CMAHC
COUNCIL for the MODEL AQUATIC HEALTH CODE

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Summary of TRC Call Agenda for 6/16

The following is a summary of phone-based discussions for Change Requests (CRs) addressed by the Technical Review Committee (TRC) for the week of 6/16/2020. A link the recording of the call can be viewed at the CMAHC's Youtube channel by visiting our website at https://cmahc.org/technical-review-committee.php.

This TRC call focused on CR submissions by the CMAHC Indoor Air Quality ad hoc committee. This summary was provided by the CR Champion for this set of CRs.

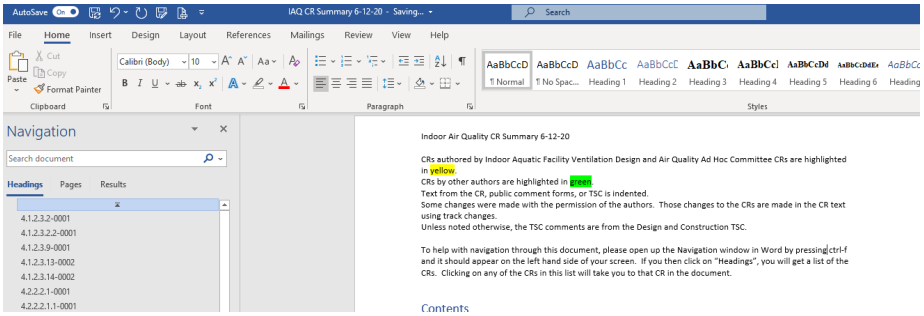
Indoor Air Quality CR Summary 6-14-20

- CRs authored by Indoor Aquatic Facility Ventilation Design and Air Quality Ad Hoc Committee CRs are highlighted in yellow.
- CRs by other authors are highlighted in green.
- If the Design and Construction TSC accepted the CR, "TSC Yes" is in the title. Most of these are minor changes. So that if we don't get to them during the meeting, a letter ballot could be held.
- TRC votes are also summarized in the titles.
- Text from the CR, public comment forms, or TSC is indented.
- Some changes were made with the permission of the authors. Those changes to the CRs are made in the CR text using track changes. If a change was made without the approval/knowledge of the authors, a comment is made next to the text.
- Unless noted otherwise, the TSC comments are from the Design and Construction Technical Support Committee.
- TRC refers to the Technical Review Committee.
- Items that still need to be addressed after the TRC vote are highlighted in pink.

To help with navigation through this document, please open up the Navigation window in Word by pressing ctrl-f and it should appear on the left-hand side of your screen (see image below). If you then click on "Headings", you will get a list of the CRs. Clicking on any of the CRs in this list will take you to that CR in the document.

Most of the CRs are duplicated in the overall re-organization proposed by the ad hoc committee in 4.2.6-0002. CR 4.2.6-0002 is at the end of this document, and is where I will be starting the discussion in Monday's meeting. CR's marked with a * appear in 4.2.6-0002.

Links have been added to aid navigation. Each individual CR contains a link to its location in the overall 4.6.2-0002 CR. The sections within 4.6.2-0002 that have proposed language also contain links to the individual CRs.



General Comments

Following are some general comments that the authors shared with me to help me understand these CRs. I thought it might help if I share these comments with you all.

> You have to understand we are trying to write a code that applies to many types and variations of equipment. Basically, it [the air delivery rate] is the net cfm running 24/7 of all fan based equipment that is moving the air within the aquatic space.
>
> Air Delivery Rate as defined by ASHRAE in the Pool chapter consists of:
> - Air Rotations within the space that contains the bodies of water.
> - o ASHRAE states between 4 & 8 air rotations.
> - Air Rotation formula CFM = air volume of space x number of air rotations / 60
> - o This cfm is required to:
> - Prevent Air Stratification
> - Maintain surfaces above space dew point to prevent condensation
> - Outdoor ventilation air amounts
> - Exhaust air amount to maintain a negative space pressure
> - Amount of air/cfm required to control the heating of the space

- Amount of air/cfm required to control sensible cooling of the space
- Amount of air/cfm required to control the humidity

All of these could be a separate piece of equipment having it's own fan or a single piece of equipment. Usually the Air Rotation CFM is the largest of all the requirements and this amount must be supplied 24/7. The air handler system depending on the design of the manufacture may not have enough supply cfm to meet this requirement so additional mechanical fans maybe required.

I am afraid of trying to over simplify the definition and over look some combination. This is a specialized design code we are writing and have to assume the people using this code are design professionals and know the specific operation and terminology of proper HVAC design.

Following are TSC comments, variations of which were used for many of the CRs. To save space, I did not repeat them each time in the individual CRs below.

We believe the CR has merit in principle. However, we question whether some of these requirements belong in the MAHC, which is primarily under the jurisdiction of a health department or other health related AHJ. Most pool plan reviewers do not have the expertise to address the architectural building envelope or mechanical elements identified within this Change Request. Perhaps these requirements would be better suited for Indoor Pool/Natatorium sections of the International Building Code, the International Mechanical code, or ASHRAE 62.1 similar to the way swimming pools are addressed in Article 680 of the National Electrical Code.

These are HVAC design criteria that will be included in the building HVAC design by mechanical consultant rather than the aquatics consultant. These requirements may be better suited for an ASHRAE standard or Mechanical Code document and should be reviewed by an expert in that field rather than a health department reviewer.

No supporting data was provided for inclusion in the Annex. If we are going to require health department officials to review mechanical details, adequate information should be included in the Annex to equip them to perform that review.

No data or supporting information has been offered to substantiate this Change Request.

Several of the comments also recommended putting the requirement in a separate section to clarify that it was intended for indoor aquatic facilities. These comments should all be addressed by CR 4.6.2-0002.

Champion overall comments

The Ad Hoc Committee members are editors and original authors of the indoor pool chapter in ASHRAE.

In general, I voted Yes for these CRs based on their technical merit. However, I think it would be good for the TRC to have a general discussion about MAHC scope before getting into the details of the individual CRs.

The MAHC is very long and very complicated, and it is certainly a challenge for public health authorities to have a deep understanding of everything from the intricacies of the effect of cyanuric acid on chlorine efficacy to the intricacies of HVAC system design. However, health authorities can look at their local building and mechanical codes, consult with their local authorities responsible for the building and mechanical codes, and determine which of the MAHC provisions are needed, and whether they belong in

the health code, building code or mechanical code. Of course, AHJ's would need to be very careful to make sure that there are not any discrepancies between their health, building and mechanical codes.

TRC Comments

There was a general discussion about the scope of the MAHC and whether many of these requirements belong in other codes (ASHRAE, etc.). It is the understanding of the TRC that most of the provisions in these CRs are not provided in code language in any of the existing model codes/standards provided by ICC, ASHRAE or any other organization. Many of these CRs are based on ASHRAE's 2019 Handbook on HVAC Applications, Chapter 6 Indoor Swimming pools. However, since this chapter is educational and is not written in code language, it was necessary to create that code language here.

4.1.2.3.2-0001* TSC No TRC Yes

4.6.2.6.3 Technical Details

Original CR

The following technical specifications shall be provided for each AQUATIC FACILITY:
1) ~~POOL w~~Water temperatures for each venue/pool,
2)Square footage of each venue/pool (length and width)
3) Space design,
a. Listing of each room size (length, width, height)
b. Statement that a vapor barrier is included in the construction of all interior and exterior wall and ceiling surfaces.
c. Statement that all windows are at least double pane and include a thermal break along with the U value.
d. A listing of all wall and ceiling construction R values

4) Design/desired ~~D~~dry bulb and dew point temperatures, and
5) Design/desired ~~R~~relative humidity.
6) Type of Water treatment
7)Wet Deck Area as defined in the ASHRAE 62.1 2019 Standard which defines this area as the "area surrounding the pool surface that is capable of being wetted during pool use or when the pool is occupied."

CR changed during TRC meeting with approval from author:

The following technical specifications shall be provided for each AQUATIC FACILITY:
1) ~~POOL w~~Water temperatures for each AQUATIC VENUE
2)Effective surface area of each AQUATIC FEATURE/AQUATIC VENUE
3) Space design,
a. Listing of each room size (length, width, height)
b. Statement that a vapor barrier is included in the construction of all interior and exterior wall and ceiling surfaces.
c. Statement that all windows are at least double pane and include a thermal break along with the U value.
d. A listing of all wall and ceiling construction R values

4) Design/desired ~~D~~dry bulb and dew point temperatures, and
5) Design/desired ~~R~~relative humidity.
6) Type of Water treatment
7)PERIMETER DECK and POOL DECK which are the same as the Wet Deck Area as defined in the ASHRAE 62.1 2019 Standard which defines this area as the "area surrounding the pool surface that is capable of being wetted during pool use or when the pool is occupied."

No public comments

Deleted: venue/pool

Deleted: Square footage

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TRC comments: The committee originally voted on the text as it appears above, except that the changes to #7 had not yet been made. After a review of the deck definitions, we returned to this CR, amended #7 and re-voted.

TRC vote on revised text: unanimous Yes, revote for change to #7 unanimous Yes

TSC: No. Additional research/improvement needed
See general comments above.

The elements requested within this Change Request address items that apply to indoor pools only. Yet Section 4.1.2.3 requirements apply to all pool plans, whether the venue is indoors or outdoors.

- Item 1) Agree with the proposed language change.
- Item 2) Revise to "Water surface area of each venue (sf)". Less than half of the pools currently designed are simple rectangles rendering length and width dimensions useless.
- Item 3) The proposed Space design requirements are meaningless to an outdoor venue. If they are to be included in Section 4.1.2.3 they should be in a new subsection titled "Additional requirements for indoor venues". We believe that these requirements should be within the building code rather than the MAHC as they are part of the architectural design of the building envelope and should be reviewed by an expert in that field rather than a health department reviewer.
- Items 4&5) These are HVAC design criteria that will be included in the building HVAC design by mechanical consultant rather than the aquatics consultant. These requirements may be better suited for an ASHRAE standard or Mechanical Code document and should be reviewed by an expert in that field rather than a health department reviewer.
- Item 6) If included, should be further detailed into
  - Type of filtration system
  - Type of primary disinfection system
  - Type of pH control system
  - Type of secondary disinfection system
- Item 7) We agree with identifying the square footage of the Wet Deck Area. However, the definition of Wet Deck Area belongs in Section 3.2. The reference to ASHRAE 62.1 2019 should be deleted. No references to a specific version of another standard should be included within the MAHC as that will require a change to the MAHC every time the referenced standard is updated.

Champion recommendation: Yes
Champion comments/conversations with authors

Since both the PERIMETER DECK and POOL DECK as defined in the MAHC may get wet, the total of these two areas is equal to the “Wet Deck” as defined in ASHRAE 62.1.

