

## MAHC Draft Module ID – 6.1-07272010 – Operator Training

The [Model Aquatic Health Code \(MAHC\) Steering and Technical 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 Draft Review Form](#) to submit your detailed, succinct comments. Return your review form by **September 30, 2010**, as an email attachment to [MAHC@cdc.gov](mailto:MAHC@cdc.gov).
- To provide context for this module review, please consult the [MAHC Project Outline](#) and [MAHC Strawman](#). Section headers of related content have been included in this draft module to assist reviewers 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 addressed, will be posted again for a final review and comment before MAHC publication.
- 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](mailto:MAHC@cdc.gov). You may also request to be on the direct email list for alerts the other draft MAHC modules as they are released for comment.

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

Sincerely,

Douglas C. Sackett, Director  
MAHC Steering Committee

## Model Aquatic Health Code

### 6.0 Policies and Management

Key word	Section	CODE	Grade
	6.0	Policies and Management	
	6.1	Operator Training	
	6.1.1	Operator Qualifications and Certification	B
<i>Qualifications</i>	6.1.1.1	A QUALIFIED OPERATOR shall have completed an operator training course that is recognized by the HEALTH AUTHORITY.	
<i>Training Documentation</i>	6.1.1.2	A QUALIFIED OPERATOR shall have a current certificate or written documentation acceptable to the HEALTH AUTHORITY showing completion of an operator training course.	
<i>Certificate Available</i>	6.1.1.3	Originals or copies of such certificate or documentation shall be available on site for inspection by the HEALTH AUTHORITY for each QUALIFIED OPERATOR employed at or contracted by the site, as specified in this code.	
	6.1.2	Essential Topics in Qualified Operator Training Courses	
<i>Operator Training Course Content</i>	6.1.2.1	All operator training courses recognized by the HEALTH AUTHORITY shall include, at a minimum, the following teaching elements: <ol style="list-style-type: none"> <li>1) Water DISINFECTION</li> <li>2) Water Chemistry</li> <li>3) Mechanical Systems</li> <li>4) Health and Safety</li> <li>5) Operations.</li> </ol>	

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**6.1.2.1.1 Water Disinfection**

B

*Water  
Disinfection*

Course work for water DISINFECTION shall include:

- 1) Disinfectants
- 2) Contact Time (CT) Values
- 3) Bromine
- 4) CHLORINE
- 5) Cyanuric Acid (CYA)
- 6) BREAKPOINT/SUPERCHLORINATION
- 7) HYPERCHLORINATION
- 8) Combined Chlorine
- 9) SECONDARY DISINFECTION
- 10) SUPPLEMENTAL DISINFECTION

*Disinfectants*

6.1.2.1.1.1

Disinfectant types including:

- 1) Descriptions of different types of disinfectants,
- 2) Their unique physical (e.g., shape or state [solid, liquid, or gas]) and chemical properties (e.g., how it reacts with acids or bases),
- 3) How they disinfect and impact water chemistry and monitoring systems,
- 4) How to calculate dosing,
- 5) How they are used safely, and
- 6) The advantages or disadvantages of using each disinfectant.

*CT VALUES*

6.1.2.1.1.2

CONTACT TIME (CT) VALUES including:

- 1) How to calculate the amount of time needed to inactivate PATHOGENS at a given concentration of a disinfectant, and
- 2) The importance and reasons for maintaining appropriate water PH and temperature.

*Bromine*

6.1.2.1.1.3

Bromine including:

- 1) Definition of bromine as an element,
- 2) Its use as a residual disinfectant and oxidizer in water,
- 3) Bromine chemistry, and
- 4) The DISINFECTION role of hypobromous acid.

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<i>CHLORINE</i>	6.1.2.1.1.4	CHLORINE including: <ol style="list-style-type: none"><li>1) Definition of CHLORINE as an element,</li><li>2) Its use as a residual disinfectant and oxidizer in water,</li><li>3) CHLORINE chemistry and the role of pH,</li><li>4) The DISINFECTION role of hypochlorous acid,</li><li>5) Unstabilized products (sodium hypochlorite, calcium hypochlorite, lithium hypochlorite, and CHLORINE gas),</li><li>6) Stabilized products (sodium dichloro-s-triazinetriene and sodium trichloro-s-triazinetriene),</li><li>7) Safe chemical handling, and</li><li>8) On-site CHLORINE generation.</li></ol>
<i>Cyanuric Acid</i>	6.1.2.1.1.5	Cyanuric acid (CYA) including reasons for use and recommended concentrations.
<i>BREAKPOINT/ SUPER- CHLORINATION</i>	6.1.2.1.1.6	BREAKPOINT CHLORINATION including how to achieve it through calculation of chemical dosing to reach the desired free CHLORINE level and its relationship to reducing and controlling formation of combined chlorine.
<i>HYPER- CHLORINATION</i>	6.1.2.1.1.7	HYPERCHLORINATION including procedures for implementation of FECAL/Vomit/Blood Contamination Response.
<i>Combined CHLORINE</i>	6.1.2.1.1.8	Combined CHLORINE including: <ol style="list-style-type: none"><li>1) How different combined CHLORINE and DISINFECTION by-products are formed in the water and air,</li><li>2) The maximum acceptable level of combined CHLORINE,</li><li>3) How methods such as water replacement, BREAKPOINT CHLORINATION, ultraviolet light, ozone, and ventilation can reduce combined CHLORINE level,</li><li>4) The advantages and disadvantages of each, and</li><li>5) Possible health effects of combined CHLORINE products in the air.</li></ol>

