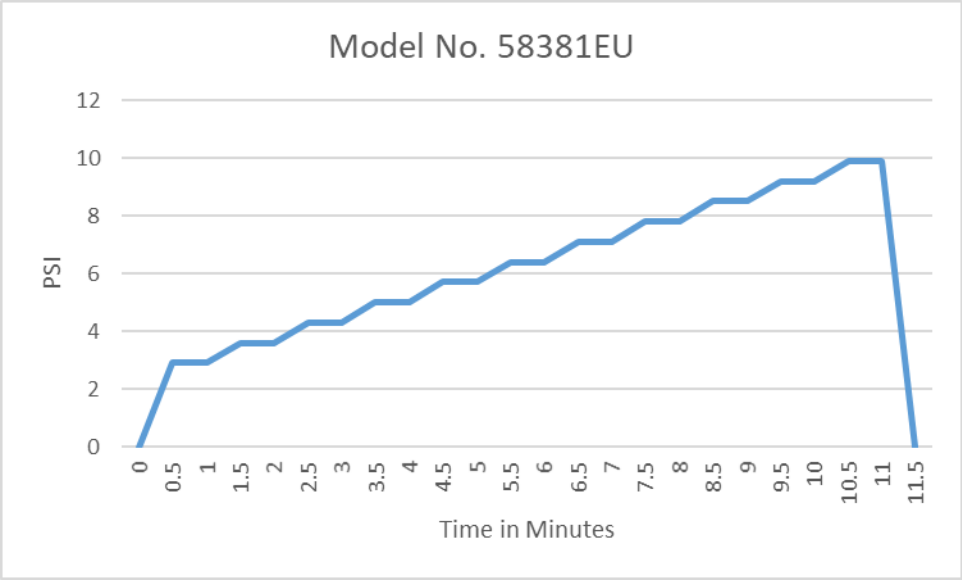


Table 6: Model No.: 58389EU

Testing Laboratory:	IAPMO EGS
Operator:	Jason Tsan
Test Date:	December 13, 2017
Manufacturer:	Bestway Inflatables
Product Code:	Model No.: 58389EU
Test Temperature:	28.3°C
Specified Pressure:	2.9 psi
Final Upstream Pressure (burst pressure)	12 psi
Pressure rise curve as a function of time	See chart below
Failure Type(s)	Leak occurred between lid and filter body.

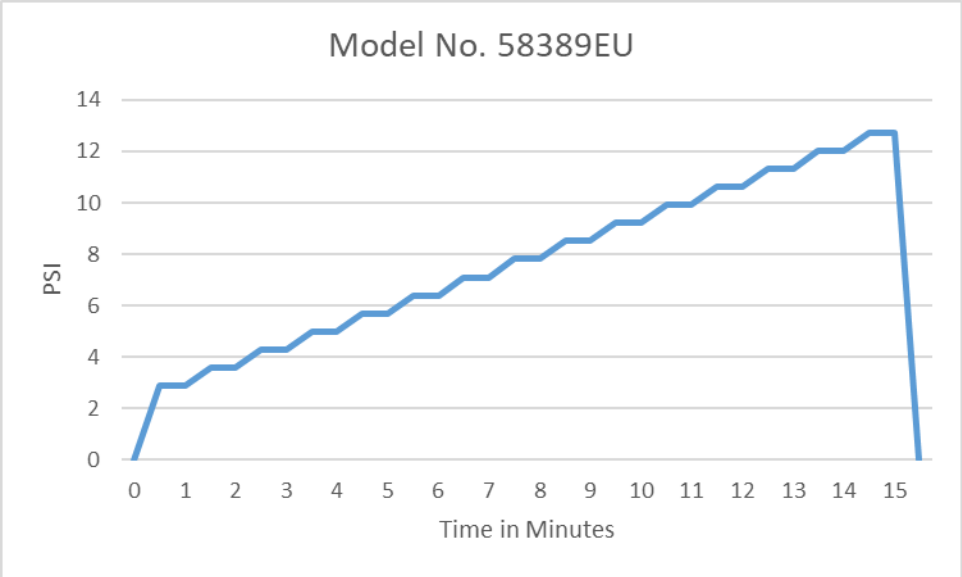


Table 7: Model No.: 58391EU

Testing Laboratory:	IAPMO EGS
Operator:	Jason Tsan
Test Date:	December 15, 2017
Manufacturer:	Bestway Inflatables
Product Code:	Model No.: 58391EU
Test Temperature:	28.3°C
Specified Pressure:	2.9 psi
Final Upstream Pressure (burst pressure)	19.7 psi
Pressure rise curve as a function of time	See chart below
Failure Type(s)	Leak occurred between lid and filter body.