This section was edited in this CR and then moved to section 4.6.2 in CR 4.6.2-0002. However, some text needs to remain in 4.1.2.3.2 to apply to all aquatic facilities.

4.1.2.3.2.2-0001* TSC No TRC Yes

4.6.2.6.2 Intended Use
Original CR

Design of the ventilation and ~~AIR HANDLING~~ CLIMATE CONTROL SYSTEMS for INDOOR AQUATIC FACILITIES shall include consultation with, and input ~~by~~ from, the owner/operator, the architect and the Mechanical engineer of record to address intended uses, type of VENUES (FLAT WATER, AGITATED WATER, HOT WATER) and intended typical operating water temperatures, space air temperature and relative humidity.

CR changed during TRC meeting with approval from author:

During the design of the ventilation and ~~AIR HANDLING~~ CLIMATE CONTROL SYSTEMS for INDOOR AQUATIC FACILITIES, the design professionals (engineers and architects) shall ~~include~~ consult with, and obtain input ~~by~~ from, the owner/operator, to address intended uses, type of VENUES (FLAT WATER, AGITATED WATER, HOT WATER) and intended typical operating water temperatures, space air temperature and relative humidity. A design criteria document shall be written as a result of these consultations, signed by all parties involved and become a permanent document of the project specifications and owner's manual.

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Deleted: the architect and the Mechanical engineer of record

TRC comments: CLIMATE CONTROL SYSTEMS needs to be added to 3.2 glossary.

3.2 CLIMATE CONTROL SYSTEMS means a combination of the pieces of equipment designed to control the temperature, humidity, introduce ventilation air and maintain building negative pressure.

TRC vote on gray highlighted text: unanimous Yes

No public comments

TSC: No. Acceptable only with modification.
See general comments above.

The elements requested within this Change Request address items that apply to indoor pools only. Yet Section 4.1.2.3 requirements apply to all pool plans, whether the venue is indoors or outdoors.
We agree with the proposed language clarification within the limited context of Section 4.1.2.3.2.

Section 4.1.2.3.2 is meaningless to an outdoor venue. If these requirements are to be included in Section 4.1.2.3 they should be in a new subsection titled "Additional requirements for indoor venues".

Champion recommendation: Yes
Champion comments/conversations with authors

I think it is clear from the text that this requirement if only for indoor aquatic facilities. The original text of this section was solely for indoor pools and was not in a separate section.

4.1.2.3.9-0001* TSC No TRC Yes

4.6.2.6.8 Equipment Specifications

Original CR

The technical specifications for each AQUATIC VENUE shall include information on each piece of equipment associated with that AQUATIC VENUE. For air handling equipment, The specifications shall include the following items at a minimum. Sensible cooling capacity, Sensible Heating Capacity, Moisture Removal Capacity (MRC) in lbs.hr, Moisture Removal Efficiency (MRE) as listed in the AHRI Standard 920, CFM of outside air, CFM of Exhaust Air, CFM of Supply Air, voltage, power requirements, design temperature & humidityt

Since the CR is introducing new terms, acronyms and standards, additional text would need to be added to the MAHC. Following is a re-wording of the original CR, plus the additional text that would need to be added. This revised text was approved by the author.

The technical specifications for each INDOOR AQUATIC FACILITY shall include information on each piece of equipment associated with that INDOOR AQUATIC FACILITY. For climate control equipment, the specifications shall include the following items at a minimum: Sensible cooling capacity, Sensible Heating

Deleted: VENUE

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Capacity, Moisture Removal Capacity (MRC) in lbs/hr, Moisture Removal Efficiency (MRE) as listed in the AHRI Standard 920-2020 Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units and/or AHRI Standard 910-2014 Performance Rating of Indoor Pool Dehumidifiers, CFM of outside air, CFM of Exhaust Air, CFM of Supply Air, voltage, power requirements, design temperature and humidity.

For section 3.1 the following additions would be made:

MRC Moisture Removal Capacity
MRE Moisture Removal Efficiency

For section 3.2 the following additions would be made:

"Moisture removal capacity" means the amount of condensate produced by the climate control equipment which includes the effects of reheat coils, circulating fans and other components in the air stream; excluding supplementary heating, cooling or outdoor air; and expressed in pounds of moisture/hour.

"Moisture removal efficiency" means a ratio of the MRC in pounds of moisture/hour to the power input values in kilowatts at any given set of Rating Conditions expressed in pounds of moisture/kilowatt hour.

For section 3.3 the following additions would be made:

Air-Conditioning, Heating, and Refrigeration Institute (AHRI)

- ANSI/AHRI Standard 910 (I-P), 2014 Standard for Performance Rating of Indoor Pool Dehumidifiers
- ANSI/AHRI Standard 920 (I-P), 2020 Standard for Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units

TSC vote for revised and additional text: Unanimous Yes

No public comments

TSC: No. Not technically defensible.
See general comments above.

The elements requested within this Change Request address items that apply to indoor pools only. Yet Section 4.1.2.3 requirements apply to all pool plans, whether the venue is indoors or outdoors.
If the additional requirements listed are to be included in Section 4.1.2.3 they should be in a new subsection titled "Additional requirements for indoor venues".

Champion recommendation: Yes
Champion comments/conversations with authors

I agree with the TSC that a subsection is needed and would like to propose that the added text be put into new section 4.1.2.3.9.1.
This section was edited in this CR and then moved to section 4.6.2 in CR 4.6.2-0002. However, some text needs to remain in 4.1.2.3.2 to apply to all aquatic facilities, so renumbering would help avoid this issue. Only 4.1.2.3.9.1 would be moved.

~~4.1.2.3.13-0002 withdrawn by author~~

Air Delivery Rate The technical specifications for each room that includes a body of water shall include the air circulation rate per hour provided by the air handler system plus any other dedicated air moving

device in this space. The total shall meet the minimum circulation rate as specified in the 2019 version of the ASHRAE Applications Handbook on Natatorium Design.

No public comments

TSC: No. Not technically defensible.
See general comments above.
The requested language seems that it would apply to every room of a building rather than just the natatorium space.

Champion recommendation: No
Champion comments/conversations with authors
This CR is being withdrawn by the ad hoc committee because the requirements are covered un 4.6.2.7.4-0001.

4.1.2.3.14-0002*

4.6.2.7.13.1 Air Filter Media

4.1.2.3.14 Air Filter Media The air filters used should be suitable for elevated humidity levels.

No public comments

TSC: No. Not technically defensible.
See general comments above.
The CR does not provide any direction as to what qualifies as an air filter suitable for elevated humidity levels. Annex data needs to be provided to instruct the plan reviewer what is acceptable.

Champion recommendation: Yes
Champion comments/conversations with authors
I think it would be good for guidance to be added to the Annex on what qualifies as an air filter suitable for elevated humidity levels. Additions to the Annex can be handled directly with CDC and outside of the CMAHC process.

4.2.2.2.1-0001*

4.6.2.6.10.1 Condensation Prevention

INDOOR AQUATIC FACILITY building envelope construction shall include a vapor-retarder/insulation arrangement to assist in preventing the condensation of water on inside envelope of the pool room building surfaces and within any wall,ceiling, glass or floor structure under the coldest outdoor conditions based on the ASHRAE climate data for the project locale or nearest reporting city and the highest design indoor relative humidity.

No public comments

TSC: No. Acceptable only with modification. Not technically achievable.
This code section requires a vapor retarder and insulation arrangement to prevent condensation within an indoor pool space. The proposed language includes glass areas of the building envelope, which are impossible to apply additional insulation or vapor retarders to.

Champion recommendation: I am not sure about this one.

4.2.2.2.1.1-0001*

4.6.2.6.10.2 Weather Data.

4.2.2.2.1.1 Weather Data.

The ASHRAE Dehumidification Weather Data for the facility geographical location shall be used when calculating the effects of the ventilation air to the space it is being introduced. This shall be added to the evaporation load of all water surfaces, and occupant (includes spectators, swimmers and non-swimmers on the deck) latent moisture when sizing the climate control equipment.

No public comments

TSC: No. Acceptable only with modification. Additional research/improvement needed.

Section 4.2.2.2.1 requires an architectural vapor retarder and insulation arrangement to prevent condensation within an indoor pool space. The proposed language appears to be providing direction on what criteria to use when sizing ventilation equipment, which is outside the scope of that section. Perhaps the proposed section was mis-numbered and would better fit within Section 4.2.2.3.

This information is useful direction for an HVAC design engineer. However, we question whether it belongs in the Code document used by the AHJ during plan review and the enforcement mechanism to be used during plan review.

Champion recommendation: Yes

Champion comments/conversations with authors

I think the organizational issue is addressed in 4.6.2-0002.

I think the sub-committee should consider whether this repetition is needed given 4.6.2.5-0001.

4.2.2.3.3-0001* TSC No TRC Yes

4.6.2.6.9 Indoor Aquatic Facility Air Pressure

Changes to the CR accepted by the author:

Indoor Aquatic Facility Air Pressure shall be relative to the areas external to it (such as adjacent indoor spaces or outdoor ambient space). The AQUATIC FACILITY AIR HANDLING SYSTEM design, construction, and installation shall comply with the 201~~1~~9 negative pressure recommendation as outlined in the ASHRAE Applications Handbook on ~~Natatorium~~ Indoor Pool Design and the ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality, and/or applicable local CODES.

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TRC comment: Need to add statement at beginning of 4.6.2-0002 about how air supported and temporary structures are not covered by the requirements in section 4.6.2 of this code. Need to look at details to see if any of the provisions would be applicable (e.g. chemical storage spaces for an air supported structures).

TRC vote: Unanimous Yes.

No public comments

TSC: No. Additional research/improvement needed

Agree with updating the language in the MAHC to reflect the current language used by the referenced organization.

We question whether the referenced "2019 negative pressure recommendation as outlined in the ASHRAE Applications Handbook on Indoor Pool Design" should be revised to read "negative pressure recommendation as outlined in the Indoor Pool Design Chapter within the 2019 ASHRAE Applications Handbook -- HVAC Applications".

The Annex for this section discusses air-pressure supported indoor aquatic facilities. Yet the proposed language adds a conflicting reference to "negative pressure recommendation". Additional work will be required to continue to allow air pressure supported structures to be utilized for indoor pool spaces.

No supporting documentation was provided to justify exclusion of positive air pressure within indoor aquatic spaces.

The TSC does not recommend approval until the conflict between negative pressure recommendation and the air supported structures reference in the Annex is resolved.

Champion recommendation: Yes as edited
Champion comments/conversations with authors
This CR was a duplicate of 4.6.2.7.7-0001, so 4.6.2.7.7-0001 was deleted and the text for 4.2.2.3.3-0001 was expanded (see edits above).
Here is the text for 4.6.2.7.7-0001 for reference. The TSC accepted this CR.