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<i>SECONDARY DISINFECTION</i>	6.1.2.1.1.9	<p>SECONDARY DISINFECTION including:</p> <ol style="list-style-type: none"> <li>1) How ozone and ultraviolet disinfectants are used in conjunction with residual disinfectants to inactivate PATHOGENS, and</li> <li>2) Sizing guidelines/dosing calculations, safe use, and advantages and disadvantages of each method.</li> </ol>
<i>SUPPLEMENTAL DISINFECTION</i>	6.1.2.1.1.10	SUPPLEMENTAL DISINFECTION including other disinfection chemicals or systems on the market and their effectiveness in water treatment.
	<b>6.1.2.1.2</b>	<b>Water Chemistry</b>
<i>Water Chemistry</i>		<p>Course work for water chemistry shall include:</p> <ol style="list-style-type: none"> <li>1) Source Water</li> <li>2) Water Balance</li> <li>3) Saturation Index</li> <li>4) Water Clarity</li> <li>5) pH</li> <li>6) Total Alkalinity</li> <li>7) Calcium Hardness</li> <li>8) Water Temperature</li> <li>9) Total Dissolved Solids</li> </ol>
<i>Source Water</i>	6.1.2.1.2.1	Source water including requirements for supply and pre-treatment.
<i>Water Balance</i>	6.1.2.1.2.2	<p>Water balance including:</p> <ol style="list-style-type: none"> <li>1) Effect of unbalanced water on DISINFECTION, AQUATIC VENUE surfaces, mechanical equipment, and fixtures, and</li> <li>2) Details of water balance including pH, total alkalinity, calcium hardness, temperature, and total dissolved solids (TDS).</li> </ol>
<i>Saturation Index</i>	6.1.2.1.2.3	Saturation index including calculations, ideal values, and effects of values which are too low or too high.

- Water Clarity* 6.1.2.1.2.4 Water clarity including:
- 1) Causes of poor water clarity,
  - 2) Maintenance of good water clarity, and
  - 3) Closure requirements when water clarity is poor.
- PH* 6.1.2.1.2.5 PH including:
- 1) How PH is a measure of the concentration of hydrogen ions in water,
  - 2) Effects of high and low PH on patrons and equipment,
  - 3) Ideal PH range for patrons and equipment,
  - 4) factors that affect PH,
  - 5) How PH affects disinfectant efficacy, and
  - 6) How to decrease and increase PH.
- Total Alkalinity* 6.1.2.1.2.6 Total alkalinity including:
- 1) How total alkalinity relates to PH,
  - 2) Effects of low and high total alkalinity,
  - 3) Factors that affect total alkalinity,
  - 4) Ideal total alkalinity range, and
  - 5) How to increase or decrease total alkalinity.
- Calcium Hardness* 6.1.2.1.2.7 Calcium hardness including:
- 1) Why water naturally contains calcium,
  - 2) How calcium hardness relates to total hardness and temperature,
  - 3) Effects of low and high calcium hardness,
  - 4) Factors that affect calcium hardness,
  - 5) Ideal calcium hardness range, and
  - 6) How to increase or decrease calcium hardness.
- Temperature* 6.1.2.1.2.8 Water temperature including:
- 1) How low and high water temperatures increase the likelihood of corrosion and scaling, respectively, and
  - 2) Its effect on DISINFECTION, its health effects, and other operational considerations,
  - 3) Its health effects, and

## 4) Other operational considerations.

*Total Dissolved Solids* 6.1.2.1.2.9

Total dissolved solids (TDS) including:

- 1) Why the concentration of TDS increases over time,
- 2) Association with conductivity and organic CONTAMINANTS, and
- 3) Key TDS levels as they relate to starting up an AQUATIC FACILITY and galvanic corrosion.

*Water Treatment Systems*

6.1.2.1.2.10 Water treatment systems including:

- 1) Descriptions of system use, monitoring, calibration and maintenance of automatic controllers,
- 2) Descriptions of common types of liquid, dry chemical, and gas mechanical feeders,
- 3) CHLORINE and ozone generators,
- 4) Ultraviolet systems,
- 5) Unique features of feeders, generators, and systems,
- 6) How to generally operate and maintain them, and
- 7) Advantages and disadvantages of different feeders, ultraviolet systems, and ozonator types.

*Water Testing* 6.1.2.1.2.11

Water testing including:

- 1) How different methods (including but not limited to colormetric, titrimetric, turbidimetric and electronic) test water to determine free available and total CHLORINE, free available and total bromine, PH, total alkalinity, calcium hardness, temperature, TDS, CYA, metals, and any other tests (including but not limited to salt concentrations, phosphates, nitrates, and potassium monopersulfate),
- 2) The advantages and disadvantages of each method,
- 3) How to maintain testing equipment,
- 4) How to collect water samples,
- 5) How to perform and interpret tests,

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- 6) How frequently to test,
- 7) The steps of the dilution method, and
- 8) How to calculate combined CHLORINE levels.

**6.1.2.1.3 Mechanical Systems**

**B**

*Mechanical Systems*

Course work for mechanical systems shall include:

- 1) Calculations
- 2) Circulation
- 3) Main Drains
- 4) Gutters and Surface Skimmers
- 5) Mechanical System Balance
- 6) Circulation Pump and Motor
- 7) Valve
- 8) Return Inlets
- 9) Filtration
- 10) Filter Backwashing/Cleaning

*Calculations*

6.1.2.1.3.1

Calculations including:

- 1) Explanations of why particular calculations are important,
- 2) How to convert units of measurement within and between the English and metric systems,
- 3) How to determine the surface area of regularly and irregularly shape POOLS,
- 4) How to determine the water volume of regularly and irregularly shaped POOLS, and
- 5) Why proper sizing of filters, pumps, and pipes is important.

*Circulation*

6.1.2.1.3.2

Circulation including:

- 1) Why circulation is needed,
- 2) Factors that affect water flow,
- 3) How direct suction and overflow systems work,
- 4) How to calculate turnover and flow rates,
- 5) How the following components of the circulation system relate to each other: main drains, gutters and surface skimmers, circulation pump and motor, valves, and return inlets,

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- 6) How to read flow meters,
- 7) How to safely operate pressurized systems after the pump,
- 8) Information on dye testing,
- 9) An understanding of total dynamic head (TDH),
- 10) How it is calculated,
- 11) How it is field-determined using vacuum and pressure gauges, and
- 12) Its effect on pump flow.

*Main Drains*      6.1.2.1.3.3      Main drains including:

- 1) A description of the role of main drains,
- 2) Why they should not be resized without engineering and public health consultation,
- 3) The importance of daily inspection of structural integrity, and
- 4) Discussion on balancing the need to maximize surface water flow while minimizing the likelihood of entrapment.