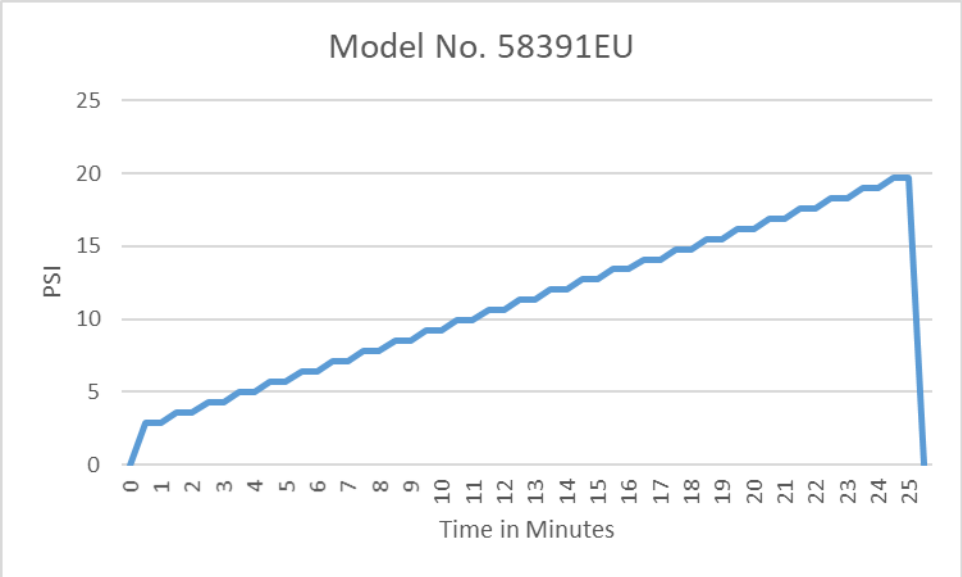
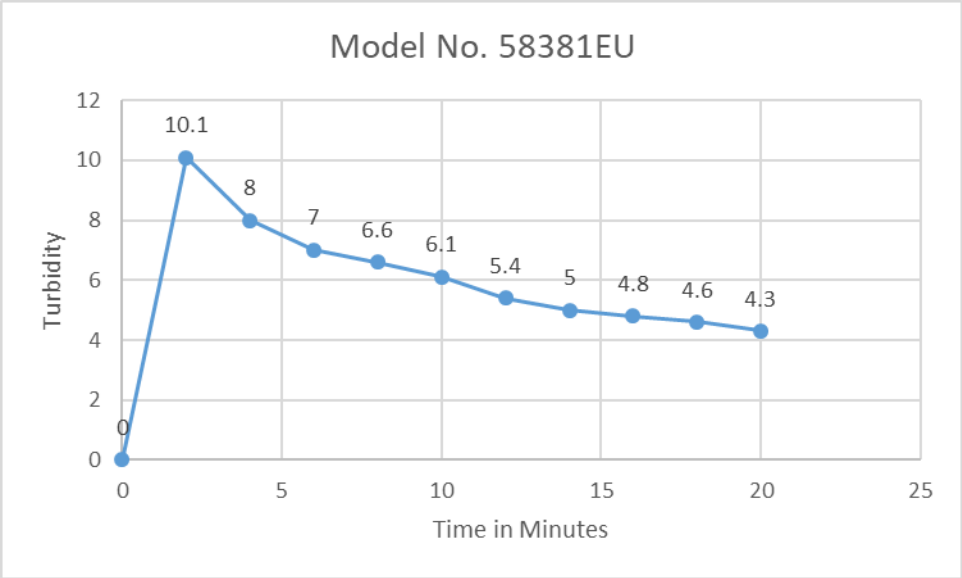
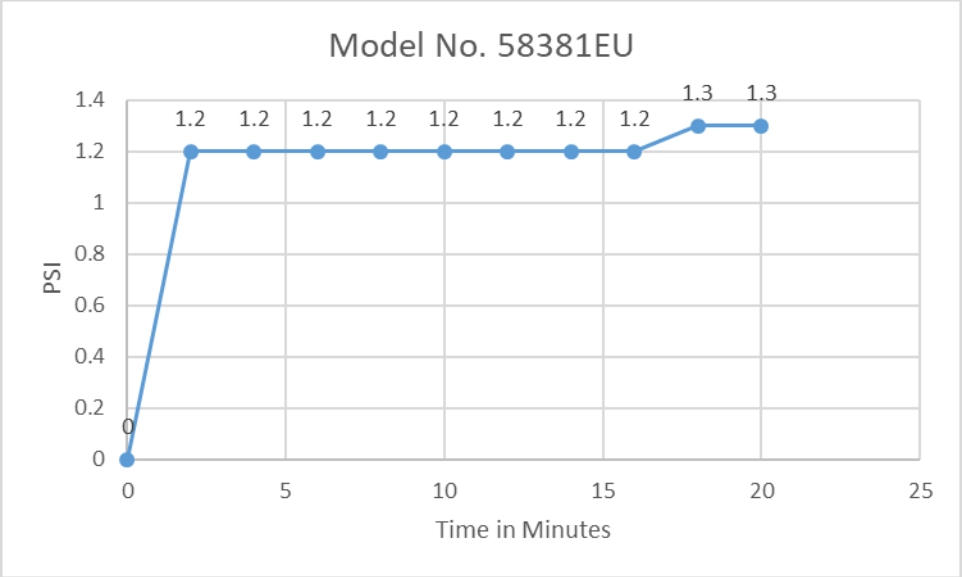