Negative Air Pressure AIR HANDLING SYSTEM and/or independent exhaust systems air flow shall be designed to maintain negative air pressure in the INDOOR AQUATIC FACILITY relative to the areas external to it (such as adjacent indoor spaces and outdoor ambient space).

4.2.2.3.3.1-0001*

4.6.2.6.9.1.1

Chemical Storage Space Air Pressure AIR HANDLING SYSTEM design for CHEMICAL STORAGE SPACES shall conform to the International Mechanical Code or Uniform Mechanical Code, and either the International Fire Code or the NFPA 1 Fire Code, and any applicable local CODES.

4.2.2.3.3.1.1 This AIR HANDLING SYSTEM is independent from the INDOOR AQUATIC FACILITY Climate Control System and shall not be interconnected.

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More edits needed.

No public comments

TRC comments
The definition of INDOOR AQUATIC FACILITY is important here, particularly the last sentence highlighted below:

"Indoor Aquatic Facility" means a physical place that contains one or more aquatic venues and the surrounding bather and spectator/stadium seating areas within a structure that meets the definition of "Building" per the 2012 International Building Code (IBC). It does not include equipment, chemical storage, or bather hygiene rooms or any other rooms with a direct opening to the aquatic facility. Otherwise known as a natatorium.

Therefore, this CR is not requiring that the chemical storage space area have its own separate air conditioner, heater and dehumidifier. The storage space can pull air from non-aquatic venue portions of the building such as the lobby and locker rooms.

TSC: No. Acceptable only with modification. Not technically defensible.

Agree that the proposed change is a best practice for chemical room design. However, a fundamental premise for the MAHC is that the document must be based on science. The committee on ventilation is proposing that we add a requirement to the Code and has not included any supporting documents or explanation as to why this addition is necessary.

Is the requirement already within all of the referenced mechanical codes?

Suggest that the TRC consider combining this CR with the language change proposed in CR 4.2.2.3.3.1-0002

AIR HANDLING SYSTEM design for CHEMICAL STORAGE SPACES shall conform to the International Mechanical Code or Uniform Mechanical Code, and either the International Fire Code or the NFPA 1 Fire Code, and all applicable federal, state, or local laws, rules, regulations, or ordinances ~~any applicable local CODES~~.

Commented [ME-C1]: Text inserted by champion.

The TSC withholds recommending approval pending submittal of supporting documentation justifying the addition to the code that may be included in the Annex.

Champion recommendation: Not sure

Champion comments

I am wondering if this additional requirement is necessary given the following provisions that are already in the MAHC for chemical storage spaces:

4.9.2.1.2 Minimize Vapors Where such materials must be stored in a building intended for occupancy, the transfer of chemical fumes and vapors from the CHEMICAL STORAGE SPACE to other parts of the building shall be minimized.

4.9.2.2.4 Minimize Fumes The construction and operation of a CHEMICAL STORAGE SPACE shall minimize the transfer of chemical fumes into any INTERIOR SPACE of a building intended for occupation.

4.9.2.2.6A No Openings There shall be no permanent or semi-permanent opening between a CHEMICAL STORAGE SPACE and any other INTERIOR SPACE of a building intended for occupation unless compliant with MAHC 4.9.2.4.3, 4.9.2.4.4, and 4.9.2.4.5.

4.9.2.5A Interior Chemical Storage Spaces

4.9.2.5.1A No Air Movement There shall be no transfer grille, pass-through grille, louver, or other device or opening that will allow air movement from the CHEMICAL STORAGE SPACE into any other INTERIOR SPACE of a building intended for occupancy or into another CHEMICAL STORAGE SPACE.

4.9.2.5.2A Electrical Conduit System Interior CHEMICAL STORAGE SPACES that share any building surface (wall, floor, ceiling, door, etc.) with any other INTERIOR SPACE shall be equipped with a ventilation system that operates continuously and ensures that all air movement is from all other INTERIOR SPACES and toward the CHEMICAL STORAGE SPACE.

4.9.2.5.2.1 Additional Interior Space Interior CHEMICAL STORAGE SPACES that share an electrical conduit system with any other INTERIOR SPACE shall be equipped with a ventilation system that operates continuously and ensures that all air movement is from all other INTERIOR SPACES and toward the CHEMICAL STORAGE SPACE.

4.9.2.5.2.2A Pressure Difference This pressure difference shall be maintained by a continuously operated exhaust system used for no other purpose than to remove air from that one CHEMICAL STORAGE SPACE.

4.9.2.5.2.3 Separate Exhaust System Where more than one CHEMICAL STORAGE SPACE is present, a separate exhaust system shall be provided for each CHEMICAL STORAGE SPACE.

4.9.2.5.2.3.1 Airflow Rate The exhaust airflow rate shall be the greater of the:

1) OSHA requirements for working in such enclosed spaces, or
2) Amount needed to maintain the concentration of vapors or fumes below the PEL for the expected exposure time (defined by 29 CFR 1910.1000 (OSHA)) for each stored chemical, or
3) Amount specified by International Mechanical Code, or
4) Amount specified by the Uniform Mechanical Code, or
5) Amount needed to maintain the specified pressure difference.

4.9.2.5.2.4A Alarm The function of this exhaust system shall be MONITORED continuously by an audible differential-pressure alarm system which shall sound if the specified differential air pressure is not maintained for a period of thirty minutes.

4.9.2.5.2.4.1 Minimum Output This alarm shall have a minimum output level of 85 dbA at 10 feet (3.0 m).

4.9.2.5.2.4.2 Manual Reset The specified alarm shall require manual reset to silence it.

4.9.2.6 Air Ducts in Interior Chemical Storage Spaces

4.9.2.6.1A No Air Movement No duct shall allow air movement from the CHEMICAL STORAGE SPACE into any other INTERIOR SPACE of a building intended for occupation or into any other CHEMICAL STORAGE SPACE.
4.9.2.6.2 Chemical Storage Air ducts shall not enter or pass through an interior CHEMICAL STORAGE SPACE.
4.9.2.6.2.1 Corrosion-Resistant Exception: A corrosion-resistant duct used for no other purpose than to exhaust air from the CHEMICAL STORAGE SPACE shall be acceptable.
4.9.2.6.2.1.1 Building Exterior This corrosion-resistant duct shall exhaust to the exterior and must end at a point on the exterior of the building, at least 20 feet (6.1 m) from any air intake for breathing air, cooling air, or combustion air.
4.9.2.6.2.2 Makeup Air Exception: A duct used for no other purpose than to supply makeup air to the CHEMICAL STORAGE SPACE shall be acceptable.
4.9.2.6.2.2.1 Building Exterior This makeup air supply duct shall end at a point on the exterior of the building, at least 20 feet (6.1 m) from any air intake for breathing air, cooling air, or combustion air.
4.9.2.6.2.3 Other Ducts Exception: Any other ducts specifically allowable by applicable building and mechanical CODES where such ducts are corrosion-resistant and joint-free to the extent feasible shall be acceptable.

4.2.2.3.4.1-0001* TSC Yes

4.6.2.6.10.3 Insulated Duct Exterior

Insulated Duct ~~Exterior~~ Any system duct work located in an area not being conditioned ~~Ducts~~ shall be insulated on the exterior of the duct with a mold-resistant material where the surface temperature of the duct is capable of being less than the airstream temperature within the duct.

No public comments

TSC: Yes. Acceptable as submitted

Agree that the proposed change is a best practice for duct design.

A fundamental premise for the MAHC is that the document must be based on science. The committee on ventilation is proposing that we add a requirement to the Code and has not included any supporting documents or explanation as to why this addition is necessary.

Champion: Yes.

4.6.2.5-0001* TSC No TRC Yes

4.6.2.5.1 Weather Data.

4.6.2.5 ASHRAE 62.1 Compliance
INDOOR AQUATIC FACILITY AIR HANDLING SYSTEM design, construction, and installation shall comply with ASHRAE Standard 62.1 201~~3~~9, Ventilation for Acceptable Indoor Air Quality, and/or applicable local CODES with additional requirements as stated in MAHC 4.6.2.6.
4.6.2.5.1 Weather Data.
The ASHRAE Dehumidification Weather Data for the facility geographical location shall be used when calculating the effects of the ventilation air to the space it is being introduced. This shall be added to the evaporation load of all water surfaces when sizing the climate control equipment.

TRC: Reference date in 4.6.2.5 may be removed if possible during the formatting process.
TRC vote: Unanimous Yes

No public comments

TSC: No. Not technically defensible. Additional research/improvement needed.
Agree with updating the reference to the 2019 edition of ASHRAE 62.1.

Added Section 4.6.2.5.1. No justification has been provided to substantiate the request. If new requirements are being added to the MAHC, there needs to be supporting information to justify the request.

This CR should have been divided to separate the updated ASHRAE reference from the text that is proposed for addition to the section.

The TSC recommends against adding requirements without justification, substantiating data, or other supporting information.

Champion recommendation: No
Champion comment
It makes logical sense that you would need to account for the temperature and humidity of the outdoor air when sizing control equipment. However, I am not sure this text is needed given the text in 4.2.2.2.1.1-0001 (or section 4.6.2.6.10.2.as it appears in CR 4.6.2-0002). The text in 4.2.2.1.1-0001 is more complete.

4.6.2.6-0001* TSC No TSC Yes

4.6.2.6
Original CR
~~Air Handling System Design~~ Temperature and Humidity Control
TRC proposed language that was accepted by the author
Indoor air quality control

No public comments

TSC comments
The new proposed text is more broad and should address the TSC concerns.
TSC: vote unanimous Yes for TRC proposed language

TSC: No. Not technically defensible
We disagree with the proposed title change. The title "Temperature and Humidity Control" does not adequately address ventilation, exhaust, or outside air issues addressed throughout 4.6.2.6.

No justification has been provided to substantiate the request.

The TSC recommends against this change without additional justification, substantiating data, or other supporting information.

Champion suggested change: Climate control system design.
I think this would address the TSC concerns as well as being consistent with other wording changes in this group of CRs.

