

Model Aquatic Health Code

Monitoring & Testing Module CODE Sections for the First 60-day Review Posted for Public Comment on 12/12/2012

Currently Open for Public Comment that Closes on 2/10/2013

In an attempt to speed the review process along, the MAHC steering committee has decided to release MAHC draft modules prior to their being fully complete and formatted. These drafts will continue to be edited and revised while being posted for public comment. The complete versions of the drafts will also be available for public comment again when all MAHC modules are posted for final public comment. The MAHC committees appreciate your patience with the review process and commitment to this endeavor as we all seek to produce the best aquatic health code possible.

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MAHC Monitoring & Testing Module Abstract

Ensuring water and air quality is important for maintaining a safe and healthy environment for pool and spa users and operators. The Monitoring and Testing Module identifies activities and procedures that pool and spa operators should follow to proactively evaluate the water and air quality in their facilities. The Monitoring and Testing Module contains requirements for new and existing aquatics facilities that include:

- 1) Ensuring that water quality testing devices comply with existing standards.
- 2) Monitoring automated controllers and treatment systems to ensure proper functioning.
- 3) Use of dye testing to evaluate pool circulation.
- 4) Procedures for collecting water samples from in-line sample ports and from bulk pool water, including frequency and timing of sample collection.
- 5) Frequency of testing for specific water quality chemical parameters.

MAHC Monitoring & Testing Module Review Guidance

The **Model Aquatic Health Code (MAHC) Steering** (<http://www.cdc.gov/healthywater/swimming/pools/mahc/steering-committee/>) and **Technical** (<http://www.cdc.gov/healthywater/swimming/pools/mahc/technical-committee/>) **Committees** appreciate your willingness to review this draft MAHC module. Your unique perspectives and science-based suggestions will help ensure that the best available standards and practices for protecting aquatic public health are available for adoption by state and local environmental health programs.

Review Reminders:

- Please download and use the **MAHC Comment Form** (<http://www.cdc.gov/healthywater/swimming/pools/mahc/structure-content/>) to submit your detailed, succinct comments and suggested edits. Return your review form by 2/10/2013, as an email attachment to MAHC@cdc.gov.
- If part of a larger group or organization, please consolidate comments to speed the MAHC response time to public comments.
- To provide context for this module review, please consult the **MAHC Strawman Outline** (<http://www.cdc.gov/healthywater/pdf/swimming/pools/mahc/structure-content/mahc-strawman.pdf>). Section headers of related content have been included in this draft module to assist reviewers to see where each section fits into the overall MAHC structure. Additional MAHC draft modules that contain this content will be or already have been posted for your review.
- The complete draft MAHC, with all of the individual module review comments

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addressed will be posted again for a final review and comment before MAHC publication. This will enable reviewers to review modules in the context of other modules and sections that may not have been possible during the initial individual module review.

- The published MAHC will be regularly updated through a collaborative all-stakeholder process.

Please address any questions you may have about MAHC or the review process to MAHC@cdc.gov. You may also request to be on the direct email list for alerts (“Get Email Updates” is in a box on the right hand side of the Healthy Swimming website at www.cdc.gov/healthyswimming) on the other draft MAHC modules as they are released for public comment.

Thank you again, and we look forward to your help in this endeavor.
Sincerely,

Douglas C. Sackett, Director
MAHC Steering Committee

The Monitoring & Testing Code Module shows a Table of Contents giving the context of the Monitoring & Testing Design, Construction, Operation and Maintenance in the overall Model Aquatic Health Code's Strawman Outline (<http://www.cdc.gov/healthywater/pdf/swimming/pools/mahc/structure-content/mahc-strawman.pdf>).

Reviewer Note on Module Section Numbering:

Please use the specific section numbers to make your comments on this Draft Model Aquatic Health Code module. These numbers may eventually change during the editing of the compiled Draft that will be issued for a final round of comments.

**MAHC “Strawman”
Table of Contents (4.0 – 6.0 show proposed structure)**

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| 4.0 | Design Standards and Construction |
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- 8.0 Annexes
- 9.0 Summary of Changes

4.0 Design Standards and Construction

- 4.1 Plan Submittal
 - 4.2 Materials
 - 4.3 Equipment Standards
 - 4.4 Pool Operation and Facility Maintenance [N/A]
 - 4.5 Pool Structure (Shell)
 - 4.6 Indoor/Outdoor Environment
 - 4.7 Recirculation and Water Treatment**
 - 4.8 Decks and Equipment
 - 4.9 Filter/Equipment Room
 - 4.10 Hygiene Facilities (Bathhouse)
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-
- 4.7 Recirculation and Water Treatment
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5.0 Operation and Maintenance