Table 8 – 7.2.4 Turbidity reduction test

Model No.	GPM	Water Temperature ©	Upstream Pressure (PSI)	Initial differential Pressure (PSI)	Final differential pressure (PSI)	Initial turbidity reading	Final turbidity reading	Was the turbidity reduction efficiency 50 % or greater
58381EU	5.2 (19.7 lpm)	23.2	0.7	0.2	0.4	10.1	4.3	Yes
58389EU	15.3 (57.91 lpm)	23.5	2.6	0.2	0.4	11.5	4.5	Yes
58391EU	30.3 (114.7 lpm)	2.34	6.2	0.2	0.3	14.3	5.9	Yes

Individual results and plot curve below.


Model No. 58381EU
Turbidity
Time in Minutes
0
10.1
8
7
6.6
6.1
5.4
5
4.8
4.6
4.3


Model No. 58381EU
PSI
Time in Minutes
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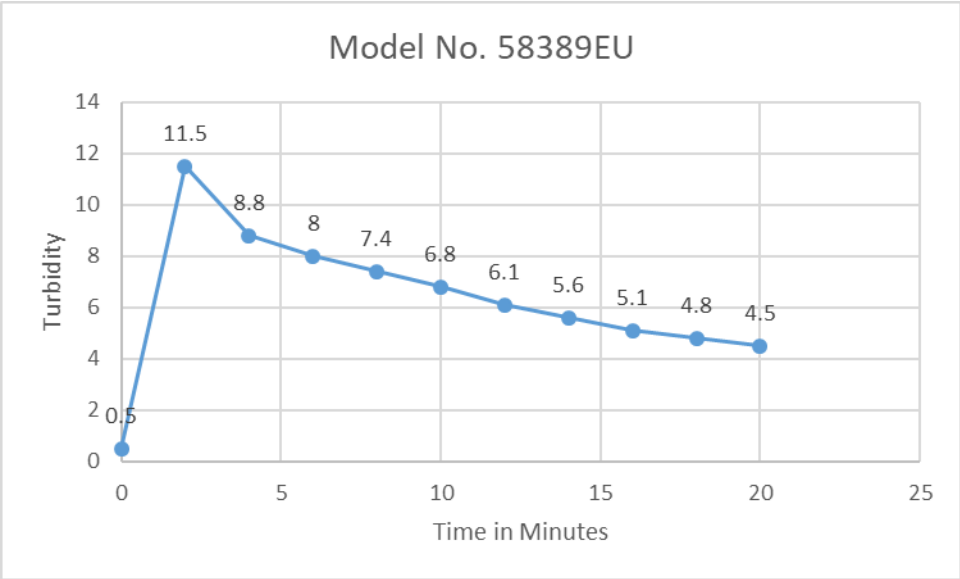
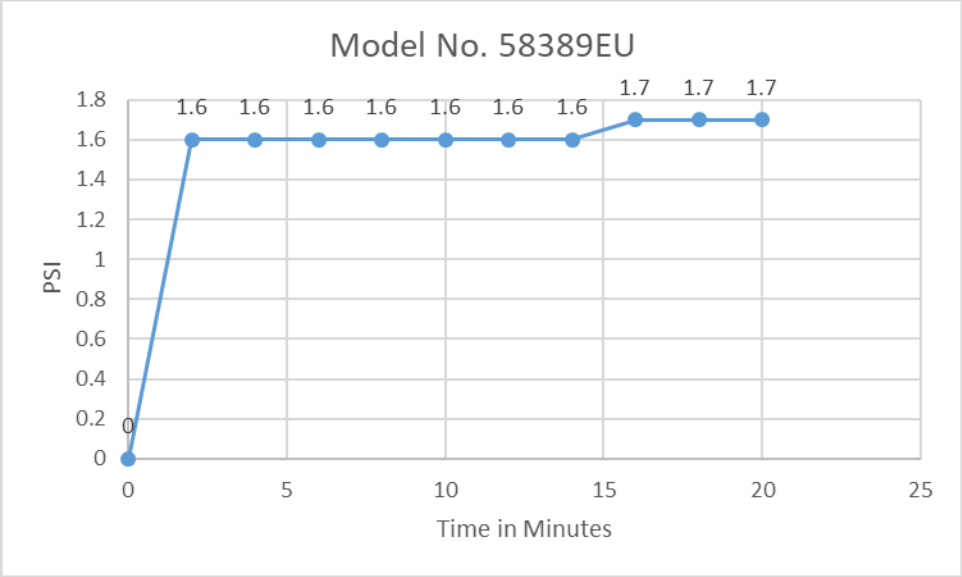
1.2
1.2
1.2
1.2
1.2
1.2
1.2
1.3
1.3