4.6.2.6.2-0001* TSC No TRC Yes

4.6.2.6.4 Design Factors and Performance Requirements

CR text with changes approved by the author

4.6.2.6.2 Design Factors and Performance Requirements. The AIR HANDLING SYSTEM design engineer shall provide plan drawings and documentation with the following components showing the design meets the performance requirements per MAHC 4.6.2.7:

1) Building layout identifying the geographic location of the INDOOR AQUATIC FACILITY;
2) INDOOR AQUATIC FACILITY size including area in square feet and height, ~~volume in cubic feet~~;
3) The surface area for Dry DECK, PERIMETER DECK, POOL DECK, pool water surface and for STADIUM SEATING sections (should add up to total area in item 2);
4) THEORETICAL PEAK OCCUPANCY per AQUATIC VENUE, spectator and DECK spaces;
5) Placement of AIR HANDLING SYSTEM and other building outdoor air intakes exterior to the building;
6) Placement of AIR HANDLING SYSTEM and other building exhaust vents exterior to the building;
7) Placement of return air intakes within the INDOOR AQUATIC FACILITY;
8) Placement of supply air locations within the INDOOR AQUATIC FACILITY;
9) Identify system capabilities, if ~~utilized~~ provided, to automatically or manually modulate the amount of outdoor air for the purposes of reducing the number of cfm of outdoor air when occupancy in stadium seating sections is lower than THEORETICAL PEAK OCCUPANCY; and
10) Identify system design to maintain negative air pressure in the INDOOR AQUATIC FACILITY relative to the indoor areas external to it, and/or to the outside of the facility.
11)Heating, Cooling, and Dehumidification Load Calculations including design envelope sensible cooling loads, envelope heating loads, ventilation sensible and latent loads, spectator sensible and latent loads (if applicable) and pool evaporation loads.

Deleted: in square feet

TRC discussion

In ASHRAE, the swimmers are accounted for in the pool surface area. Therefore, for air handling, THEORETICAL PEAK OCCUPANCY only applies to non-swim areas. Spectator areas are the only areas where the occupancy is additive to the HVAC calculations.
ASHRAE calculations are all minimums, so you would not have any turn down in the swimmer areas while they are occupied. Turn downs would only be allowed for seating areas.

Text should be added to the Annex to explain that the ASHRAE definition of “wet deck” is equivalent to the sum of the PERIMETER DECK and POOL DECK as defined in the MAHC.

Commented [ME-C2]: I think we should discuss this in the sub-committee meeting. The bather load will have a huge effect on the amount of chloramines being produced and agitation of the water that will lead to volatilization of the chloramines. Perhaps some annex text is in order to explain that the requirements proposed here are the bare minimum and that the requirements will increase with increasing bather load.

TRC vote: unanimous Yes.

No public comments

TSC: No. Acceptable only with modification. Additional research/improvement needed.

Item 1. Agree with adding the word "geographic"
Item 2. Disagree with revising the language "volume in cubic feet" to "height". The term "height" does not address natatorium spaces that may have multiple ceiling heights, or a sloping ceiling.
Item 3. Disagree with revising the term "DECK" with the terms "DRY DECK, PERIMETER DECK, POOL DECK". These terms are all contained within the definition of DECK contained in Section 3.2, Page 14. Suggest revising the term "pool water surface" with "pool water surface area". The proposed explanation of the total within parenthesis should be moved to the Annex.
Item 4. Agree with adding the term "spectator"
Item 9. Agree with revising the term "utilized" with "provided". The system designer has no control over whether any system is utilized once it is installed. Disagree with the addition of "in stadium seating

sections". Not every natatorium has spectator or stadium seating and facilities should not be required to run the HVAC system at full capacity during periods of low use.
Item 10. Further clarification is required regarding the proposed addition of ", and/or to the outside of the facility.
Item 11. Disagree with the addition of code language that requires the designer to provide calculations as part of a drawing or submittal package. The Mechanical Engineer sealing the drawings is responsible for the calculations and should not be required to submit that information to the plan reviewer. We also disagree that the language belongs within the MAHC. If required, the language belongs in an ASHRAE standard or the International Mechanical Code.

When referring to the various areas of the natatorium space in Item 3, which the author contends should add up to the total, where does a perimeter gutter get included in the calculation? Perhaps a revised definition of "Perimeter Deck" is needed in Section 3.2 to clearly identify the perimeter gutter as part of the perimeter deck?

The justification has been provided to substantiate the request is to align with the language within current ASHRAE publications. We question whether the requirements belong in the MAHC at all if we are duplicating, or possibly conflicting with, requirements of another code document.

The individual changes within this request should have each been submitted as separate Change Requests.

The TSC recommends against this change without additional justification, substantiating data, or other supporting information.

Champion

1) Yes
2) Yes
3) Yes, even though the different kinds of deck are spelled out in MAHC 3.2, with the current MAHC wording, it is not clear that the area of each kind of deck needs to be provided separately.
4) Yes
9) Yes
   Following is text from section 5.6.2 for operation of HVAC systems that should also be considered.
   5.6.2.4.1 System Operation The AIR HANDLING SYSTEM shall operate continuously, including providing the required amount of outdoor air.
   5.6.2.4.1.1 Operation Outside of Operating Hours Exception: During non-use periods, the amount of outdoor air may be reduced by no more than 50% as long as acceptable air quality is maintained.
   See MAHC 4.6.2.7 and associated CRs for more on turn downs.
10) I think there may be some confusion about “and/or”. Would it be sufficient to maintain a negative air pressure relative to the outside, but not to other indoor areas?
11) Yes

4.6.2.6.4-P0313*

4.6.2.6.12. Air Delivery Rate

~~AIR HANDLING SYSTEM design may not consider mechanical fans used to push air within the space as part of the outdoor air calculations for the INDOOR AQUATIC FACILITY as defined in MAHC 4.6.2.7.~~

No public comments

TSC: No. Acceptable only with modification. Additional research/improvements needed
We agree that if the requirement is identified elsewhere in the MAHC, that it should not be identified in multiple locations.

As design professionals, we see value in the section remaining within the MAHC.

No substantiating data or supporting information was provided.

The TSC does not recommend approval without identification of the other location(s) within the code that the item is addressed.

Champion recommendation: I am ambivalent.
Champion comments/conversations with authors
Statement from authors
The existing statement in this CR is confusing in the fact that it mentions mechanical fans that push the air around within the space and then mentions the outside air requirements. Fans that push the air around have nothing to do with outside air being introduced. This section needs to be deleted as submitted.

These mechanical fans that push air around are covered in section 4.6.2.6.4.1-0001
Champion comments
I am ambivalent on this one because I don't think the statement needs to be removed, nor do I think it needs to stay.
The intent of 4.6.2.6.4.1 is to say that you can use mechanical fans used to push air within the space in the calculation for air delivery rate. However, I think it may still serve a purpose to make sure that it is explicitly prohibited for mechanical fans used to push air within the space to be included in the outdoor air calculations. It should be obvious that fans that push the air around have nothing to do with outside air being introduced. So I don't think the text is necessary, but I don't think it hurts to keep this text in the MAHC.

4.6.2.6.4.1-0001*

4.6.2.6.12. Air Delivery Rate

4.6.2.6.~~4.1~~ Air Delivery Rate Mechanical fans used to push air within the space may be used in the calculation for air delivery rate per MAHC 4.6.2.7.5 ~~(TURNOVER)~~.

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Note: The numbering referenced in this CR reflects new numbering per the Re-organization CR for the entire ventilation related section

No public comments

TSC: No Acceptable only with modification. Additional research/improvement needed.
We agree with providing the referenced section number for the noted calculation.

However, the CR refers to a revised section number that is only valid if CR 4.6.2-0002 is accepted. The CR needs to be rewritten to be a stand alone change. Acceptance of this CR as written without acceptance of CR 4.6.2-0002 does not provide a useable reference within the MAHC.

We agree with replacing the defined term TURNOVER in this context. The definition of TURNOVER within Section 3.2 is the period of time required to circulate a volume of water equal to the capacity of the aquatic venue. In this context, we are discussing recirculating a volume of air equal to the volume of the room that the aquatic venue is located.

The TSC does not recommend approval unless it is rewritten as a stand alone CR independent of CR 4.6.2-0002

Champion: Yes with changes
Proposed text, using the old numbering scheme:

4.6.2.6.4.~~1~~ Air Delivery Rate Mechanical fans used to push air within the space may be used in the calculation for air delivery rate per MAHC 4.6.2.7.4 ~~(TURNOVER)~~.

The number 4.6.2.7.5 would remain in the version of this CR that appears in 4.6.2-0002.

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4.6.2.7-0001*

4.6.2.7.1
Performance Requirements for Air Handling Systems
4.6.2.7.1 The air handling system shall be designed to maintain the space temperature, relative humidity and dewpoint as defined in Section 4.6.2.6.3. The design shall achieve the following objectives:

1. Maintaining homogeneous air quality, space temperature, relative humidity, and negative space pressure
2. Delivering outside air to the breathing zone of swimmers, people on the deck, and spectators
3. Provide low velocity airflow low across water surfaces to prevent build-up of DBPs Note: If the air velocity is greater than 30fpm across the water surface, the empirical Equation 1 Evaporation Formula as listed in the ASHRAE 2019 Applications Handbook, Indoor Pool Chapter must be used. This evaporation formula allows the entry of the actual air velocity across the water surface.
4. Assist in removing DBPs from the space
5. Provide a comfortable environment for occupants in all zones of the natatorium (with an emphasis on swimmers

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RE-Number existing 4.6.2.7.1 to 4.6.2.7.2 and then subsequent sections

No public comments

TSC: No. Not technically defensible.

We believe the CR has merit in principle. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

Should the 'breathing zone' be further defined? We believe it should be in order to provide guidance to the design professional. (i.e. Delivering outside air to the breathing zone of swimmers, people on the deck, and spectators.) Also has the cost impact of this be evaluated.

There is no documentation provided to support the 30 fpm air velocity. (Provide low velocity airflow low across water surfaces to prevent build-up of DBPs Note: If the air velocity is greater than 30fpm across the water surface adjustments in the evaporation formula listed in the ASHRAE Handbook must be modified to compensate for the increased evaporation.) If this CR is accepted, documentation should be provided. The author should consider making this a separate paragraph. The purpose of the 4.6.2.7 should be to give an overview, not specific design parameters.

Any documentation provided should be included in the Annex

There is nothing enforceable in the proposed language. The entire section would be better suited for the Annex.

Champion comment: I agree that this may be better suited to the Annex because no measurable/enforceable criteria are set.

4.6.2.7.1-0001*

4.6.2.7.2 Minimum Outdoor Air Requirements

4.6.2.7.1 Minimum Outdoor Air Requirements. The AIR HANDLING SYSTEM shall have a design capability to supply no less than the minimum outdoor air requirements using ASHRAE Standard 62.1 2013~~6~~, Ventilation for Acceptable Indoor Air Quality.

4.6.2.7.1.1 The Minimum Outdoor Air Requirements may be higher than the amount calculated using ASHRAE Standard 62.1 2016 Table 6.2.2.1 as determined by the Registered Design Professional.

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No public comments

TSC: Acceptable only with modification
See general comments above.

Agree with updating the ASHRAE reference to the 2016

We agree with this CR. Paragraph 4.6.2.7.1.1 provides clarification for the design professional.