*Gutters &  
Surface  
Skimmers*

6.1.2.1.3.4      Gutters and surface skimmers including:

- 1) Why it is important to collect surface water,
- 2) A description of different gutter types (at a minimum: scum, surge, and rim-flow),
- 3) How each type generally works,
- 4) The advantages and disadvantages of each, and
- 5) Description of the components of skimmers (e.g., weir, basket, and equalizer assembly) and their respective roles.

*Mechanical  
System Balance*

6.1.2.1.3.5      Mechanical system balance including:

- 1) An understanding of mechanical system balancing,
- 2) Methodology for setting proper operational water levels,
- 3) Basic hydraulics which affect proper functioning of the balance tank and POOL,
- 4) Methods of setting and adjusting modulation valves,
- 5) Balance lines,

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- 6) Skimmers,
- 7) Main drains, and
- 8) The operation of the water make-up system.

*Circulation  
Pump & Motor*

6.1.2.1.3.6 Circulation pump and motor including:

- 1) Descriptions of the role of the pump and motor,
- 2) Self-priming and flooded suction pumps,
- 3) Key components of a pump and how they work together,
- 4) Cavitation,
- 5) Possible causes of cavitation, and
- 6) Troubleshooting problems with the pump and motor.

*Valves*

6.1.2.1.3.7

Valves including descriptions of different types of valves (e.g., gate, ball, butterfly/wafer, multi-port, globe, modulating/ automatic, and check) and their safe operation.

*Return Inlets*

6.1.2.1.3.8

Return inlets including a description of the role of return inlets and the importance of replacing fittings with those that meet original specifications.

*Filtration*

6.1.2.1.3.9

Filtration including:

- 1) Why filtration is needed,
- 2) A description of pressure and vacuum filters and different types of filter media,
- 3) How to calculate filter surface area,
- 4) How to read pressure gauges,
- 5) A general description of sand, cartridge, and diatomaceous earth filters and alternative filter media types,
- 6) The characteristic flow rates and particle size entrapment of each filter type,
- 7) How to generally operate and maintain each filter type,
- 8) Troubleshooting problems with the filter, and
- 9) The advantages and disadvantages of different filters and filter media.

*Filter  
Backwashing/*

6.1.2.1.3.10 Filter backwashing/cleaning including:

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*Cleaning*

- 1) Determining and setting proper backwash flow rates,
- 2) When backwashing/cleaning should be done and the steps needed for clearing a filter of fine particles and other CONTAMINANTS,
- 3) Proper disposal of waste water from backwash, and
- 4) What additional fixtures/equipment may be needed (i.e., sump, separation tank).

**6.1.2.1.4 Health and Safety**

B

*Health and Safety*

Course work for health and safety shall include:

- 1) Recreational Water Illness (RWI)
- 2) RWI Prevention
- 3) Risk Management
- 4) Record Keeping
- 5) Chemical Safety
- 6) Entrapment Prevention
- 7) Electrical Safety
- 8) Rescue Equipment
- 9) Injury Prevention
- 10) Drowning Prevention
- 11) Barriers
- 12) Signage and Depth Markers
- 13) Facility Sanitation
- 14) Emergency Response

*Recreational Water Illness*

## 6.1.2.1.4.1

Recreational water illness (RWI) including:

- 1) How water can contain or become contaminated with parasites, bacteria, viruses, fungi, DISINFECTION by-products, or unsafe levels of chemicals; and
- 2) The role of the operator in reducing risk.

*Causes of RWIs*

## 6.1.2.1.4.2

Common infectious and chemical causes of RWIs, including but not limited to:

- 1) Diarrheal illness (*CRYPTOSPORIDIUM*, *Giardia*, *Shigella*, and NOROVIRUS),
- 2) Skin rashes (*Pseudomonas aeruginosa*, molluscum contagiosum),

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- 3) Respiratory illness (*Legionella*, endotoxins, combined CHLORINE),
- 4) Neurologic infections (echovirus),
- 5) Eye/ear illness (*Pseudomonas aeruginosa*, adenovirus, *Acanthamoeba*, and combined CHLORINE), and
- 6) Hypersensitivity reactions (*Mycobacterium avium* complex).

<i>RWI Prevention</i>	6.1.2.1.4.3	Recreational water illness (RWI) prevention including: <ol style="list-style-type: none"> <li>1) Methods of prevention of RWIs, including but not limited to chemical level control;</li> <li>2) Why public health, operators, and patrons need to be educated about RWIs and collaborate on RWI prevention;</li> <li>3) The role of showering,</li> <li>4) The efficacy of swim diapers,</li> <li>5) Formed-stool and diarrheal FECAL incident response, and</li> <li>6) Developing a plan to minimize PATHOGEN and other biological (e.g., blood, vomit, sweat, urine, and skin and hair care products) contamination of the water.</li> </ol>
<i>Risk Management</i>	6.1.2.1.4.4	Risk management including techniques that prevent illness and injuries associated with AQUATIC FACILITIES open to the public.
<i>Record Keeping</i>	6.1.2.1.4.5	Record keeping including the need to keep accurate and timely records of the following areas: <ol style="list-style-type: none"> <li>1) Operational conditions (e.g., water chemistry, water temperature, filter pressure differential, flow meter reading, and water clarity),</li> <li>2) Maintenance performed (e.g., backwashing, change of equipment),</li> <li>3) Incidents and response (e.g., FECAL incidents in the water and injuries), and</li> <li>4) Staff training and attendance.</li> </ol>
<i>Chemical Safety</i>	6.1.2.1.4.6	Chemical safety including steps to safely store and handle chemicals including:

