



**NSF International**  
Recreational Water Program  
Component Certification Specification  
CCS-18325

Water Conditioning Devices for  
Recreational Water Facilities

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## **NSF International Recreational Water Program Component Certification Specification for Water Conditioning Devices for Recreational Water Facilities (CCS-18325)**

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The illustrations, if provided, are intended to assist in understanding their adjacent standard requirements. However, the illustrations may not include *all* requirements for a specific product or unit, nor do they show the only method of fabricating such arrangements. Such partial drawings shall not be used to justify improper or incomplete design and construction.

Unless otherwise referenced, the annexes are not considered an integral part of NSF Standards. The annexes are provided as general guidelines to the manufacturer, regulatory agency, user, or certifying organization.



## **Scope:**

This CCS contains requirements for water conditioning devices used on recreational water facilities. A water conditioning device is intended to treat swimming pool water and improve water quality without the introduction of additional chemicals. The purpose of a water conditioning device is to assist in improving water quality but is not intended for supplemental or secondary disinfection.

### **1.0 Materials**

- 1.1 Materials shall comply with Section 3 of NSF/ANSI 50.
- 1.2 Surfaces exposed to concentrated chemical or ultraviolet light shall be resistance to use application conditions.

### **2.0 General design and construction**

- 2.1 Parts of water conditioning devices requiring cleaning and maintenance shall be accessible.
- 2.2 If circulation system components are not supplied with the installation kit the manufacturer shall provide a piping diagram, a parts list, and installation procedures.

### **3.0 Head loss**

The manufacturer shall make available a head loss claim. The actual head loss shall not exceed the claimed head loss by more than 10%.

### **4.0 Hydrostatic pressure**

Water conditioning equipment that operates under pressure shall have a minimum designed pressure rating of 50 psi, and show no evidence of rupture, leakage, burst, or permanent deformation when subject to a hydrostatic pressure 1.5 times the manufacturer's maximum operation pressure.

### **5.0 Valve and component identification**

All valves and components shall have a permanent, easily legible, and conspicuous label or tag identifying their operation.

Valves shall comply with NSF/ANSI Standard 50.

### **6.0 Performance indication**

Water conditioning devices shall be provided with a means to alert the user when a component of the equipment essential to certified performance is not operating.

If the performance of the unit is dependent on a specified water flow rate, the flow shall be provided on the data plate.



## 7.0 Operational protection

Units utilizing ultraviolet light shall be equipped with either:

- a viewing port such that the operational status of the lamp is readily viewable and a warning to disconnect electrical power before servicing; or
- an automatic mechanism for shutting off the power whenever the cover is removed.

Power to the water conditioning device shall be interrupted upon the loss of circulation flow if operation of the device without circulation flow could introduce a potential hazard to bathers or equipment.

## 8.0 Performance validation

Water conditioning equipment intended for the reduction of combined chlorine, chlorine consumption, acid consumption, turbidity, phosphate levels or filter cleaning water consumption shall be tested in accordance with Annex U.

## 9.0 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 of the unit;
- instructions for proper installation;
- operation and maintenance instructions;
- a statement of the manufacturer's warranty;
- applicable caution statements (prominently displayed);
- ventilation requirements (if applicable);
- a warning, if the potential exists for release of high dosages of substances that may endanger bathers.
- UV systems that have been certified to CCS-18325 as only a water conditioning device, and not as Ultraviolet Light Process Equipment, shall have a statement in the manual that the unit has not been certified for supplemental or secondary disinfection.
- Applicable specific water conditioning performance claim(s)
  - Reduction of combined chlorine
  - Reduction of chlorine consumption
  - Reduction of acid consumption
  - Reduction of turbidity
  - Reduction of phosphate levels
  - Reduction of filter cleaning water consumption

## 10.0 Data plate

A data plate 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 at least the following:

- equipment name/model number;



- manufacturer's name and contact information (address & phone number or website);
- electrical requirements – volts, amps and hertz (if applicable)
- serial number and/or date of manufacture;
- flow rate if applicable;
- caution statements (prominently displayed);
- UV systems shall have a prominently displayed caution statement that UV light is harmful to eyes and exposed skin and to turn off electrical supply before opening the unit;
- a statement that the unit is a water conditioning device for the applicable specific water conditioning performance claim(s)
  - o Reduction of combined chlorine
  - o Reduction of chlorine consumption
  - o Reduction of acid consumption
  - o Reduction of turbidity
  - o Reduction of phosphate levels
  - o Reduction of filter cleaning water consumption
- Certification mark attesting compliance to CCS-18325.
- Marking, labelling, and statements on the product or manuals shall not misrepresent the type of certification, performance, or function. The certification Mark shall make clear the certification is to CCS-18325.
- UV systems that have been certified to CCS-18325 as only a water conditioning device, and not as Ultraviolet Light Process Equipment, shall have a statement that the unit has not been certified for supplemental or secondary disinfection.