This CR should be divided into two separate CRs. The first, 4.6.2.7.1, updating the ASHRAE reference. The second, 4.6.2.7.1.1, adding the section.

This information is useful direction for an HVAC design engineer. However, we question whether it belongs in the Code document used by the AHJ during plan review and the enforcement mechanism to be used during on-site inspection. The proposed language for 4.6.7.2.1.1 gives the mechanical Engineer of Record the option to increase the Minimum Outdoor Air requirement, but there is nothing enforceable in the section. The added language would be better suited for the Annex.

Champion: Yes. I think the change to 4.6.2.7.1 with the addition of the words “no less than” may be sufficient, but I don’t think it hurts to add 4.6.2.7.1.1.

4.6.2.7.2-0001*

4.6.2.7.3 System Alarm

4.6.2.7.2 System Alarm. The AIR HANDLING SYSTEM design shall provide system features to notify the operator if the outdoor air flow rate entering the INDOOR AQUATIC FACILITY is below ~~0.48 cfm/ft2 (1.8 m3/h)~~ the minimum amount as designated by the Design Professional for each mode of operation (e.g. occupied normal mode, occupied meet mode, unoccupied mode).

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No public comments

TSC: No. Additional research/improvement needed
See general comments above.

The system alarm should be set to the design point established by the Engineer/Designer of Record.

However, if we are eliminating a minimum parameter, Annex language should be included to provide some direction on how to determine the alarm set point. This may be a detailed explanation or a reference to an existing ANSI or ASHRAE standard.

No guidance was provided to show a plan reviewer what the alarm notification points should be set at. There is no explanation of why the minimum set point was proposed to be deleted.

Champion: Yes. Annex material can be added outside of the CMAHC process.

4.6.2.7.3-0001*

4.6.2.7.4 Real-Time Occupancy

4.6.2.7.3 Real-Time Occupancy. Design of the AIR HANDLING SYSTEM for stadium seating areas shall meet the requirements in ASHRAE 62.1-2019 for the Area Outdoor Air Rate (0.06 cfm/ft2) and the People Outdoor Air Rate (7.5 cfm/person) ~~shall meet the requirements for the number of cfm/ft2~~ based on the THEORETICAL PEAK OCCUPANCY of the stadium seating area.

No public comments

TSC: No. Not technically defensible. Additional research/improvement needed.

We believe the CR has merit in principle. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

We question the use of 'stadium seating.' If it is to be used it should have a definition in 3.2 and/or the Annex to provide guidance to the design professional. The term can be interpreted a number of ways. Is it capacity? Height? Only permanent seating?

There might be other venue types were ‘stadium seating’ might not apply. For example, swim schools will have spectators. But the term stadium won’t be applicable.

Removing ‘stadium seating’ for the CR is accepted.

The proposed language changes the intent of the code from applying to the entire indoor venue air space to only applying to the capacity of a stadium seating area. Perhaps the proposed language should be added as a subsection addressing "spectator seating areas". The design criteria for overall natatorium occupancy should remain in the code.

More information is needed regarding real time occupancy needs to address the increased air requirements for stadium or spectator seating.

Champion recommendation: Yes

Champion comments:

Stadium seating is defined in MAHC 3.2. It is hidden under Theoretical Peak Occupancy:

> “Stadium Seating” means an area of high-occupancy seating provided above the pool level for observation.

In ASHRAE 62.1 2019, Table 6-1 provides minimum ventilation rates. The rates vary depending on the occupancy category. The choice of occupancy category for pools is straightforward since there is only once category that applies (“Swimming (pool and deck)”. The requirement for 0.48 cfm/ft2 for swimming pools is in Table 6-1, and this requirement is implied in MAHC 4.6.2.5 that requires compliance with ASHRAE 62.1. The pool category does not have a cfm/person requirement in Table 6-1, therefore there is

no way to account for the bather load in the ASHRAE calculations, and the THEORETICAL PEAK OCCUPANCY is irrelevant for the pool and deck area indoor air requirements.

However, if an aquatic venue has a stadium seating area, the choices are not as straightforward and include "Multiuse assembly" under the educational facilities heading, "multipurpose assembly" under the Hotels, Motels, Resorts, Dormitories heading, "Auditorium seating area" under the Public assembly spaces heading, or "spectator areas" under the Sports and Entertainment heading. This CR provides clarity about which requirements apply to these areas, and how to apply those requirements.

4.6.2.7.3.1-0001*

4.6.2.7.4.1 Method to Determine

4.6.2.7.3.1 Method to Determine. If a method to determine real-time actual occupancy is available for stadium seating areas , then the system may modulate to reduce outdoor air cfm to meet the requirement for the actual occupancy in those areas for the associated time frame.

No public comments

TSC: No. Acceptable only with modification
Same comments regarding definition of stadium seating.

We believe the CR has merit in principle. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

We recommend remove 'stadium seating' if the CR is accepted.

The proposed language changes the intent of the code from applying to the entire indoor venue air space to only applying to the capacity of a stadium seating area. Perhaps the proposed language should be added as a subsection addressing "spectator seating areas". The design criteria for overall natatorium occupancy should remain in the code.

Champion: Yes
As indicated in the comments for 4.6.2.7.3-0001, the number of people doesn't enter into the calculations for air handling of pools and decks. Since the ASHRAE 62.1 requirements are minimum requirement, the air flow cannot be reduced below these requirements, except when the facility is unoccupied (see MAHC 5.6.2.4.1.1). Only in stadium seating areas would it be acceptable to reduce the outdoor air cfm while the area is in use.

4.6.2.7.4-0001*

4.6.2.7.5 Air Delivery Rate

4.6.2.7.4 Air Delivery Rate. The AIR HANDLING SYSTEM shall supply an air delivery rate as defined in ASHRAE Handbook – HVAC Applications 201~~9~~9, ~~Places of Assembly, Natatoriums~~ Indoor Pool Design. The Air Delivery Rate is the supply cfm of the air handler system(s) comprised of a combination of outside air and return air minus any exhaust air if exhausted within the air handler itself. The air delivery rate shall be sufficient to meet the latent and sensible cooling loads and the heating loads of the space, and to meet the requirements of the Air Distribution System defined in Sections 4.6.2.7.6 through 4.6.2.7.9

No public comments

TSC: No. Additional research/improvement needed
See general comments above.

We agree with updating the ASHRAE reference and replacing "Places of Assembly, Natatoriums" with "Indoor Pool Design" if that is the language in the referenced ASHRAE Handbook.

The definition of Air Delivery Rate included in the CR should be added to section 3.2 - "The Air Delivery Rate is the supply cfm of the air handler system(s) comprised of a combination of outside air and return air minus any exhaust air if exhausted within the air handler itself."

The remaining added text should be a new subsection 4.6.2.7.4.1 "The air delivery rate shall be sufficient to meet the latent and sensible cooling loads and the heating loads of the space, and to meet the requirements of the Air Distribution System defined in Sections 4.6.2.7.6 through 4.6.2.7.9."

The line "…sufficient to meet the latent and sensible cooling loads…" seems like it is wide open to intrepretation. Is this a defined term in HVAC language? Perhaps this line is better suited for a mechanical code or ASHRAE standard.

We see nothing in the proposed revised text that adds clarity to the section.

Champion: Yes with numbering changes made based on TSC comments, see below:

4.6.2.7.4 Air Delivery Rate. The AIR HANDLING SYSTEM shall supply an air delivery rate as defined in ASHRAE Handbook – HVAC Applications 201~~9~~, ~~Places of Assembly, Natatoriums~~ Indoor Pool Design.

Section 3.2
AIR DELIVERY RATE means the supply cfm of the air handler system(s) comprised of a combination of outside air and return air minus any exhaust air if exhausted within the air handler itself.

4.6.2.7.4.1
The air delivery rate shall be sufficient to meet the latent and sensible cooling loads and the heating loads of the space, and to meet the requirements of the Air Distribution System defined in Sections 4.6.2.7.6 through 4.6.2.7.9

4.6.2.7.5-0001*

4.6.2.7.6 Consistent Constant Air Flow

4.6.2.7.5 ~~Consistent~~ Constant Air Flow. INDOOR AQUATIC FACILITY AIR HANDLING SYSTEM shall be designed to provide ~~consistent~~ continuous air flow through all parts of the INDOOR AQUATIC FACILITY to ~~preclude~~ minimize ~~any~~ stagnant areas ,stratification of temperature and humidity, and provide homogeneous air quality, space temperature, relative humidity, and pressure throughout the space.

No public comments

TSC: No. Not technically defensible.
See general comments above.

The proposed language adds performance criteria without any enforceable provisions or tangible minimum requirements. We question the need to add the proposed language. Perhaps the additional language would be better placed within the Annex as a guidance rather than in the Code as a requirement.

Champion: Yes. The TSC's argument could also apply to the existing text. The new text is an improvement since it provides categories of things that could be measured to ensure homogeneity (e.g. temperature and humidity).

4.6.2.7.6-0001* TSC Yes

4.6.2.6.10.4 Relative Humidity

The AIR HANDLING SYSTEM shall maintain the relative humidity in the space as defined in ASHRAE Handbook: HVAC Applications, 201~~9~~, Chapter 6 ~~Places of Assembly, Natatoriums~~.

No public comments

TSC: Yes, Acceptable as submitted.
Agree with updating the ASHRAE reference to the 2019

Champion: Yes

4.6.2.7.6.1-0001*

4.6.2.6.10.5 Dew Point

4.6.2.7.6.1 Dew Point. The AIR HANDLING SYSTEM shall be designed to maintain the dew point as defined in Technical Details section 4.6.2.6.3 item 5. The design team shall design the enclosure to limit condensation on interior surfaces of the aquatic SPACE ~~less than the dew point of the interior walls~~ as prescribed by the architect to ensure condensation is avoided on wall, ceiling, glass and floor interior surface as well as the interior structure of these building components at all times so as to prevent damage to structural members and to prevent biological growth on walls.

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No public comments

TSC: No. Not technically defensible.
See general comments above.

We question the addition of 'as prescribed by the architect.' This assumes this is provided by architect, or another design professional. What if that is not provided?

The CR references 4.6.2.6.3 item 5. Is that correct? 4.6.2.6.3 is for Other Air Handling Systems. It's not related to dew point.

Any documentation provided should be included in the Annex

Cost impact is unknown based on undefined parameters within the text.

There is no enforcable criteria for a health department AHJ plan reviewer to assess within the revised language.

The language is written more as guidance for a mechanical designer than an enforcable requirement. Perhaps it is better suited for inclusion in the Annex.