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		<ol style="list-style-type: none"> <li>1) How to read labels and material safety data sheets,</li> <li>2) How to prevent individual chemicals from mixing together or with other substances (including water), and</li> <li>3) Use of personal protective equipment.</li> </ol>
<i>Entrapment Prevention</i>	6.1.2.1.4.7	<p>Entrapment prevention including:</p> <ol style="list-style-type: none"> <li>1) Different types of entrapment (e.g., hair, limb, body, evisceration/disembowelment, and mechanical), and</li> <li>2) How to prevent and/or decrease likelihood of entrapment.</li> </ol>
<i>Electrical Safety</i>	6.1.2.1.4.8	<p>Electrical safety including possible causes of electrical shock and steps that can be taken to prevent electrical shock (e.g., bonding, grounding, ground fault interrupters, and prevention of accidental immersion of electrical devices).</p>
<i>Rescue Equipment</i>	6.1.2.1.4.9	<p>Rescue equipment including a description and rationale for the most commonly found rescue equipment including:</p> <ol style="list-style-type: none"> <li>1) Rescue tubes,</li> <li>2) Reaching poles,</li> <li>3) Ring buoys and throwing lines,</li> <li>4) Backboards,</li> <li>5) First aid kits,</li> <li>6) Emergency alert systems, and</li> <li>7) Emergency phones with current numbers posted.</li> </ol>
<i>Injury Prevention</i>	6.1.2.1.4.10	<p>Injury prevention including basic steps known to decrease the likelihood of injury, at a minimum:</p> <ol style="list-style-type: none"> <li>1) Banning the use of alcohol and glass containers at AQUATIC FACILITY,</li> <li>2) Patron education, and</li> <li>3) Daily visual inspection for hazards.</li> </ol>
<i>Drowning Prevention</i>	6.1.2.1.4.11	<p>Drowning prevention including causes and prevention of drowning.</p>

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|------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Barriers</i>                    | 6.1.2.1.4.12 | Barriers including descriptions of how fences, gates, doors, and safety covers can be used to prevent access to water; and basics of design that effectively prevent access to water.                                                                                                                                                                                                                            |
| <i>Signage &amp; Depth Markers</i> | 6.1.2.1.4.13 | Signage and depth markers including the importance of maintaining signage and depth markers.                                                                                                                                                                                                                                                                                                                     |
| <i>Facility Sanitation</i>         | 6.1.2.1.4.14 | Facility sanitation including: <ol style="list-style-type: none"> <li>1) Steps to clean and disinfect all surfaces that patrons would commonly come in contact with (e.g., deck, restrooms, and diaper-changing areas), and</li> <li>2) Procedures for implementation of Code Section 6.5 FECAL/Vomit/Blood Contamination Response in relation to responding to a body fluid spill on these surfaces.</li> </ol> |
| <i>Emergency Response Plan</i>     | 6.1.2.1.4.15 | Emergency response plan including: <ol style="list-style-type: none"> <li>1) Steps to respond to emergencies (at a minimum, severe weather events, drowning or injury, contamination of the water, chemical incidents), and</li> <li>2) Communication with emergency responders and local health department notification as part of an emergency action plan.</li> </ol>                                         |

#### **6.1.2.1.5 Operations**

B

##### *Facility Operations*

Course work for operations shall include:

- 1) Regulations
- 2) Local and State Health Departments
- 3) Aquatic Facility Types
- 4) Daily/Routine Operations
- 5) Preventive Maintenance
- 6) Weatherizing
- 7) Aquatic Facility Renovation and Design
- 8) Heating
- 9) Air Circulation

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## 10) Spa and Therapy Pool Issues

<i>Regulations</i>	6.1.2.1.5.1	<p>Regulations including the application of local, regional, state, and federal regulations and STANDARDS relating to the operation of AQUATIC FACILITIES.</p> <p>Course work shall also highlight reasons why an inspector or operator would immediately close an AQUATIC FACILITY.</p>
<i>Local &amp; State Health Departments</i>	6.1.2.1.5.2	Local and state health departments including stressing the importance of a good working relationship with the local and state health department.
<i>AQUATIC FACILITY Types</i>	6.1.2.1.5.3	AQUATIC FACILITY types including common POOL types and settings and a discussion of features and play equipment that require specific operation and maintenance steps.
<i>Daily/Routine Operations</i>	6.1.2.1.5.4	<p>Daily/routine operations including listing and describing the daily maintenance requirements of an AQUATIC FACILITY including, but not limited to:</p> <ol style="list-style-type: none"> <li>1) AQUATIC FACILITY bottom cleaning,</li> <li>2) Deck cleaning,</li> <li>3) Restroom cleaning and DISINFECTION, and</li> <li>4) Deck equipment inspection.</li> </ol>
<i>Preventative Maintenance</i>	6.1.2.1.5.5	<p>Preventative maintenance including how to develop:</p> <ol style="list-style-type: none"> <li>1) A preventative maintenance plan,</li> <li>2) Routine maintenance procedures, and</li> <li>3) Record keeping system needed to track maintenance performed.</li> </ol>
<i>Weatherizing</i>	6.1.2.1.5.6	Weatherizing including the importance of weatherizing and the steps to prevent damage to AQUATIC FACILITIES and their mechanical systems due to very low temperatures or extreme weather conditions (e.g., flooding).

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- Facility Renovation & Design* 6.1.2.1.5.7 Aquatic facility renovation and design including:
- 1) Definitions of AQUATIC FACILITY renovation and remodeling,
  - 2) When it is necessary to renovate,
  - 3) When it is necessary to notify the HEALTH AUTHORITY of planned renovations and remodeling, and
  - 4) Current trends in facility renovation and design.
- Heating* 6.1.2.1.5.8 Heating issues including:
- 1) Recommended water temperatures and limits,
  - 2) Factors that contribute to the water's heat loss and gain,
  - 3) Heating equipment options,
  - 4) Sizing gas heaters, and
  - 5) How to troubleshoot problems with heaters.
- Air Circulation* 6.1.2.1.5.9 Air circulation including:
- 1) Issues to take into account when designing an air handling system for an indoor AQUATIC FACILITY,
  - 2) The importance of regulating humidity,
  - 3) The need to maintain negative pressure,
  - 4) How poor indoor air quality can affect patrons and staff, and
  - 5) How to balance air change and energy efficiency.
- SPA & Therapy POOL Issues* 6.1.2.1.5.10 SPA and therapy POOL issues including:
- 1) Operational implications of smaller volumes of water and hot water,
  - 2) How to maintain water chemistry,
  - 3) Typical water temperature ranges highlighting maximum temperatures,
  - 4) Risks of hyperthermia and hypothermia,
  - 5) Need for emergency shut-off switches, and
  - 6) Frequency of cleaning, draining, and DISINFECTION.