- 5.1 Plan Submittal [N/A]
- 5.2 Materials [N/A]
- 5.3 Equipment Standards [N/A]
- 5.4 Pool Operation and Facility Maintenance
- 5.5 Pool Structure (Shell)
- 5.6 Indoor/Outdoor Environment
- 5.7 Recirculation and Water Treatment**
- 5.8 Decks and Equipment
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- 5.10 Hygiene Facilities (Bathhouse)
- 5.11 Water Supply/Wastewater Disposal

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5.12 Specific Venues - Special Requirements

- 5.7 Recirculation and Water Treatment**
 - 5.7.1 Recirculation Systems and Equipment
 - 5.7.2 Filtration
 - 5.7.3 Disinfection**
 - 5.7.3.1 Testing**
 - 5.7.3.2 Water Quality Testing Devices and Kits**
 - 5.7.3.3 Automated Controllers**
 - 5.7.4 Water Sample Collection for Routine Monitoring
 - 5.7.5 Water Quality Chemical Testing Frequency
 - 5.7.6 Water Clarity

Acronyms in this Module:

| | |
|------|---|
| NRTL | Nationally Recognized Testing Laboratory |
| OEM | Original Equipment Manufacturer |
| ORP | Oxidation-Reduction Potential |
| OSHA | Occupational Safety and Health Administration |
| SI | Saturation Index |
| UVT | UV Transmissivity |
| WQTD | Water Quality Testing Device |

Glossary Terms in this Module:

“**Automated controller**” means a system of at least one chemical probe, a controller, and auxiliary or integrated component that senses the level of one or more water parameters and provides a signal to other equipment to maintain the parameters within a user-established range.

“**Manual Sanitizer Feed System**” means a sanitizer delivered by a flow through erosion feeder or metering pump without an automated controller.

“**Monitoring**” is the regular and purposeful observation and checking of systems or facilities and recording of data, including system alerts, excursions from acceptable ranges, and other facility issues. Monitoring includes human or electronic means.

“**Nationally Recognized Testing Laboratory**” means a testing facility recognized by ANSI as an organization that provides third party product safety testing and certification services to manufacturers.

“**Oxidation-reduction potential**” means a measure of the tendency for a solution to either gain or lose electrons; higher (more positive) reduction potential indicates a more oxidative solution

“Saturation Index” means a mathematical representation or scale representing the ability of water to deposit calcium carbonate, or dissolve metal, concrete or grout.

“UV transmissivity” means the percentage measurement of ultraviolet light able to pass through a solution.

“Water Quality Testing Device” means a product designed to measure the level of a parameter. A WQTD includes a device or method to provide a visual indication of a parameter level, and may include one or more reagents and accessory items.

Preface: *This document does not address all health and safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to each use.*

DRAFT

**Model Aquatic Health Code
Monitoring & Testing Module Code
4.0 Design and Construction**

| Keyword | Section | Code | Grade |
|--|------------------|---|-------|
| | 4.0 | Design Standards and Construction | |
| | 4.1 | Plan Submittal | |
| | 4.2 | Materials | |
| | 4.3 | Equipment Standards | |
| | 4.4 | Pool Operation and Facility Maintenance | |
| | 4.5 | Pool Structure | |
| | 4.6 | Indoor/Outdoor Environment | |
| | 4.7 | Recirculation and Water Treatment | |
| | 4.7.1 | Recirculation Systems and Equipment | |
| | 4.7.2 | Filtration | |
| | 4.7.3 | Disinfection | |
| | 4.7.3.1 | <i>Oxidants</i> | |
| | 4.7.3.2 | <i>Stabilizers</i> | |
| | 4.7.3.3 | <i>Supplemental/Other</i> | |
| | 4.7.3.4 | <i>pH</i> | |
| | 4.7.3.5 | <i>Levels</i> | |
| | 4.7.3.6 | <i>Feed Equipment</i> | |
| <i>Water Quality Testing Devices</i> | 4.7.3.7 | <i>Water Quality Testing Devices and Kits</i> | |
| <i>Certification</i> | 4.7.3.7.1 | Conformity with NSF/ANSI Standard 50 shall be evidenced by the certification, listing, and/or testing by a third party Nationally Recognized Testing Laboratory (NRTL). | |
| <i>Water Clarity Device</i> | | <i>Note: For info regarding water clarity devices, refer to MAHC Section 5.7.6.</i> | |
| <i>Automated Controllers</i> | 4.7.3.8 | <i>Automated Controllers</i> | |
| <i>Comply</i> | 4.7.3.8.1 | Automated controllers shall comply with the most recent requirements of NSF/ANSI Standard 50. | |
| <i>Certification</i> | 4.7.3.8.2 | Conformity with NSF/ANSI Standard 50 shall be evidenced by the certification, listing, and/or testing by a third party NRTL. | |
| <i>Microbiological Testing Equipment</i> | 4.7.3.9 | <i>Microbiological Testing Equipment</i> | |
| <i>EPA-Approved</i> | 4.7.3.9.1 | Microbiological testing equipment and methods shall be EPA-Approved or conforming to Standard Methods. | |