Champion Yes
In the current MAHC, the section referenced in the CR (4.6.2.6.3) is 4.1.2.3.2. If CR 4.6.2-0002 is not accepted, then the CR should read:

4.6.2.7.6.1 Dew Point. The AIR HANDLING SYSTEM shall be designed to maintain the dew point as defined in Technical Details section 4.1.2.3.2 item 5. The design team shall design the enclosure to limit condensation on interior surfaces of the aquatic SPACE ~~less than the dew point of the interior walls~~ as

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prescribed by the architect to ensure condensation is avoided on wall, ceiling, glass and floor interior surface as well as the interior structure of these building components at all times so as to prevent damage to structural members and to prevent biological growth on walls.

4.6.2.7.6.2-0001* TSC Yes

4.6.2.7.7 Condensation & Mold Control

The AIR HANDLING Distribution SYSTEM shall be designed ~~to achieve several objectives including~~ to inhibit condensation and mold by: 1) Maintaining homogenous space conditions, ~~2) Delivering the outside air to the breathing area,~~ and 2) Flushing the outside walls and windows, which can have the lowest surface temperature and therefore the greatest chance for condensation.

No public comments

TSC: Yes. Acceptable as submitted.

The CR has merit in principle. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

Does not provide justification for the removal of 'Delivering the outside air to the breathing area.'

Any documentation provided should be included in the Annex.

Agree with removing the objective of 'Delivering outside air to the breathing area' since that objective has nothing to do with the title of the section, 'Condensation and Mold Control'.

The other changes are editorial and clarify the intent of the section.

Champion: Yes

~~4.6.2.7.7-0001* TSC Yes, withdrawn~~

4.6.2.7.8 Negative Air Pressure

Negative Air Pressure AIR HANDLING SYSTEM and/or independent exhaust systems air flow shall be designed to maintain negative air pressure in the INDOOR AQUATIC FACILITY relative to the areas external to it (such as adjacent indoor spaces and outdoor ambient space).

No public comments

TSC: Yes. Acceptable as submitted.

The CR is acceptable. It provides clarification and guidance for the design professional.

The proposed language is a reasonable clarification of system design. It includes independent exhaust systems such as chemical rooms or surge tanks in the overall calculation of supply air from the natatorium HVAC system to verify that the air pressure in the space remains negative.

Champion recommendation: No
Champion comments/conversations with authors
This CR was a duplicate of 4.2.2.3.3-0001, so 4.6.2.7.7-0001 was deleted and the text for 4.2.2.3.3-0001 was expanded.

4.6.2.7.8-0001 TSC Yes

Annex text

It is the MAHC's intent not to limit the development of new technologies. Although the efficacy of these technologies are not readily apparent, in the future there is a hope that the CODE will allow for the design professional to decrease the outside air requirements when secondary technology is used and the design professional can prove the efficacy of the added technology. Other methods and technology for decreasing DBPs include: * Ventilating surge tanks to remove off-gassing TRICHLORAMINE before the water re-enters the POOL area, and * Use of a cooling tower to force water to off-gas TRICHLORAMINE before reintroducing water to the POOL area.

Low exhaust placed near aquatic venue surfaces such that they remove the highest concentration of airborne DBP contaminated air are effective to remove tri-chloramines from breathing zone. Proper placement of exhaust, return intakes and supply air will promote better overall air movement and can successfully reduce total concentration of tri-chloramine below "odor" levels.

No public comments

TSC: Yes. Acceptable as submitted.

CR is acceptable as written for inclusion in the Annex.

Champion:Yes

4.6.2.7.8-0002* TSC Yes

4.6.2.7.9 Disinfection By-Product Removal

Sufficient return/exhaust air intakes shall be placed near AQUATIC VENUE surfaces such that they remove the highest concentration of airborne DBP contaminated air.

No public comments

TSC: Yes, acceptable as submitted

We believe the CR is acceptable. It provides clarification and guidance for the design professional.

No revision to the Annex is required for this change.

No substantiating data or supporting information was provided.

Champion: Yes

4.6.2.7.8.1-0002*

4.6.2.7.9.1.1

4.6.2.7.8.1 Airflow Across Water Surface. The AIR HANDLING SYSTEM shall be designed considering airflow across the water surface to promote removal of DBPS.

4.6.2.7.8.1.1 Sufficient return air intakes shall be placed low in the space near aquatic venue surfaces such that they draw air across the water surfaces and pull in the highest concentration of airborne DBP contaminated air.

No public comments

TSC: No. Additional research/improvement needed

We believe the CR has merit in principle. The intent to locate air intakes in close proximity to the source of the DBPs is reasonable and logical. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

The basis of the section as currently written in the Code requires sufficient return air intakes be placed near the Aquatic Venue water surfaces. More research is required to determine what a "sufficient" quantity is for a plan reviewer to assess whether or not this requirement has been met.

The TSC recommends against approval without additional supporting information and defined parameters to provide design guidance and enforceable direction.

Champion: Yes

Documentation to confirm the validity may be found in the following excerpts from 2019 ASHRAE Handbook-HVAC Applications Chapter 6, Indoor Swimming Pools.

1. Design Components, Exhaust Air
   - Low exhaust air at or near the surface of the pool water surface should also be evaluated to assist in evacuating any chloramines from the space.
2. Design Issues, Ventilation Requirements
   - Some air movement at the deck and pool water level is essential to ensure acceptable air quality. Complaints from swimmers indicate that the greatest chloramine concentrations occur at the water surface.
   - Ideally, these pollutants should be removed from close to the source before they have a chance to diffuse and negatively affect air quality.

2. Design issues, Air Distribution Effectiveness and Duct Design
   - Return air inlets should be located to recover warm, humid air and return it to the ventilation system for treatment, to prevent supply air from short-circuiting and to minimize recirculation of chloramines.
   - Exhaust air inlets should be located to maximize capture effectiveness and minimize recirculation of chloramiens.

4.6.2.7.8.1-0003*

4.6.2.7.9.1.2

Airflow Across Water Surface. The AIR HANDLING SYSTEM shall be designed considering airflow across the water surface to promote removal of DBPS.

4.6.2.7.8.1.1 Sufficient return air intakes shall be placed low in the space near aquatic venue surfaces such that they draw air across the water surfaces and pull in the highest concentration of airborne DBP contaminated air. (this new content is proposed via CR 4.6.2.7.8.1-0002)

4.6.2.7.8.1.2 Where a source capture exhaust system is provided, the AIR HANDLING SYSTEM shall be designed to help move the air on the water surface towards the exhaust. This exhaust air should not be allowed to mix with any return airflow in the AIR HANDLING SYSTEM

No public comments

TSC: No. Additional research/improvement needed.

We believe the CR has merit in principle. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

Agree with the additional language proposed as 4.6.2.7.8.1.2.

However, no explanation was provided as to why the added language is necessary. There is no substantiating data or supplementary information provided to justify the request for the additional language.

The TSC recommends against approval of this Change Request without additional justification or supporting data.

Champion: Yes

4.6.2.7.8.1-0004*

4.6.2.7.9.1.3

4.6.2.7.8.1 Airflow Across Water Surface. The AIR HANDLING SYSTEM shall be designed considering airflow across the water surface to promote removal of DBPS.
4.6.2.7.8.1.1 Sufficient return air intakes shall be placed low in the space near aquatic venue surfaces such that they draw air across the water surfaces and pull in the highest concentration of airborne DBP contaminated air. (this new content is proposed via CR 4.6.2.7.8.1-0002)
4.6.2.7.8.1.2 Where a source capture exhaust system is provided, the AIR HANDLING SYSTEM shall be designed to help move the air on the water surface towards the exhaust. This exhaust air should not be allowed to mix with any return airflow in the AIR HANDLING SYSTEM (this new content is proposed via CR 4.6.2.7.8.1-0003)

4.6.2.7.8.1.3 Air velocities shall not exceed 30 feet per minute (FPM) so as not to increase the evaporation rate and dehumidification requirement, unless adjustments are made to the evaporation rate as stated in section 4.6.2.7.1.

Deleted: ould

Deleted:

No public comments
TSC: No. Acceptable only with modification. Additional research/improvements needed
We believe the CR has merit in principle. However, there is not scientific documentation provided to confirm the validity. Can some be provided?

Any documentation provided should be included in the Annex

The TSC recommends against approval of this CR without documentation justifying the 30 fpm parameter identified in the requirement.

Champion: Yes. The 30 fpm value is provided in 2019 ASHRAE Handbook -HVAC Applications, Chapter 6 Indoor Swimming Pools.

4.6.2.7.9-0001* TSC Yes

4.6.2.7.10 Re-Entrainment of Exhaust and Contaminants

Re-entrainment of Exhaust and Contaminants. AIR HANDLING SYSTEM outdoor air intakes shall be ~~placed~~ located to ~~minimize~~ avoid RE-ENTRAINMENT of exhaust air and contaminants from building systems including Air Handling System exhaust back into the facility.

No public comments

TSC: Yes. Acceptable as submitted.

We believe is acceptable. It expands and clarifies the intent of this section of the MAHC. It gives design professionals a clearer objective.

Editorial changes only. Does not change the intent of the original language.

Champion: Yes

4.6.2.7.11.1-0001* TSC Yes

4.6.2.7.12.1 Purge Capacity

4.6.2.7.11.1 Purge Capacity. The AIR HANDLING SYSTEM shall have a PURGE capacity equal or greater than two times the ASHRAE Standard 62.1 201~~3~~9 level.

No public comments

TSC: Yes. Acceptable as submitted.

We believe the CR is acceptable. It updates the MAHC to include the current ASHRAE standard.

Champion: Yes

4.6.2.7.11.2-0001*

4.6.2.7.12.2 Outdoor Air

4.6.2.7.11.2 Outdoor Air. Outdoor air required for PURGE shall ~~not~~ be required to be heated or otherwise treated to maintain the design space temperature to prevent condensation in the duct system, the AIR HANDLING SYSTEM, and the building surfaces.

New version after discussion with authors:
4.6.2.7.11.2 Outdoor Air. If a system is designed with 100% purge mode, the outdoor air delivered during PURGE in winter shall be heated to a temperature established by the HVAC design engineer to address any condensation in the duct system, the AIR HANDLING SYSTEM, and the building surfaces.

No public comments

TSC: No. Acceptable only with modification

We believe the CR has merit in principle. The intent to have purge air heated to prevent condensation is reasonable and acceptable.

This is a wholesale change in the language of the Code. Requiring that the air be heated when previously the MAHC was clear that the purge air did not require heat.

However, could there be exceptions or qualifiers for when it doesn't need to be heated? For example, if the outdoor air is within a specified range of the setpoint could the requirement be omitted? Suggest clarifying the parameters that would require heat vs. not require heat.

Also is there some ASHRAE guidance on this type of situation: purging with outside air to prevent condensation?

The Annex should be updated to correspond.