Model No. 58389EU
Turbidity
Time in Minutes
0.5
11.5
8.8
8
7.4
6.8
6.1
5.6
5.1
4.8
4.5


Model No. 58389EU
PSI
Time in Minutes
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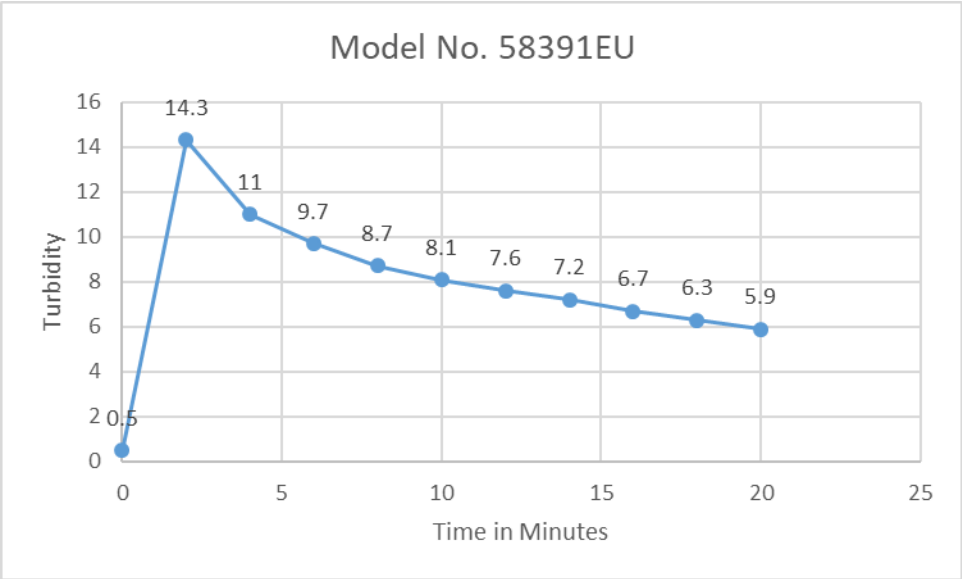
1.6
1.6
1.6
1.6
1.6
1.6
1.6
1.7
1.7
1.7


Model No. 58391EU
Turbidity
Time in Minutes
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11
9.7
8.7
8.1
7.6
7.2
6.7
6.3
5.9