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| <i>Keyword</i> | <i>Section</i> | <i>Code</i> | <i>Grade</i> |
|---|-----------------|---|--------------|
| <i>Filtration and Water Treatment Equipment</i> | 4.7.3.10 | <i>Filtration and Water Treatment Equipment</i> | |
| <i>Comply</i> | 4.7.3.10.1 | Circulation and sanitation equipment shall comply with the most recent requirements of NSF/ANSI Standard 50. | |
| <i>Certification</i> | 4.7.3.10.1.1 | Conformity with NSF/ANSI Standard 50 shall be evidenced by the certification, listing, and/or testing by a third party NRTL. | |
| <i>Ozone Monitored</i> | 4.7.3.10.2 | Ozone Systems shall be capable of being monitored at a frequency consistent with MAHC Table 5.7.3.3.5. | |
| <i>Ozone Fault Detections</i> | 4.7.3.10.2.1 | Ozone system fault detections shall be tied into the operation of the ozone system. | |
| <i>Shut Down</i> | 4.7.3.10.2.2 | Any fault shall shut down the ozone generator and display the fault for the operator to observe. | |
| <i>Alarm</i> | 4.7.3.10.2.3 | Ozone systems shall be equipped with a low-ORP alarm. | |
| <i>Indoor</i> | 4.7.3.10.2.4 | For indoor installations, ozone systems shall be equipped with an ozone off-gas alarm (i.e., ambient gaseous ozone monitor). | |
| <i>Recommendations</i> | 4.7.3.10.2.5 | Manufacturer's recommendations shall be followed to place ozone monitors. | |
| <i>UV Systems</i> | 4.7.3.10.3 | To ensure proper functioning, UV systems shall be capable of being monitored at a frequency consistent with MAHC Table 5.7.3.3.6. | |

Model Aquatic Health Code Monitoring & Testing Module 5.0 Operation and Maintenance

| Keyword | Section | Code | Grade |
|--|----------------|---|-------|
| | 5.0 | Operation and Maintenance | |
| | 5.1 | Plan Submittal | |
| | 5.2 | Materials | |
| | 5.3 | Equipment Standards | |
| | 5.4 | Pool Operation and Facility Maintenance | |
| | 5.5 | Pool Structure | |
| | 5.6 | Indoor/Outdoor Environment | |
| | 5.7 | Recirculation and Water Treatment | |
| | 5.7.1 | Recirculation Systems and Equipment | |
| | 5.7.2 | Filtration | |
| | 5.7.3 | Disinfection | |
| <i>Testing</i> | 5.7.3.1 | Testing | |
| <i>Dye Testing</i> | | <i>NOTE: Dye testing shall be conducted in accordance with parameters outlined in MAHC Recirculation and Filtration Module. Language still under development.</i> | |
| <i>Copper/ Silver Systems</i> | 5.7.3.1.2 | Copper/Silver systems shall be tested for copper at the appropriate frequency and methodology approved by manufacturer. | |
| <i>Copper Concentrations</i> | 5.7.3.1.2.1 | Copper concentrations in the water shall not exceed EPA drinking water standards. | |
| <i>Water Quality Testing Devices</i> | 5.7.3.2 | Water Quality Testing Devices and Kits | |
| <i>Available</i> | 5.7.3.2.1 | Water Quality Testing Devices (WQTDs) shall be available on site. | |
| <i>Expiration Dates</i> | 5.7.3.2.1.1 | WQTDs utilizing reagents shall be checked for expiration at every use. | |
| <i>Store</i> | 5.7.3.2.2 | WQTDs shall be stored in accordance with manufacturer's instructions. | |
| <i>Temperature</i> | 5.7.3.2.3 | Chemical testing reagents shall be maintained at proper manufacturer specified temperatures. | |
| <i>Calibration</i> | 5.7.3.2.4 | WQTDs that require calibration shall be calibrated in | |

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Keyword
UV System
Monitoring
and
Calibration
Frequency

Section

Code

Grade

| <i>Parameter</i> | <i>Monitoring Frequency</i> | <i>Recording Frequency</i> |
|---|----------------------------------|----------------------------|
| Power Draw | Continuous | Every 4 hours |
| Flow rate | Continuous | Every 4 hours |
| Set-Point Intensity | Continuous | Every 4 hours |
| Water Temperature (MP Medium Pressure) | Continuous | Daily |
| UV Lamp On/Off Cycles | Continuous | Weekly (Total cycles/week) |
| Iron, Calcium hardness | Weekly (if fouling is prevalent) | Weekly |
| UVT (UV Transmittance) Analyzer Calibration | Weekly | Weekly |
| Calibration of Intensity | Annual | At time of calibration |
| Calibration of Flow Meter | Per manufacturer's requirements | At time of calibration |

Water Sample Collection In-Line Sample port

5.7.4 Water Sample Collection for Routine Monitoring

5.7.4.1 The pool operator shall acquire a water sample for testing from the in-line sample port when available.

Same Volume

5.7.4.1.1 If an aquatic venue has more than one recirculation system, the same sample volume shall be collected from each in-line sample port and tested separately.