We believe that this requirement is better suited for inclusion under an indoor pool space section of the International Mechanical Code or an ASHRAE standard so that the plans are reviewed and the work inspected by experts in that field rather than a health department plan reviewer.

If the intent of Section 4.6.2.7.11 is to design a system that allows a manual purge during a superchlorination event, as stated in the Annex, Sections 5.6.2.8 and 5.6.2.9 should be revised to require a manual purge during a superchlorination event.

Additional information from authors (This discussion happened before the TSC comments were received.)

Purge mode is not covered in ASHRAE and is a temporary manually triggered emergency mode. It is also not something all systems have it. It is supposed to happen when the space is unoccupied because they are dealing with an IAQ issue or they are shocking the pool and want an air purge.

Consequently the indoor conditions are not subject to concerns of occupant comfort. Summer is no concern at all. There is no building concern or condensation concern. If it's 95F outside and the pool goes to 95F also – no big deal. There is zero chance of condensation.

Winter is a concern. Do you want to dump 100% -20F OA into the space? Not smart. Does the air need to be 82-85F, probably not needed either. It would be smart to temper it though. So yes, I'd also expect some resistance here. I'd put this on the design engineer to assess and perhaps we word it like this:

> 4.6.2.7.11.2 Outdoor Air. If a system is designed with 100% purge mode, the outdoor air delivered during PURGE in winter shall be heated to a temperature established by the HVAC design engineer to address any condensation in the duct system, the AIR HANDLING SYSTEM, and the building surfaces.

The design engineer can decide if they want to brute force it and size the heater for 100% OA, limit the OA temp when purge mode can operate or regulate the amount of OA based on heater capacity. Manufacturers can handle either scenario no problem.

If you also look at CR 4.6.2.7.11.1-0001 (New Section # 4.6.2.7.12.1) this states the Purge CFM range if part of the design states a minimum of 2 times the ASHRAE 62.1 ventilation amount or up to 100% of the air handler capacity. If someone is concerned about cost this allows some flexibility in the design to minimize the additional cost of installation and operating cost when this is manually engaged.

Champion: Yes to the new version, except possibly remove the reference to winter. Couldn't cold air conditioned ducts get condensation if warm humid outside air is passed through them? Suggestion if this can happen:

4.6.2.7.11.2 Outdoor Air. If a system is designed with 100% purge mode, the outdoor air delivered during PURGE shall be adjusted to a temperature established by the HVAC design engineer to address any condensation in the duct system, the AIR HANDLING SYSTEM, and the building surfaces.

Deleted: in winter

Deleted: heated

4.6.2.8.1-0001*

4.6.2.8.1 Air Handling System Procedures

4.6.2.8.1 Air Handling System ~~Procedures~~. The contractor installing the INDOOR AQUATIC FACILITY AIR HANDLING SYSTEM shall provide the AQUATIC FACILITY owner with an ~~operating~~ operation and maintenance manual. ~~from the manufacturer which includes:~~Information to be included: 1)Mechanical drawings and specifications 2)All manufacturers' operation and maintenance manuals. ~~1~~3)All equipment ~~S~~startup and shutdown procedures; ~~2~~4) PURGING and other SAFETY procedures; ~~3~~5) Cleaning procedures; ~~4~~6) General maintenance requirements with standard replaceable parts listings and frequency of maintenance (i.e., filter cleaning frequencies, motor bearing maintenance); ~~5~~7 Pressure differential specifications for filter replacement, filter replacement type, and frequency of cleaning or replacement; ~~6~~8) Troubleshooting processes; ~~7~~9) Frequency of required calibration of equipment; ~~8~~10) Descriptions of general operating schemes; and ~~9~~11) Contact information for ~~the~~ all manufacturers,local representative or authorized service company.

No public comments

TSC: No Acceptable only with modification.

We believe this CRs improves and expands the procedural, close-out and system handover requirements. It will give the owner/operator all the necessary documentation for operating and maintaining the system(s).

This is a reasonable clarification to the language currently in the MAHC. However, these requirements should apply to the air handling system for the entire building, not just the natatorium space, and would better suited as part of the International Mechanical Code.

Section 4.6.2.8 is titled "Air Handling System Installation". Yet, nothing in the section addresses installation. Suggest that Section 4.6.2.8 be renamed "Air Handling System Documentation" and suggest that Section 4.6.2.8.1 be renamed "Operation and Maintenance Manual"

Suggest that Item 11 be revised to read "Contact information for all air handling system manufacturers and their local representatives or authorized service companies." This better covers requirements if multiple manufacturers are selected to provide various components of the air handling system.

No supporting information or documentation was provided to substantiate this proposed revision to the MAHC.

Champion: Yes with TSC changes to the titles and #11.

4.6.2.9.2-0001*

4.6.2.9.2 Written Statement

4.6.2.9.2 Written Statement. A written statement of commissioning shall be provided to the AQUATIC FACILITY owner including but not limited to: 1) The ~~number of cfm of~~ cfm outdoor air flowing into the INDOOR AQUATIC FACILITY during all modes of operation shall be verified at the time of commissioning; 2) The ~~number of cfm of~~ exhaust air cfm flowing through the system during all modes of operation shall be verified at the time of commissioning; and, 3)The supply air cfm flowing into the space and resulting air changes per hour during all modes of operation shall be verified at the time of commissioning; and 4)Air velocity measurements at 6 different locations around the pool deck area at 12 inches above the deck surface.

~~3) A statement that the amount of outdoor air meets the performance requirements of MAHC 4.6.2.7.~~

No public comments

TSC: No. Additional research/improvement needed.

This CR improves and expands the commissioning requirements, which will help insure the commissioning process with a more thorough review. It will ensure the construction and installation meets the design intent. Additionally, it will give the owner/operator validation of the design intent they paid for was met.

It is a reasonable clarification to the language currently in the MAHC. However, these requirements should apply to the air handling system for the entire building, not just the natatorium space, and would better suited as part of the International Mechanical Code.

Does it really need to be a separate document for the natatorium air handling system and included within the MAHC, to be enforced by an health department AHJ?

It may be more beneficial to require HVAC commissioning information to be included in the overall facility HVAC O&M manual.

Will have a moderate impact on the overall commissioning fees at start-up.

No supporting information or documentation was provided to substantiate this proposed revision to the MAHC.

Listed as Additional Research/Improvement needed to assess whether this should be in the MAHC to be reviewed and enforced by a Health Department AHJ separate from the remainder of the building, or included as an overall building air handling system requirement in a building mechanical code enforced by a building official who is more familiar with HVAC systems.

Champion: Yes, as indicated in the general comments above, local jurisdictions can work out how best to administer these requirements.

4.2.2-0001

4.2.2.7 Indoor Air Quality

Indoor aquatic facilities shall test for the following contaminants following construction, prior to occupancy and with aquatic features filled, treated and under expected typical conditions. Failure on any of the levels detailed below shall result in the facility addressing the contaminant of concern thru mitigation strategies and retesting to ensure compliance.

Mandatory indoor VOC contaminant testing

Contaminant VOC Compound (CAS#)	**Concentration Limit ($\mu g/m^3$)**	**Concentration Limit reference***	**Allowed Test Methods****
Acetaldehyde 75-07-0	140	Cal EPA OEHHA CRELS	ISO 16000-3, 6, EPA IP-1, EPA TO-17, ISO 16017-1, 2; ASTM D6345-10
Benzene 71-43-2	3		
Styrene 100-42-5	900		
Toluene 108-88-3	300		
Naphthalene 91-20-3	9		

Dichlorobenzene (1,4-) 106-46-7	800		
Xylenes-total 108-38-3, 95-47-6, and 106-42-3	700		
Formaldehyde 50-00-0	20 (16 ppb)	NIOSH	ISO 16000-3, 4; EPA TO-11, EPA comp. IP-6 ASTM D5197
Total volatile organic compounds (TVOC)***	500	LEED v4	ISO 16000-6

*Concentration limits derived from Cal EPA OEHHA CRELs (as of June 2016), NIOSH (as of April 2016), and LEED v4.

**For Table 1, implement testing using referenced laboratory testing methods only.

*** VOC as defined in ISO 16000-6

Mandatory inorganic contaminant testing

Contaminant non- VOC inorganics	**Concentration Limit**	**Concentration Limit reference***	**Allowed Test Methods**	**Measure indoors and outdoors**
Ozone	137 ug/m^3 (0.07 ppm)	EPA NAAQS	ASTM D5149-02, ISO 13964, and/or monitoring devices**	Yes
Carbon Monoxide (CO)	10 mg/m^3 and no greater than 2 mg/m^3 above outdoors (<9 ppm and no greater than 2 ppm above outdoors)	EPA NAAQS	ISO 4224, EPA IP-3, and/or monitoring devices**	Yes
Carbon Dioxide (CO_2)	CO2 concentration equivalent to ASHRAE 62.1 Ventilation Rate Procedure level using the methods in ASHRAE 62.1–2010, Appendix C.	LEED Pilot Credit	ISO 4224, EPA IP-3	Yes
PM 2.5	35 ug/m^3 or 12 ug/m^3***	EPA NAAQS	EPA IP-10, and/or monitoring devices**	Yes

*Concentration limits derived from EPA NAAQS as of March 2017. See Behind the Intent in the reference guide content for more information. The derivation of CO2 threshold: 700 ppm above outdoor levels is based upon the assumptions of activity level and steady state concentrations in a space type in ASHRAE 62.1.

**Scientific and building grade monitoring devices such as sensors or direct read instruments are also an allowed test method for the contaminants in Table 2. The devices must be calibrated in accordance with the device manufacturer's recommendations and capable of measuring below the concentration limit and in the same measurement range as the laboratory method. Individuals performing the indoor air testing must be trained by the manufacturer on calibration methods, inspection, use, chain-of-custody, troubleshooting, and data retrieval for each monitoring device used.

***Projects in areas with high ambient levels of PM2.5 (known EPA nonattainment areas for PM2.5, or local equivalent) must meet the 35 ug/m3 limit, all other projects should meet the 12 ug/m3 limit.