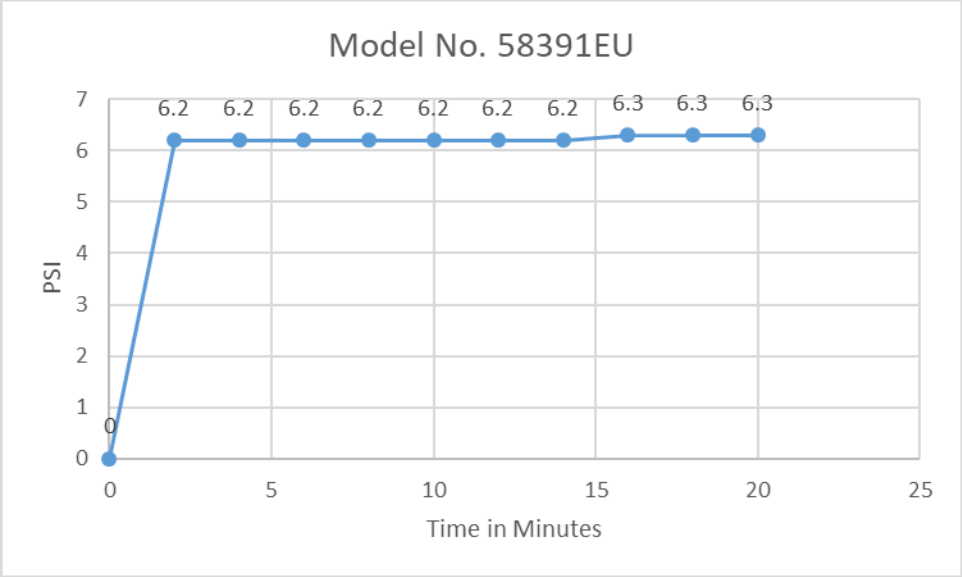
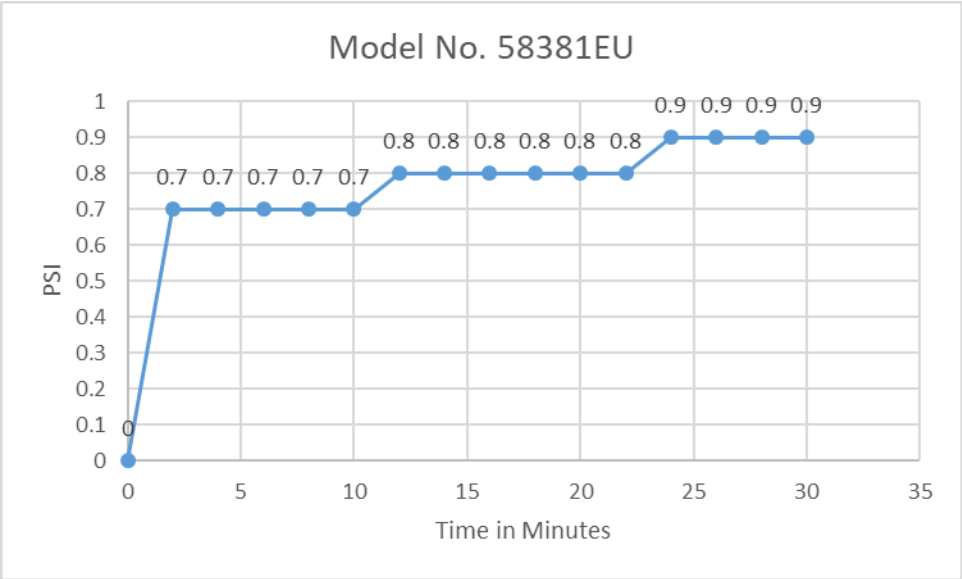
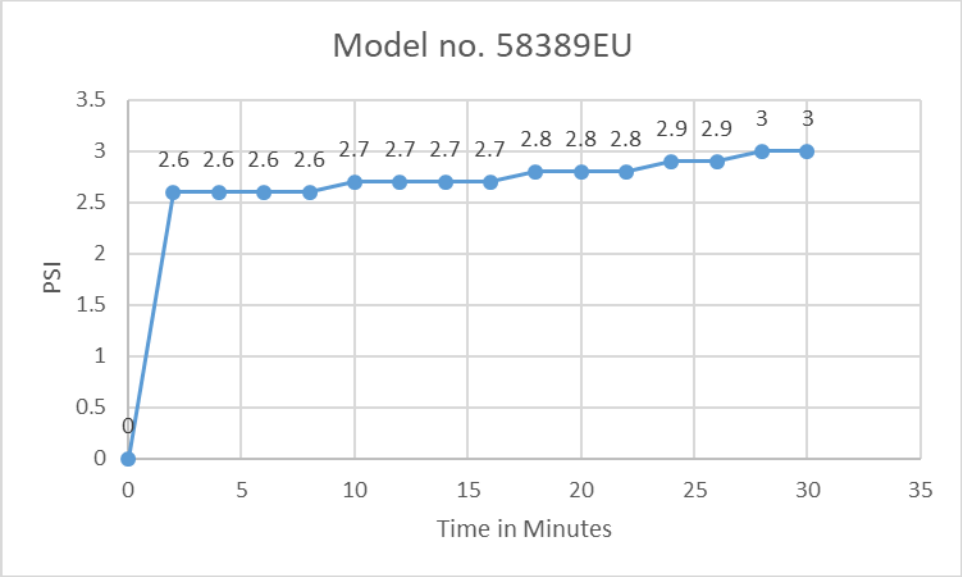