<i>Recognized Courses</i>	6.1.3	General Requirements for Training Courses	B
	<p>Providers of recognized QUALIFIED OPERATOR training courses, <i>if required by the HEALTH AUTHORITY to verify that the course meets the requirements and intent of this Code</i>, shall submit course information including:</p> <ol style="list-style-type: none"> <li>1) Course development expertise</li> <li>2) Course content</li> <li>3) Course length</li> <li>4) Instructor qualifications</li> <li>5) Exam administration</li> <li>6) Certificate procedures</li> <li>7) Updates of information as changes are made</li> </ol>		
<i>Providers</i>	<b>6.1.3.1</b>	<b>Course Providers</b>	B
	<p>QUALIFIED OPERATOR courses shall be developed by individuals or organizations with expertise in AQUATIC FACILITY operation and maintenance and expertise in education or training as evidenced by combined work experience and training.</p>		
<i>Content</i>	<b>6.1.3.2</b>	<b>Course Content</b>	B
	<p>Training materials at a minimum, covering all of the essential topics as outlined in Sec. 6.1.2.1 shall be provided and used in QUALIFIED OPERATOR training courses.</p>		
<i>Course Length</i>	<b>6.1.3.3</b>	<b>Course Length</b>	B
	<p>Course agenda or syllabus shall show amount of time planned to cover each of the essential topics.</p>		
<i>Instructors</i>	<b>6.1.3.4</b>	<b>Instructor Requirements</b>	B
	<p>QUALIFIED OPERATOR training course providers shall furnish course instructor information including:</p> <ol style="list-style-type: none"> <li>1) Expertise in AQUATIC FACILITY operation and</li> </ol>		

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maintenance—as evidenced by work experience and/or training,

- 2) Completion of an operator training course, which at a minimum, covers all of the essential topics as outlined in Sec 6.1.2.1, including passing the final exam,
- 3) Successful completion of an operator training instructor course, and
- 4) If the operator training course is online, procedures which make such an instructor available to answer students’ questions during normal business hours.

**6.1.3.5 Final Exam B**

*Final Exam* 6.1.3.5.1 QUALIFIED OPERATOR training course providers shall furnish course final exam information including:

- 1) Final exam, which at a minimum, covers all of the essential topics as outlined in Sec 6.1.2.1,
- 2) Final exam passing score criteria, and
- 3) Final exam security procedures.

*Final Exam Administration* 6.1.3.5.2 QUALIFIED OPERATOR training course providers shall provide final exam administration, proctoring and security procedures including:

- 1) Checking student’s government-issued photo identification, to ensure that the individual taking the exam is the same person who is given a certificate documenting course completion and passing of exam,
- 2) Final exam completion is without assistance or aids that may improve exam results, and
- 3) Final exam is passed, prior to issuance of a QUALIFIED OPERATOR certificate.

**6.1.3.6 Course Certificates B**

*Certificates* QUALIFIED OPERATOR training course providers shall furnish course certificate information including:

- 1) Procedures for issuing nontransferable certificates to the individuals who successfully

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- complete the course work and pass the final exam,
- 2) Procedures for delivery of course certificates to the individuals who successfully complete the course work and pass the final exam,
  - 3) Instructions for the participant to maintain their originally issued certificate, or a copy thereof, for the duration of its validity, and
  - 4) Procedures for the QUALIFIED OPERATOR training course provider to maintain an individual's training and exam record for a minimum period of five years after the expiration of the individual's certificate.

### 6.1.3.7 Continuing Education

(Reserved)

### 6.1.3.8 Certificate Renewal

B

*Renewal*

QUALIFIED OPERATOR training course providers shall furnish course certificate renewal information including:

- 1) Criteria for re-examination with a renewal exam that meets the specifications for initial exam requirements and certificate issuance specified in this Code, or
- 2) Criteria for a refresher course with an exam that meets the specifications for the initial course, exam, and certificate issuance requirements specified in this Code.

### 6.1.3.9 Suspension and Revocation of Certificate

B

*Suspension &  
Revocation*

- 1) Course providers shall have procedures in place for the suspension or revocation of certificates.
- 2) *Course providers may suspend or revoke an operator's certificate based on evidence that the operator's actions or inactions unduly created safety and health hazards.*

	<b>6.1.3.10</b>	<b>Additional Training or Testing</b>	C
<i>Additional Training &amp; Testing</i>		<i>The HEALTH AUTHORITY may, at its discretion, require additional operator training or testing.</i>	
	<b>6.1.3.11</b>	<b>Health Authority Certificate Recognition</b>	C
<i>Certificate Recognition</i>		<i>The HEALTH AUTHORITY may, at its discretion, choose to recognize, not to recognize, or rescind a previously recognized certificate of a qualified operator based upon demonstration of INADEQUATE knowledge, poor performance, or due cause.</i>	
	<b>6.1.3.12</b>	<b>Health Authority Course Recognition</b>	C
<i>Course Recognition</i>		<i>The HEALTH AUTHORITY may, at its discretion, recognize, choose not to recognize, or revoke a previously accepted course based upon demonstration of INADEQUATE knowledge or poor performance of its qualified operators, or due cause.</i>	
	<b>6.1.3.13</b>	<b>Length of Certificate Validity</b>	B
<i>Certificate Validity</i>		The maximum length of validity for qualified operator training certificate shall be 5 years.	
	<b>6.2</b>	<b>Lifeguard Training</b>	
	<b>6.2.1.1</b>	<b>Essential Topics in Lifeguard Training Courses</b>	
	<b>6.2.1.2</b>	<b>General Requirements for Training Courses</b>	
	<b>6.2.1.3</b>	<b>Aquatic Supervisory Skill Requirements</b>	
	<b>6.2.1.4</b>	<b>First Aid and CPR</b>	
	<b>6.2.1.5</b>	<b>On-Site Training</b>	
	<b>6.2.1.6</b>	<b>In-Service Training</b>	

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- 6.2.1.7 **Length of Valid Certification, Recertification**
  
- 6.3 Facility Staffing
  - 6.3.1 Operators: Staff Requirements and Availability
    - 6.3.1.1 **On-Site Qualified Venue Operator**
    - 6.3.1.2 **Contracted Off-Site Qualified Venue Operator**
    - 6.3.1.3 **Qualified Operator Records**
  
