



**Summary of Substantive Changes  
between the 2013 and the 2016 editions of  
NSF/ANSI 50, “Equipment for Swimming Pools, Spas, Hot Tubs  
and other Recreational Water Facilities”**

**Presented to the IAPMO Standards Review Committee on November 7, 2016**

**General:** The changes to this standard might have an impact on currently listed products. The substantive changes are:

- Moved the note for pumps not required to have a NPSH curve into the body of the standard and added requirements for multispeed and variable speed pumps (see Section 6.6 and Annex C).
- The section heading was revised and new requirements were added for the toxicology review and evaluation of swimming pool treatment chemicals (See Section 3 and New Annex R)
- Clarified life testing and other requirements for equipment that is not designed for continuous operation (see Sections 13, 14, 15, 16, 17 and Annex I)
- Changed the requirement for UV light processing equipment to indicate performance from, an effective means to alert the user when the equipment is not operating, to specify a constantly visible readout of the actual value of, flow, dose and lamp intensity (see Section 14.5).
- Added an exemption to further evaluation in accordance with Annex H for equipment demonstrating a 3-log or greater inactivation of *Cryptosporidium parvum* (see Section 14.8).
- Added requirements for devices utilized to increase or decrease the temperature of pools, spas, and other recreational waters (see New Section 22).
- Added requirements for evaluation of flow metering devices (see new Section 23 and New Annexes S and T)
- Update the testing requirements for ozone generating equipment to reflect current best practices by removing the requirement of recording dew point and O<sub>2</sub> concentration of output of the air prep equipment or ambient oxygen levels (See Annex H.3)

Section 2, Definitions: Multiple definitions were revised and new definitions were added for terms including the following:

coolant flow rate, dew point (dew-point temperature), feed gas, feed gas flow rate, ozone concentration, ozone generator cell pressure, ozone output rate, ozone short cycle or batch system, packaged ozone system, and relative humidity:

Section 3, Materials: The section heading was revised and new requirements were added for the evaluation of swimming pool treatment chemicals as follows:

3 ~~Materials~~ [Swimming pool water contact materials and swimming pool treatment chemicals](#)

3.1 ~~General~~ [Swimming pool water contact materials](#)

3.2 ~~Material formulation~~ [Swimming pool treatment chemicals](#)

[3.2.1 Formulation submission](#)

[3.2.2 Formulation review](#)

[3.2.3 Contaminant testing](#)

3.3 *Corrosion resistance*



Section 4.5 PVC Hose: Updated the referenced standard for helix or fabric reinforced flexible PVC as follows:

*Helix or fabric reinforced flexible PVC hose, for use on circulation piping in pools, hot tubs, spas, and jetted bathtub units, shall comply with the following:*

- ~~IAPMO PS 33~~ [IAPMO /ANSI Z1033](#);
- the requirements of 3; and
- Annex B, section B.1.5 after a 20,000 cycle strength test conducted in accordance with Annex B, section B.1.4.

Section 6.6 Pump performance curve: Moved the note for pumps not required to have a NPSH curve into the body of the standard and added requirements for multispeed and variable speed pumps as follows:

6.6.1 *For each pump... model or model series, the manufacturer shall provide a pump performance curve that plots the pump's total dynamic head versus the discharge flow rate. The manufacturer shall also have a curve available that plots the net positive suction head (NPSH) or total dynamic suction lift (TDSL), brake horsepower, and pump efficiency in relation to the performance curve. Pumps with a rating of 5 HP (3.7 kW) or less are not required to have a NPSH curve.*

~~NOTE~~ *Pumps with a rating of 5 HP (3.7 kW) or less are not required to have a NPSH curve.*

6.6.2 *The actual pump curve, as determined in accordance with Annex C, section C.1, shall be within a range of -3% to +5% of the total dynamic head or -5% to +5% of the flow, whichever is greater, indicated by the performance curve. Data taken above 90% full flow shall not be judged to the acceptance criteria.*