Model No. 58391EU
PSI
Time in Minutes
0
6.2
6.2
6.2
6.2
6.2
6.2
6.2
6.3
6.3
6.3

Table 9 – 7.2.5 Simplified 20 cycles retention test (dp20)

Model No.	GPM	Water Temperature (C)	Upstream Pressure (PSI)	Differential Pressure (PSI)	Final Differential Pressure (PSI)	Total Time of test
58381EU	5.2 (19.7 lpm)	23.1	0.7	0.2	0.04	30 min.
58389EU	15.3 (57.91 lpm)	23.5	2.6	0.2	0.06	30 min.
58391EU	30.3 (114.7 lpm)	23.4	6.2	0.1	0.08	30 min.

Individual curve listed below.


Model No. 58381EU
PSI
Time in Minutes
0 0.7 0.7 0.7 0.7 0.7 0.8 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9


Model no. 58389EU
PSI
Time in Minutes
0 2.6 2.6 2.6 2.6 2.7 2.7 2.7 2.7 2.8 2.8 2.8 2.9 2.9 3 3

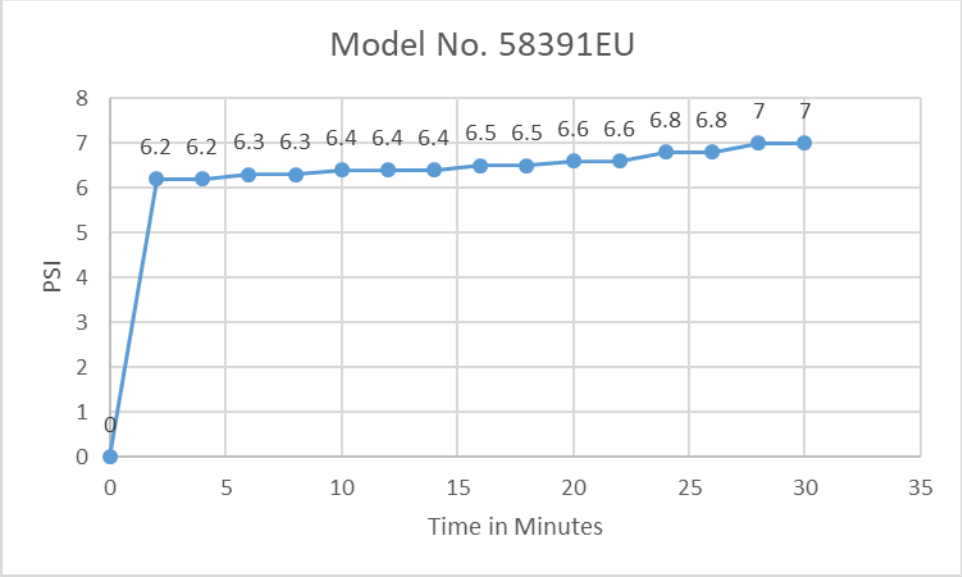

Model No. 58391EU
PSI
Time in Minutes
0 6.2 6.2 6.3 6.3 6.4 6.4 6.4 6.5 6.5 6.6 6.6 6.8 6.8 7 7

Table 10 – 7.2.5.4 Determination of the retained mass of contaminant

Model No.	GPM	Test Water Volume (in Liter)	Total Injected Mass (in Grams)	Retained Mass (in Grams)	Turbidity efficiency (in %)
58381EU	5.2 (19.7 lpm)	40.4	40.4	21.06	52.1
58389EU	15.3 (57.91 lpm)	58.9	58.9	35.58	60.4
58391EU	30.3 (114.7 lpm)	118.7	118.7	77.2	65.0

Photos of tested samples:

Model No.: 58381EU

Model No.: 58389EU

Model No.: 58391EU