## Test Methods

### U.1 Water conditioning device performance validation

#### U.1.1 Purpose

The purpose of this test is to determine the effect of a water conditioning device on the chlorine consumption, acid consumption, combined chlorine level, turbidity, phosphate level, and/or filter cleaning water usage.

#### U.1.2 Apparatus

- Equipment:
  - A test tank capable of holding a volume of 10,000 gallons
  - An environment free from direct air currents on the tank surface and with a temperature of  $75 \pm 10^\circ\text{F}$
  - Circulation piping constructed of 2" schedule 40 PVC
  - A sand filter having a diameter of 18 inches, equipped with multiport valve
    - Filled with standard #20 sand and conditioned with initial backwash and rinse
  - A pump with suction within 1 foot of the tank bottom, and return 6" – 12" below the water surface
    - Capable of an increase in filter inlet pressure  $\geq 8$  psi with less than a 10% drop in flow when compared to the flow rate obtained through a clean filter
  - A mixing pump sufficient in capacity to maintain suspension of turbidity challenge media
  - A particulate dosing mechanism, equipped to introduce to the test tank crushed silica #140, Sil-Co-Sil 106 or equivalent
  - A dosing pump, equipped to inject hydrochloric acid into the circulation system for pH control
  - A dosing pump, equipped to inject sodium hypochlorite into the circulation system for chlorine control
  - A dosing pump, equipped to introduce to the test tank the following synthetic bather load:

Synthetic Bather Load Insult Stock Solution Preparation	
Chemical	Concentration (g/L)
Urea	25.1
Albumin	3.9
Creatinine	1.7
Lactic Acid	1.33 ml/L
Uric Acid	0.619 ml/L
Glucuronic Acid	0.470 ml/L
Sodium Chloride	8.873
Sodium Sulfate	14.2
Ammonium Chloride	2.8
Sodium Bicarbonate	2.7
Potassium Hydrogen Phosphate	4.6
Potassium Sulfate	4.1
Suntan Lotion	4.0 mL/L

- Instrumentation:
  - Inline flow meter, minimum accuracy of  $\pm 3\%$
  - Inline turbidimeter, minimum accuracy of  $\pm 0.5$  NTU from 0-10 NTU



- Filter inlet pressure sensor, minimum accuracy of ASME 1A
- Scale accurate to  $\pm 0.05$  lbs
- Stopwatch accurate to  $\pm 1\%$  over the test duration
- Inline electric heater
  - 12 kilowatt, with removable element for ease of cleaning and weighing, Coates Heater Company Inc, series CE, or equivalent
- Water chemistry controller, certified to NSF/ANSI 50
  - Calibrated using the manufacturer's recommended calibration procedure, within the manufacturer's recommended calibration interval
  - Capable of measuring and logging the following at a period not to exceed 2 minutes
    - pH
    - Free available chlorine
    - Total chlorine
    - Temperature (minimum accuracy of  $\pm 2^\circ\text{F}$ )
- A data acquisition system capable of measuring and logging filter inlet pressure, flow rate and turbidity at a period not to exceed 2 minutes

### U.1.3 Initial water characteristics

Temperature	82 $\pm$ 5°F
pH	7.50 $\pm$ 0.10
Free Chlorine	1.75 $\pm$ 0.25 mg/L
Turbidity	$\leq 2.0$ NTU
Alkalinity	100 $\pm$ 10mg/L as CaCO <sub>3</sub>
Hardness	250 $\pm$ 10 mg/L as CaCO <sub>3</sub>
Total Phosphates	0.3 $\pm$ 0.2 mg/L as P

*Setting the initial level of phosphates may be omitted if no phosphate reduction claim is being made*

### U.1.4 Method

1. Fill the test tank with water conditioned to the parameters specified in U.1.3
  - a. Makeup water shall be added to the tank if more than 5% of the volume is lost during testing. Makeup water added to the tank during testing shall also meet the specifications of U.1.3
2. Measure the following at the initiation of testing and once daily thereafter
  - a. Mass and pH of the hydrochloric (muriatic) acid stock solution
    - i. This data shall be used to calculate consumption of HCl
  - b. Mass and free chlorine concentration of the sodium hypochlorite stock solution
    - i. This data shall be used to calculate consumption of chlorine
  - c. Total hardness and total alkalinity of the test tank water
    - i. Hardness and alkalinity are not adjusted if they fall below the initial value specified in U.1.3
  - d. Total phosphates of the test tank water
    - i. Measurement of phosphates may be omitted from the daily measurements if no phosphate reduction claim is being made by the unit under test
3. Start the circulation and mixing pumps