  - 6.3.2 Lifeguards: Staff Requirements & Availability
    - 6.3.2.2 **Requirements Based on Facility Size**
    - 6.3.2.3 **Requirements for Lifeguards or Other Supervisory Staff Based on Venue Type**
  
  - 6.3.3 Staff Management
    - 6.3.3.2 **Emergency Response/Communication Plan**
    - 6.3.3.3 **Lifeguard Rotation Plan and Procedures**
    - 6.3.3.4 **Contamination Incident Training**
  
    - Draft Reviewed - 10/01/2008
  
  - 6.3.3.5 **Remote Monitoring Systems**
  
  - 6.3.3.6 **Employee Illness Policy**

B

## Model Aquatic Health Code Annex

### **Reviewer Note on the MAHC Annex:**

#### **Rationale**

The annex is provided to:

- (a) Give further explanations on why certain recommendations are made;
- (b) Discuss rationale for making the code content decisions;
- (c) Provide a discussion of the scientific basis for selecting certain criteria, as well as discuss why other scientific data may not have been selected, e.g. due to data inconsistencies;
- (d) State areas where additional research may be needed;
- (e) Discuss and explain terminology used; and
- (f) Provide additional material that may not have been appropriately placed in the main body of suggested recommendations. This would include summaries of scientific studies, charts, graphs, or other illustrative materials.

#### **Content**

The annexes located at the back of the document can provide assistance to those charged with applying Model Aquatic Health Code provisions. No reference is made in the text of a provision to the annexes which support its requirements. This is necessary in order to keep future laws or other requirements based on the Model Aquatic Health Code straightforward. However, the annexes are provided specifically to assist users in understanding and applying the provisions uniformly and effectively.

It is, therefore, important for users to preview the subject and essence of each of the annexes before using the document. Some of the annexes (e.g., References, Public Health Reasons) are structured to present the information by the specific Model Aquatic Health Code item number to which they apply. Other annexes provide information and materials intended to be helpful to the user such as model forms that can be used, recreational water illness outbreak response, and guidelines for facility inspection.

#### **Bibliography**

The Annex includes a bibliography of the reference materials and scientific studies that form the basis for recommendations.

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## Model Aquatic Health Code Annex

### 6.0 Policies and Management

*Key word*                      **Section**                      **Annex**

6.1                                      Operator Training

6.1.1                                  Operator Qualifications

**POOL and SPA operation and maintenance violations are common.**

*POOL Inspection Data*

POOL inspection data from 15 jurisdictions across the United States indicate that over half (61.1%) of inspections identified  $\geq 1$  violation(s) and 12.1% of inspections resulted in immediate closure because of the seriousness of identified violation(s). In addition, violations regarding the following issues were frequently identified:

- disinfectant level (10.7% of inspections),
- PH level (8.9%),
- other water chemistry (12.5%),
- filtration/recirculation system (35.9%),
- water test kit (3.3%),
- record keeping (10.9%), and
- licensure (2.7%).

*SPA Inspection Data*

Review of SPA inspection reports from these same jurisdictions found over half (56%) of inspections identified  $\geq 1$  violation(s) and 11% of inspections resulted in immediate closure because of the seriousness of identified violation(s). In addition, SPA inspection data indicated that the following violations regarding the following issues are frequently identified:

- disinfectant residual (17% of inspections),
- PH level (15%),
- other water chemistry (17%),
- filtration/recirculation system (27%),
- water test kit (2%),

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<i>Key word</i>	<i>Section</i>	<i>Annex</i>
		<ul style="list-style-type: none"> <li>• and record keeping (13%).</li> </ul>
	<i>POOL Operations &amp; Maintenance</i>	<p>The authors conclude that the number of overall violations highlights the need for POOL and SPA staff training, which includes information about recreational water illness (RWI) transmission, and the potential benefits of mandating training for POOL operators throughout the United States. In addition, it underscores the need for operator training courses to include the topic areas related to the common violations listed above.</p>
	<i>Handling POOL Chemicals</i>	<p>The cause of approximately one third of reported RWI outbreaks associated with treated venues are CHLORINE sensitive. This CHLORINE sensitivity of PATHOGENS involved in outbreaks indicates that these venues were poorly operated or maintained. The authors conclude that preventing recreational water illness outbreaks, particularly those associated with INADEQUATE public operation of AQUATIC FACILITIES, calls for required POOL and SPA operator training.</p>
	<i>Studies</i>	<p>Of 36 reported POOL chemical–associated health events in New York State (1983–2006), 69% (25) were caused by poor chemical handling or storage practices and 81% (27) resulted from mixing incompatible chemicals. The authors conclude that preventing these events calls for educating public POOL operators and residential POOL owners about safe chemical handling and storage practices.</p> <p><b>Pool operator training reduces pool inspection violations.</b></p>
	<i>Local jurisdictions not requiring training</i>	<p>Two studies have shown that POOLS with operators who have successfully completed formal training in POOL operation, have better water quality than POOLS without a trained operator.</p>
		<p>Results from a study in Nebraska demonstrated that FREE CHLORINE violations and concurrent PH and FREE CHLORINE violations were twice as likely in local jurisdictions not requiring certification compared with</p>

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		<p>jurisdictions requiring training. The authors conclude that these results demonstrate the benefit of requiring POOL operator certification to help prevent recreational water illnesses.</p>
<i>POOL Inspection Data</i>	6.1.2	<p><b>Essential Topics in Operator Training Courses</b></p> <p>POOL inspection data from 15 jurisdictions across the United States indicated that 12.1% of inspections resulted in immediate closure because of the seriousness of identified violations and violations regarding the following issues are frequently identified:</p> <ul style="list-style-type: none"> <li>• FREE CHLORINE level (10.7% of inspections),</li> <li>• PH level (8.9%),</li> <li>• other water chemistry (12.5%),</li> <li>• filtration/recirculation system (35.9%),</li> <li>• water test kit (3.3%),</li> <li>• record keeping 10.9%), and</li> <li>• licensure (2.7%).</li> </ul>
<i>SPA Inspection Data</i>		<p>SPA inspection data indicated that the following violations regarding the following issues are frequently identified:</p> <ul style="list-style-type: none"> <li>• disinfectant residual (17% of inspections),</li> <li>• PH level (15%),</li> <li>• other water chemistry (17%),</li> <li>• filtration/recirculation system (27%),</li> <li>• water test kit (2%), and</li> <li>• record keeping (13%).</li> </ul> <p>These analyses underscore the need for inclusion of these topic areas in qualified operator courses. These essential topics are covered in nationally recognized operator training courses.</p>
	6.1.2.1	<p><b>Supplemental DISINFECTION</b></p> <p>Many other disinfection chemicals or systems with varying effectiveness and suitability are being offered in</p>