*Pumps with more than one operating speed shall be tested as documented below:*

- fixed multispeed pump or motor assemblies, test at each speed; or*
- variable speed pump or motor assemblies, test at 100%, 50%, and the lowest speed.*

Section 13, Ozone generation process equipment: Clarified the life testing, and added additional requirements for text to include in the installation requirements, and on the data plates of process equipment and generators that are not intended for continuous operation. Similar revisions were made in Sections 13, Ozone generation process equipment; 14, Ultraviolet (UV) light process equipment; 15, In-line electrolytic chlorinator or brominator process equipment; 16, Brine (batch) type electrolytic chlorine or bromine generators; and 17, Copper/silver and copper ion generators. An example of the revision is as follows:

#### *13.18 Life test*

*When tested in accordance with the life test described in Annex I, a minimum of 8000 operating hours shall be accumulated among the three units; no less than 3000 operating hours shall be accumulated on one of the three units. At the conclusion of the testing, the units with 3000 operating hours shall be evaluated to the ~~perform as intended by the manufacturer to the~~ output, pressure, and disinfection efficacy requirements of this section.*

#### *13.21 Operation and installation instructions*

*Drawings and a parts list for easy identification and ordering of replacement parts shall be furnished with each unit and shall include:*

- model number ...*



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– output rate (in lbs or kg per day or hour);

– maximum daily operation time (if not designed for continuous operation); and

– level of ...

### 13.23 Data plate

Data plate(s) shall be permanent; easy to read; and securely attached, cast, or stamped onto the unit at a location readily accessible after normal installation. Data plate(s) shall contain the following:

– manufacturer's name and contact information (address, or phone number, or website, or prime supplier)

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– maximum daily operation time (if not designed for continuous operation); and

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Section 14.5, Performance indication: Changed the requirement for UV light processing equipment to indicate performance from, an effective means to alert the user when the equipment is not operating, to specify a constantly visible readout of the actual value of, flow, dose and lamp intensity as follows: ~~The process equipment shall be provided with an effective means to alert the user when a component of this equipment is not operating.~~ Each system shall incorporate on the control panel a constantly visible readout of the actual flow (in gpm), the actual calculated dose (in mj/cm<sup>2</sup>) and the actual lamp intensity (in w/cm<sup>2</sup>).

14.8 Disinfection efficacy: Added an exemption to further evaluation in accordance with Annex H for equipment demonstrating a 3-log or greater inactivation of *Cryptosporidium parvum* as follows: *Process equipment designed for ~~supplemental~~ secondary disinfection shall demonstrate a 3-log reduction of influent bacteria when tested according to Annex H. Equipment that has been successfully evaluated to the requirements of this section to demonstrate 3-log or greater inactivation of *Cryptosporidium parvum* are exempt from the requirement of Annex H.*

The following New Sections were added:

22 Heat exchangers, heaters, coolers, and solar water heating systems

23 Flow Metering Device

Annex C, Test methods for the evaluation of centrifugal pumps: Removed the calculations and examples for establishing the pump energy efficiency performance curve including Examples Table 1 and Graph A as follows:

~~C.4 Pump curve and energy efficiency performance~~

Annex F, Test methods for the evaluation of mechanical chemical feeders



Annex F.4, Life test: Included the specification that following the life test part of the acceptance criteria includes continued conformity of suction lift and hydrostatic pressure requirements in Annex F as follows:

#### *F.4.5 Acceptance criteria*

*At least one of the three mechanical chemical feeders shall complete 3000 satisfactory operating hours, and a minimum of 8000 satisfactory operating hours shall be accumulated among the three units. At the conclusion of the testing, the units shall perform as intended by the manufacturer and shall continue to conform to the uniformity of output, suction lift, and hydrostatic pressure requirements in Annex F; ~~section F.5.~~*