No Port

5.7.4.1.2 If no in-line sample port is available, the pool operator shall

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| | | acquire water samples from the pool according to MAHC Section 5.7.4.3. | |
| <i>Routine Samples</i> | 5.7.4.2 | If routine samples are collected from in-line sample ports, the pool operator shall also acquire water samples from the bulk water of the pool at least once per day. | |
| <i>Midday Collection</i> | 5.7.4.2.1 | Daily bulk water samples shall be collected in the middle of the pool operational day, according to the procedures in MAHC Section 5.7.4.3. | |
| <i>Compared</i> | 5.7.4.2.2 | Water quality data from these pool samples shall be compared to data obtained from in-line port samples to assess potential water quality variability in the pool. | |
| <i>Bulk Water Sample</i> | 5.7.4.3 | The pool operator shall use the following procedure outlined in MAHC sections 5.7.4.3.1 to 5.7.4.3.5 for acquiring a water sample from bulk water of the pool. | |
| <i>Below Surface</i> | 5.7.4.3.1 | All samples shall be obtained from at least 18 inches (45.7 cm) below the surface of the water. | |
| <i>Water Depth</i> | 5.7.4.3.2 | The sample shall be obtained from a section of the pool that has a water depth of between 3 to 4 feet (91.4 cm to 1.22 m) when available. | |
| <i>Between Inlets</i> | 5.7.4.3.3 | The sample shall be obtained from a location between water inlets. | |
| <i>Rotate</i> | 5.7.4.3.4 | For each water test, sampling locations shall rotate around the shallower end of the pool. | |
| <i>Deepest Area</i> | 5.7.4.3.5 | The pool operator shall include the deepest area of the pool in the water sampling rotation once per week. | |
| <i>Testing Frequency</i> | 5.7.5 | Water Quality Chemical Testing Frequency | |
| <i>Chemical Levels</i> | 5.7.5.1 | Free available chlorine (FAC), combined available chlorine (CAC), or total bromine (TB), and pH shall be tested at all pools prior to opening each day. | |
| <i>Manual Sanitizer Feed System</i> | 5.7.5.2 | FAC or TB and pH shall be tested prior to opening to the public and every two hours at all pools using a MANUAL SANITIZER FEED SYSTEM. | |
| <i>Automatic Sanitizer</i> | 5.7.5.3 | FAC (or TB) and pH shall be tested prior to opening and | |

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| Keyword | Section | Code | Grade |
|------------------------|--------------|--|-------|
| Feed System | | | |
| | | every four hours at all pools using an automated sanitizer feed system. | |
| In-Line ORP Readings | 5.7.5.4 | In-line ORP readings shall be recorded at the same time the FAC (or TB) and pH tests are performed. | |
| Total Alkalinity | 5.7.5.5 | Total Alkalinity (TA) shall be tested weekly at all pools. | |
| Calcium Hardness | 5.7.5.6 | Calcium hardness shall be tested monthly at all pools. | |
| Cyanuric Acid | 5.7.5.7 | Cyanuric acid shall be tested monthly at all pools utilizing cyanuric acid. | |
| Tested | 5.7.5.7.1 | Cyanuric acid shall be tested 24 hours after the addition of cyanuric acid to the aquatic venue. | |
| Stabilized Chlorine | 5.7.5.7.2 | If the pool utilizes stabilized chlorine as its primary sanitizer the operator shall test cyanuric acid every two weeks. | |
| Total Dissolved Solids | 5.7.5.8 | Total dissolved solids (TDS) shall be tested quarterly at all pools. | |
| Water Temperature | 5.7.5.9 | For spas or hot tubs, water temperature shall be recorded at the same time the FAC (or TB) and pH tests are performed. | |
| Salt | 5.7.5.10 | If in-line electrolytic chlorinators are used, salt levels shall be tested at least weekly or per manufacturer's instructions. | |
| Water Clarity | 5.7.6 | Water Clarity | |
| Reference Point | 5.7.6.1 | All pools shall comply with either MAHC Section 5.7.6.1.1 to serve as a reference point for assessing adequate water clarity. | |
| Marker Tile | 5.7.6.1.1 | A 4-square-inch (10.2 cm ²) marker tile in a contrasting color to the pool surface shall be located at the deepest part of the pool. | |
| Visible | 5.7.6.2 | This reference point shall be visible at all times. | |