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<i>Key word</i>	<i>Section</i>	<i>Annex</i>
		the market to aquatic facility operators for water treatment. In general terms, discuss the evaluation steps that should be used by the aquatic facility operator, including required HEALTH AUTHORITY acceptance of the chemicals or systems for public aquatic facilities, in their decision process on using these types of supplemental systems or treatments.
	<b>6.1.2.3</b>	<b>Filtration</b>
<i>Filtration</i>		Common current alternative filter media types that can be mentioned include perlite, zeolite, and food-grade cellulose.
	<b>6.1.2.4 A</b>	<b>RWI and RWI Prevention</b>
		The number of outbreaks associated with recreational water has continued to substantially increase since reporting began in 1978, most notably in 1982, 1987, 2004, and 2007. CDC recommends that public health and the aquatic sector collaborate on educating the swimming public, an important source of recreational water contamination, about RWIs and what swimmers can do to protect themselves and others.
	<b>6.1.2.4 B</b>	<b>Chemical Safety</b>
		Reporting of POOL chemical-associated health events in the United States is not universally mandated, and no single surveillance system exists to characterize completely the number of exposures or associated injuries.
<i>NEISS and NPDS Data</i>		The National Electronic Injury Surveillance System (NEISS) and National Poison Data System (NPDS) data indicate that POOL chemical exposures and associated injuries are common. Data from NEISS show that inhalation of chemical fumes and splashing POOL chemicals into the eyes were the primary POOL chemical-associated injuries for which patients sought emergency treatment.
<i>Chemical Exposure</i>		NPDS data reveal that nearly all single POOL chemical exposures likely were unintentional. Additionally, poor
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<i>Key word</i>	<i>Section</i>	<i>Annex</i>
<i>Emergencies</i>		chemical handling and storage practices at public AQUATIC FACILITIES, particularly those leading to mixing of incompatible chemicals, were the primary contributing factors of POOL chemical-associated health events reported in New York State.
<i>CDC Preventative Recommendations</i>		Although no one data source alone clarifies completely the epidemiology of POOL chemical--associated injuries, together they reveal multiple commonalities that suggest these injuries are preventable. CDC recommendations ( <a href="http://www.cdc.gov/healthywater/swimming/pools/preventing-pool-chemical-injuries.html">http://www.cdc.gov/healthywater/swimming/pools/preventing-pool-chemical-injuries.html</a> ) for preventing injuries associated with POOL chemicals were based on a review of the New York State health events and other government regulatory guidance.
<i>Focus</i>		These recommendations focus on improving <ul style="list-style-type: none"> <li>• facility design and engineering and</li> <li>• education and training that stresses safe chemical handling and storage practices and safe and preventive maintenance of equipment.</li> </ul>
	<b>6.1.2.4 C</b>	<b>Entrapment Protection</b>
<i>Entrapment Reports</i>		The Consumer Product Safety Commission (CPSC) reports injuries and fatalities regarding entrapment in residential and commercial POOL and SPA settings.
	<b>6.1.2.5</b>	<b>Aquatic Facility Types and Settings</b>
<i>Types</i>		Types of AQUATIC FACILITIES that are recommended to be discussed include POOLS, spray grounds/ interactive fountains, leisure rivers, therapy pools, spas, wave pools, water slides, competition pools, and wading pools.
<i>Settings</i>		Settings of AQUATIC FACILITIES that are recommended to be discussed include community POOLS, apartment complex/condominium/ homeowners' association POOLS, hotel/motel POOLS, and waterparks.

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<i>Key word</i>	<i>Section</i>	<i>Annex</i>
<i>Course Length Recommendations</i>	<b>6.1.3.1</b>	<b>Course Length</b>  The MAHC intentionally does not prescribe a particular length of time for courses. Instead, the module is more performance based by requiring that all of the essential topics in 6.1.2.1 be covered during the course. Most nationally recognized operator training courses run approximately 16 hours, and the MAHC technical committee assesses that it would be unlikely that all essential topics could be effectively taught in a shorter time period.
<i>Course Content</i>	<b>6.1.3.3</b>	<b>Course Content</b>  Evidence-based recommendations for course content are provided above in the annex for essential topics in operator training courses in general and specifically for RWI, RWI prevention, chemical safety, and entrapment. Many of the essential topics are also covered in nationally recognized operator training courses.
<i>Instructor Requirements</i>	<b>6.1.3.4</b>	<b>Instructor Requirements</b>  Recognized training on AQUATIC FACILITY operation and maintenance as well as instruction (without work experience) is sufficient to qualify an individual to be an instructor if the requirements in Code section 6.1.3.4 are met. It is, however, ideal to have both work experience and training in operation and instruction.
<i>Key Components</i>	<b>6.1.3.5</b>	<b>Final Exam</b>  The final exam is intended to assess the knowledge and skills of the POOL operator. Key components of the exam should include questions on the essential topics outlined in Section 6.1.2, performing essential calculations, reading meters and electronic equipment.
<i>Skills Testing</i>		In the future it would be ideal if course final exams included more than just knowledge testing and have skills testing. This should include an on-site evaluation of skills such as proper calculations of gallonage and chemicals needed to be added to the AQUATIC FACILITY,