- a. The flow rate of the circulation system shall be  $27.8 \pm 1$  gpm, so that a six hour turnover time is achieved
4. Start the automatic controller and data acquisition system
  - a. pH adjustments shall be made using an ON/OFF control strategy that initiates the addition of acid upon the measured pH rising to 7.60 and turning off upon the measured pH failing to 7.40
  - b. Free chlorine adjustments shall be made using an ON/OFF control strategy that initiates the addition of the sodium hypochlorite stock solution upon the measured free chlorine falling to 1.5 mg/L and turning off upon the measured free chlorine rising to 2.0 mg/L
5. Synthetic Bather Load: every six hours (i.e. once per turnover) introduce  $204 \pm 5$  mL of Synthetic Bather Load into the test tank
6. Particulate challenge dosing:
  - a. For water conditioning devices claiming a reduction of chlorine consumption, combined chlorine levels, acid consumption, phosphates, or turbidity:
    - i. At the start of the test and every twenty four hours afterwards (i.e. once per four turnovers) introduce  $475 \pm 25$  grams crushed silica #140
    - ii. Introduction of the crushed silica shall only occur if the tank turbidity is  $\leq 3$  NTU, if the tank turbidity is greater than 3 NTU, four additional turnovers shall pass before particulate challenge is added
      1. Upon completion of this test procedure through step ten, at which time the water conditioning device is installed, the particulate challenge dosing schedule for the remainder of the test shall match that used during the period prior to the installation of the water conditioning device, regardless of tank turbidity levels. This is done to provide the same quantity of particulate challenge during the test periods before and after installation of the water conditioning device.
  - b. For water conditioning devices claiming a reduction filter cleaning water usage:
    - i. Every six hours (i.e. once per turnover) introduce  $950 \pm 50$  grams crushed silica #140
  - c. Water conditioning devices claiming a reduction in filter cleaning water usage as well as a reduction of chlorine consumption, combined chlorine levels, acid consumption, phosphates, or turbidity may be tested using the particulate challenge dosing scheme listed in either 6(a) or 6 (b), however the test duration criteria listed in steps 9 and 13 must still be achieved
7. If during any portion of the testing the sand filter inlet pressure increases by 8 psi above its clean inlet pressure, all process equipment (flow, heating, chemistry control, and challenge dosing) shall be stopped and the filter shall be cleaned according to the following procedure:
  - a. Record date and time such that the amount of filtration time from the previous cleaning can be determined
  - b. Perform a cleaning cycle on the filter
    - i. Place the filter in backwash mode
    - ii. Introduce flow to the filter and record and maintain the flow at the designed backwash flow rate
    - iii. Monitor the waste line turbidity in intervals not to exceed 30 seconds, and stop flow upon the turbidity reaching  $8 \pm 2$  NTU





- iv. Record the amount of time required for the effluent turbidity to reach  $8 \pm 2$  NTU
- v. Place the filter in rinse mode, restart the system flow, and record and maintain the flow at the designed rinse flow rate
- vi. After 30 seconds, stop the system flow
- vii. Place the filter in filter mode, and restart normal operation
- viii. Calculate the total amount of water used during cleaning:
  1. Filter cleaning water usage (gallons) = backwash time (min) x backwash flow rate (gpm) + rinse time (min) x rinse flow rate (gpm)
- c. Filtration system cleaning shall not result in a system down time of more than 48 hours
8. For water conditioning devices claiming a reduction of chlorine consumption, combined chlorine levels, acid consumption, phosphates, or turbidity:
  - a. Continue testing over seven days for the purpose of baseline data gathering
9. For water conditioning devices claiming a reduction in filter cleaning water usage:
  - a. Continue testing until one backwash has been performed on the sand filter or seven days, whichever is longer, for the purpose of baseline data gathering
10. After the completion of baseline data gathering, stop circulation, rebalance the test water to the levels specified in U.1.3, and clean the sand filter
11. Install the water conditioning device under test, and repeat steps 1 through 7 with the water conditioning device operating according to the manufacturer's instructions
12. For water conditioning devices claiming a reduction of chlorine consumption, combined chlorine levels, acid consumption, phosphates, or turbidity, continue testing over seven days
13. For water conditioning devices claiming a reduction in filter cleaning water usage, continue testing until one backwash has been performed on the sand filter or seven days, whichever is longer

### U.1.5 Acceptance Criteria

For devices claiming a reduction in chlorine consumption, the mass of chlorine used during the test period shall be a minimum of 25% less than the mass of chlorine used during the baseline period.

For devices claiming a reduction in combined chlorine, the average combined chlorine in the test water measured during the test period shall be a minimum of 25%, less than the average combined chlorine in the test water measured during the baseline period.

For devices claiming a reduction in acid consumption, the mass of HCl used during the test period shall be a minimum of 25% less than the mass of HCl used during the baseline period.

For devices claiming a reduction in turbidity, the average turbidity in the test water measured during the test period shall be a minimum of 25% or 0.5 NTU, whichever is greater, less than the average turbidity in the test water measured during the baseline period.

For devices claiming a reduction in filter cleaning water usage, the volume of water used to clean the system sand filter during the test period shall be a minimum of 25% less than the volume of water used to clean the system sand filter during the baseline period. To account for



baseline and test periods of differing duration, the comparison of the volume of cleaning water used during both periods shall pro-rated.

For devices claiming a reduction in phosphates, the average total phosphate concentration in the test water measured during the test period shall be a minimum of 25% or 0.3 mg/L, whichever is greater, less than the average total phosphate concentration in the test water measured during the baseline period