Annex H, Test methods for the evaluation of process equipment

Annex H.3, Ozone production test: Update the testing requirements for ozone generating equipment to reflect current best practices by removing the requirement of recording dew point and O<sub>2</sub> concentration of output of the air prep equipment or ambient oxygen levels as follows:

#### *H.3.2.2 Gas preparation equipment*

*The feed gas for a packaged ozone generator shall be the output of the packaged gas preparation equipment. ~~The feed gas dew point and oxygen concentration shall be measured and reported. The input gas to the gas preparation equipment shall be the ambient air at the laboratory. H.3.2.3 Corona discharge ozone generators The feed gas shall be 93 ± 2% oxygen by weight with a maximum dew point of 112 °F (-80 °C), or air with a dew point of -80 °F (-62 °C) or less.~~*

*~~NOTE – Ambient oxygen concentration decreases as the elevation above sea level increases. The performance of an ozone generator that uses air as the feed gas will decrease with decreasing oxygen concentration in the feed gas. The manufacturer shall provide information about the performance of the ozone generator with feed gas oxygen concentrations different from test conditions in this Standard.~~*

#### *H.3.2.4 UV ozone generators*

*~~UV Ozone generators shall be tested under ambient air conditions at the laboratory. All test conditions (including ambient temperature, relative humidity, and elevation above sea level ambient oxygen concentration) shall be documented.~~*

*~~NOTE – Ozone production from a UV ozone generator will change as operating conditions vary from test conditions. Ozone production will decrease with higher ambient temperature, higher relative humidity, and lower oxygen concentration.~~*

#### *H.3.3 Apparatus and analytical devices*

*The test apparatus shall be set according to figure A1.*

#### *H.3.4 Ozone production procedure*

*H.3.4.1 An ozone generator shall be set up and conditioned according to the manufacturer's specifications. Prior to testing the ozone generator shall be purged using the feed gas at the design flow rate for a minimum of 2 h, or as specified by the manufacturer, ~~or until the specified dew point and oxygen concentration are achieved.~~ The generator cell pressure range shall be measured and reported. ~~1) The generator cell pressure operation range shall be specified by the manufacturer.~~ The generator cell pressure shall be reported.*

*2) The type and quality of feed gas source shall be in accordance with the manufacturer's specifications.*



Annex I, Life test: Revised to address requirements specific to units that are not designed for continuous operation.

The following New Annexes were added:

[Annex R, Toxicology review and evaluation procedures for swimming pool treatment chemicals](#)

[Annex S, Flow metering devices outdoor use](#)

[Annex T, Flow metering devices head loss](#)

**Note:**

In addition, the changes reported above a number of notes previously included in the sections of the standard contained mandatory language and were moved into the body of the standard or given a new section number, and other text that was previously mandatory but was intended to be suggestive was revised for clarification.

See Sections 2.71, 2.73, 2.74, 5.2.1.1, 5.2.2, 5.3.8, 5.4.9, 6.6.1, 9.4.2, 11.5.1, 11.7.1, 13.2, 13.4, 13.9, 14.12, 20.4.3.2.2, 20.5.2, 20.5.5.1.1, 20.5.5.1.2, 20.5.5.2.1, 20.5.5.2.4, 20.10.6, 21.1, 21.3, 21.4, Annex B, B4.4, Annex C C.3, C.2.3, C.3.3, Annex D, D.2.3, D.3.3, D.4.3, D.4.4.1, D.5.3, Annex F, F.2.3, F.3.2, F.4.3, F.5.3, F.6.3, Annex H, H.3.2.3, H.3.2.4, H.4.8.3.3.4, H.4.8.4.2.1, Annex J, J.5.1.1, Annex K, last paragraph, Annex L, Annex M, M.1.2, M.2.1, M.2.3, Annex N, N.1.2.1, N.1.2.2, N.1.2.3, Annex O, O.3, O.5, and Annex Q.