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<i>Key word</i>	<i>Section</i>	<i>Annex</i>
<i>Test Security</i>		<p>how to operate the filtration/recirculation system, including backwashing the filters, and water testing (chemical and physical parameters).</p> <p>The Conference for Food Protection established Food Protection Managers Certification Program Standards (<a href="http://www.foodprotect.org/media/managercert/Rev_Standards_20081.pdf">www.foodprotect.org/media/managercert/Rev_Standards_20081.pdf</a>). The MAHC will establish the Conference for Swimmer Protection, which in turn will establish Pool Operator Certification Program Standards. These standards will address issues such as examination development, test administration, and computer-based testing development and administration.</p>
<i>Future Test Development</i>		<p>In the future it would be ideal if course final exams included more than just knowledge testing and have skills testing. This should include an on-site evaluation of skills such as proper calculations of gallonage and chemicals needed to be added to the aquatic facility, how to operate the filtration/recirculation system, including backwashing the filters, and water testing (chemical and physical parameters).</p>
	<b>6.1.3.6</b>	<b>Course Certificates</b>
<i>Unique Identifiers</i>		<p>The technical committee recommends that each certificate has a unique identifier to minimize the likelihood of mistaking the identity of certified operators.</p>
<i>Registration Organization</i>		<p>At this time, certification process for qualified operators is not established; however, the MAHC developers are working to establish a certification program similar to that of the Food Code. Thus, the Food Protection Managers Certification Program STANDARDS, Section 7.7, "Responsibilities to the Public and to Employers of Certified Personnel" reflect the following, "A certification organization shall maintain a registry of individuals certified."</p> <p>These STANDARDS reference certified food operators; however, the same STANDARD shall apply to operator training certificates. Thus, "any title or credential awarded by the course proved organization shall</p>
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<i>Key word</i>	Section	Annex
<i>Keep Up-To-Date</i>	6.1.3.7	<p>appropriately reflect the” AQUATIC FACILITY operator responsibilities and “shall not be confusing to employers, consumers, related professions, and/or interested parties.”</p> <p><a href="http://www.foodprotect.org/media/managercert/Rev_STANDARDS_20081.pdf">http://www.foodprotect.org/media/managercert/Rev_STANDARDS_20081.pdf</a>, page 27).</p> <p><b>Continuing Education</b></p> <p>It is recommended that a qualified operator continue their education by attending seminars or training courses to keep up-to-date in AQUATIC FACILITY operation and safety.</p>
<i>Continuing Education Needed</i>		<p>In the long term, there is a need for development of system for Continuing Education Units. However, it may not be prudent to make the leap to require CEUs all at once, especially since this version of the Model Aquatic Health Code will require for the first time that all AQUATIC FACILITIES have QUALIFIED OPERATORS. To have new requirements for operators at all AQUATIC FACILITIES and for CEUs may be burdensome.</p>
<i>Certificate Renewal</i>	6.1.3.8	<p><b>Certificate Renewal</b></p> <p>Nationally recognized operator training courses require renewal of certificate. However, most professional certifications do not require retaking an entire course to renew certification, just passing an exam.</p>
<i>Readily Accessible</i>	6.1.3.9	<p><b>Qualification Records</b></p> <p>Most states require these certificates or copies to be readily accessible to the HEALTH AUTHORITY. Copies of certificates should be kept on file at the site and made available upon request. If photocopies are provided as proof of certificate, or certificate renewal, the original documents should be provided within 72 hours upon request from the HEALTH AUTHORITY.</p>

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<i>Key word</i>	<i>Section</i>	<i>Annex</i>
<i>Suspension &amp; Revocation of Certificates</i>	<b>6.1.3.10</b>	<p><b>Suspension and Revocation of Certificate</b></p> <p>The HEALTH AUTHORITY is expected to contact course providers with questions about the validity of any certificate or with questions about an operator’s performance. In turn, course providers are expected to readily provide verification of certificates and suspensions and revocations of certificates and to notify the HEALTH AUTHORITY of actions taken in response to its reported concerns.</p> <p>The Food Protection Managers Certification Program STANDARDS, Section 7.5 reflect the following, “A certification organization shall have formal certification policies and operating procedures including the sanction or revocation of the certificate. These procedures shall incorporate due process.” (<a href="http://www.foodprotect.org/media/managercert/Rev_STANDARDS_20081.pdf">http://www.foodprotect.org/media/managercert/Rev_STANDARDS_20081.pdf</a>, page 27.)</p>
<i>Additional Training &amp; Testing</i>	<b>6.1.3.11</b>	<p><b>Additional Training or Testing</b></p> <p>Reasons for requiring such training or testing include but are not limited to operator performance or new developments in technology or operation. Such situations include but are not limited to repeat or serious violations identified on inspection, an investigation implicating operation as a contributing factor to illness or injury, or implementation of substantial rule changes. Training can range from brief dialogue during pool inspection to full-day seminar for all operators in a jurisdiction. Testing can range from questions during inspection to paper- or computer-based exams.</p>
<i>Certificate Recognition</i>	<b>6.1.3.12</b>	<p><b>Health Authority Certificate Recognition</b></p> <p>The technical committee aims to delegate authority to the HEALTH AUTHORITY both to choose to recognize individual certificates and to reverse its decisions if operators with certificates demonstrate INADEQUATE knowledge or poor performance or due cause.</p>

<i>Key word</i>	<i>Section</i>	<i>Annex</i>
<i>Course Recognition</i>	<b>6.1.3.13</b>	<b>Health Authority Course Recognition</b>  The technical committee aims to delegate authority to the HEALTH AUTHORITY to choose to recognize operator training courses and to reverse its decisions if operators demonstrate INADEQUATE knowledge or poor performance or due cause.
<i>Certificate Validity</i>	<b>6.1.3.14</b>	<b>Length of Certificate Validity</b>  A number of operator training course providers, including the American Swimming POOL & SPA Association, Aquatic Training Institute, National Swimming POOL Foundation, National Recreation and Park Association and YMCA, have set the maximum length of operator certificate validity and certificate renewal at 5 years.  Additional data are needed to re-evaluate this issue.
	6.2	Lifeguard Training
	6.3	Facility Staffing
	6.4	Facility Management
	6.5	Fecal/Vomit/Blood Contamination Risk Draft Reviewed - 10/01/2008
	6.5.1	Contamination Response Plan
	6.5.2	Water Contamination Response
	6.5.3	Pool Water Contamination Disinfection
	6.5.4	Surface Contamination Cleaning and Disinfection
	6.6	Inspections