-

Mandatory airborne trichloramine and chloroform testing

Contaminant	Concentration Limit	Concentration Limit reference*	Allowed Test Methods
Trichloramine	<0.50 mg/m^3	WHO	NIOSH 1003 charcoal tube GC/FID (chloroform/trichloromethanes) from EMSL
Chloroform	10 mg/m^3	ACGIH (TLV) 8-hour TWA *	NIOSH 1003 charcoal tube GC/FID (chloroform/trichloromethanes) from EMSL

*World Health Organization. *Guidelines for Safe Recreational-Water Environments, Vol. 2, Swimming Pools, Spas and Similar Recreational-Water Environments*. World Health Organization, Geneva, 2006. (https://www.who.int/water_sanitation_health/publications/safe-recreational-water-guidelines-2/en/) 98

*American Congress of Governmental Industrial Hygienists Threshold Limit Value (https://www.acgih.org/tlv-bei-guidelines/tlv-chemical-substances-introduction

Explanation from author

Health effects from indoor air pollutants may be experienced soon after exposure or, possibly, years later. Some health effects may show up shortly after a single exposure or repeated exposures to a pollutant. These include irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue. Such immediate effects are usually short-term and treatable. Sometimes the treatment is simply eliminating the person's exposure to the source of the pollution, if it can be identified. Soon after exposure to some indoor air pollutants, symptoms of some diseases such as asthma may show up, be aggravated or worsened. Other health effects may show up either years after exposure has occurred or only after long or repeated periods of exposure. These effects, which include some respiratory diseases, heart disease and cancer, can be severely debilitating or fatal. It is prudent to try to improve the indoor air quality in your building even if symptoms are not noticeable. A common source for indoor air quality pollutants is building materials and ventilation systems. Ensuring that indoor environments have as low exposure to contaminants as possible is paramount when thinking about safety of occupants. Additionally exposure to airborne trichloramine and chloroform can lead to human health impacts which align with sick building syndrome.

The below tests contribute to the comfort and well-being of building occupants by minimizing indoor air quality problems associated with construction, renovation and maintaining and indoor pool. They establish minimum standards for indoor air quality (IAQ) that should be obtained by any indoor pool environment. It will also provide management/ownership awareness of baseline indoor air contaminant levels to support indoor air quality management going forward.

Estimated costs from the author

The estimated cost for the proposed testing is $3500. This is based off of thousands of global indoor air quality tests performed around the world every year and many more thousands of chemical analysis of those air samples done in the lab every year.

Author: Josh Jacobs, UL
One public comment against the CR:

The analytical method cited in this CR for trichloramine, namely NIOSH 1003, is not suitable for trichloramine and trichloramine is not listed as a possible analyte in NIOSH 1003. Adsorption of trichloramine onto charcoal will decompose the trichloramine. The analytical method cited for trichloramine is thus an incorrect method. This CR cannot be accepted until a suitable analytical method for trichloramine is provided.

TSC's

Design and Construction: No. Additional research/improvement needed

This CR should be condensed down to the actual testing requirements with the references and supporting information included in the Annex.

The proposed language requires the testing to be conducted prior to occupancy with the aquatic elements filled, treated, and under expected typical conditions. However, we know from experience that typical conditions change when an aquatic venue is fully loaded with bathers. Very different results will be recorded when the facility is near capacity than prior to occupancy.

Cost for this CR seems proibitive. The $3500 lab testing cost cited in the CR is only part of the total cost of the proposed change. Requiring the proposed testing be completed prior to occupancy is likely to delay the opening of a facility by a week or more, assuming that the parameters are all within compliance. To meet the qualifications of this test, all construction must be complete and commissioned. The entire space must be cleaned and fully operational. The supporting information does not identify how long it will take for the test results to be provided. This time represents lost revenue by delaying the opening of the facility.

If the test shows a parameter out of compliance, The source of the contaminate may be in a building material, HVAC system, pool mechanical system, or a chemical reaction with an owner supplied substance. The owner, architect, mechanical engineer, aquatics designer, general contractor, mechanical contractor, and pool contractor will all be pointing at each other as they asses the source of the contaminate and develop a mitigation plan that will need to be retested prior to opening. This may delay the opening of a facility by several weeks.

We recommend additional testing be done on recently constructed facilities that are already open to determine whether current construction practices produce results that are out of compliance, the mitigation required to bring the facilities into compliance, and the total cost of the mitigation and downtime.

We question whether this requirement would be better suited for the International Building Code than the Model Aquatic Health Code. The source of contaminates tested are likely to be an issue with the overall building design rather than limited to the natatorium space.

Ventilation and Air Quality: No. (Not reviewed by entire committee)

While it would be great to test for all this, I don't think it is feasible. Also the tricloramine levels change during the course of a day/week/swim meet etc. So a sample test is not good enough. Certain levels need continuous monitoring and adjustments waterside and HVAC side need to be made if they exceed limits.
Part B – we don't know the limits yet. The WHO level if 0.5 is being verified by our research. It might be too high.
Part C – there is no commercially viable means to measure and monitor trichloramine levels at the moment. The research is hoping to find a good surrogate that can be measured using commercially available sensors.

Champion: No. These requirements are more suited to a green building code where the requirements are optional unless a building is seeking green certification.

4.9.1.4.1-0001

The EQUIPMENT ROOM shall be naturally or mechanically ventilated to provide ~~ventilation shall address: 1)~~ COMBUSTION air for fuel fired equipment and to control temperature, humidity, and air quality. ~~requirements, 2) Heat dissipation from equipment, 3) Humidity from surge or balance tanks, 4) Ventilation to the outside, and 5) Air quality.~~

Explanation from author
No cost, clarification of intent. I find it confusing as originally written. No sure what "Combustion requirements" are, I assume it is referring to combustion air for fuel fired equipment but not very clear. Not sure what is meant by "ventilation to the outside" perhaps exhaust air?

Author: John Kelly, IA Public Health
No public comments.

TSC:
Design and construction: No. Acceptable only with modification.
We do not agree with the proposed modifications. We believe purpose of this section is to provide the design professional with guidance for relevant requirements and guidance. Additionally, this is supported in the Annex with reference to IMC Section 502. This section of the International Mechanical Code outlines the exhaust system.
Air Quality: No
Champion: No

5.6.2.3.1-0001

~~The AIR HANDLING SYSTEM operation and maintenance requirements does not include: 1) Mechanical rooms, 2) Bath and locker rooms, and 3) Any associated rooms which have a direct opening to the AQUATIC FACILITY.~~

Explanation from author
I do not understand why these areas would have been excluded from the requirements. Does this mean the air handling systems serving the mechanical rooms, bath and locker rooms, and any associated rooms directly opening into the aquatic facility Do NOT have to be maintained and operator to protect the health and safety of the facility's patrons? That seems counter to the protection of public health. I assume the original intent was to exclude one of the provisions not all of the provisions, but it is not clear which provision.

Author: John Kelly, IA Public Health
No public comments.
TSC- CR not submitted for Design and Construction review

Ventilation and Air Quality Committee: Yes

Think this was excluded because those are spaces separate to the indoor pool and served by different air handling systems.

Champion: No. These rooms do not contain aquatic venues and so do not have aquatic facility specific air handling requirements. Therefore, they should be covered by other codes.

4.6.2-0002

Within this CR, most of the changes have been made in separate CRs and those CR numbers are listed in comments to the right.
The changes that were not submitted as separate CRs are highlighted in blue below.

The purpose of this change request is to reorganize the MAHC Design & Construction requirements pertaining to Ventilation to be all included in one section relabeled as "Indoor Aquatic Facility Temperature, Humidity & Ventilation". This was done by excerpting the various design requirements from other sections in Chapter 4 and relocating to and reorganizing the existing section "4.6.2 Indoor Aquatic Facility Ventilation". The content in this CR also includes the proposed CR wording for various individual sections that were each separately submitted as CRs.

4.6.2 Indoor Aquatic Facility Temperature, Humidity & Ventilation

4.6.2.1 Purpose

Indoor aquatic facility air handling systems shall be designed, constructed, and installed to support the health and safety of the building's patrons.

4.6.2.2 Exemptions

Indoor aquatic facility air handling system design requirements do not apply to aquatic facilities that do not meet the definition of a "Building" in the IBC 2012.

4.6.2.3 Indoor Aquatic Facility

Air handling system design requirements shall apply to new or substantially altered indoor aquatic facilities including the area of the building's aquatic venues and the surrounding bather and spectator/stadium seating areas.

4.6.2.4 Mechanical Code

Indoor aquatic facility air handling system design, construction, and installation shall comply with applicable local codes.

4.6.2.5 ASHRAE 62.1 Compliance

Indoor aquatic facility air handling system design, construction, and installation shall comply with ASHRAE Standard 62.1 2013~~9~~, Ventilation for Acceptable Indoor Air Quality, and/or applicable local codes with additional requirements as stated in MAHC 4.6.2.6.

4.6.2.5.1 Weather Data.

4.6.2.5-0001* TSC No TRC Yes

The ASHRAE Dehumidification Weather Data for the facility geographical location shall be used when calculating the effects of the ventilation air to the space it is being introduced. This shall be added to the evaporation load of all water surfaces when sizing the climate control equipment.

4.6.2.6

4.6.2.6-0001* TSC No TSC Yes

~~Air Handling System Design~~ Temperature and Humidity Control

~~4~~4.6.2.6.1 Mechanical Systems

Ventilation shall be provided through mechanical systems and/or engineered openings for natural ventilation.

4.6.2.6.2 Intended Use

4.1.2.3.2.2-0001* TSC No TRC Yes

During the d~~D~~esign of the ventilation and ~~AIR HANDLING~~ CLIMATE CONTROL SYSTEMS for INDOOR AQUATIC FACILITIES, the design professionals (engineers and architects) shall ~~include~~ consult~~ation~~ with, and obtain input ~~by~~ from, the owner/operator, to address intended uses, type of VENUES (FLAT WATER, AGITATED WATER, HOT WATER) and intended typical operating water temperatures, space air temperature and relative humidity. A design criteria document shall be written as a result of these consultations, signed by all parties involved and become a permanent document of the project specifications and owner's manual.

4.6.2.6.3 Technical Details

4.1.2.3.2-0001* TSC No TRC Yes

The following technical specifications shall be provided for each aquatic facility:

1) ~~Pool w~~Water temperatures for each venue/pool,
2) Surface area of each venue/pool (length and width)
3) Space design,
   a) Listing of each room size (length, width, height)
   b) Statement that a vapor barrier is included in the construction of all interior and exterior wall and ceiling surfaces.
   c) Statement that all windows are at least double pane and include a thermal break along with the U value.
   d) A listing of all wall and ceiling construction R values
4) Design/desired ~~D~~dry bulb and dew point temperatures, and
5) Design/desired ~~R~~relative humidity.
6) Type of Water treatment
7) Wet Deck Area as defined in the ASHRAE 62.1 2019 Standard which defines this area as the "area surrounding the pool surface that is capable of being wetted during pool use or when the pool is occupied."

Commented [ME-C3]: 4.6.2.6-0001 This change was not made in 4.6.2-002.

Deleted: Air Handling System Design

Deleted: ¶

Deleted: Square footage

Commented [ME-C4]: 4.1.2.3.2-0001. Numbering was not used in the CR, but was added here to be consistent with 4.1.2.3.2-0001

4.6.2.6.4 Design Factors and Performance Requirements

4.6.2.6.2-0001* TSC No TRC Yes

The air handling system design engineer shall provide plan drawings and documentation with the following components showing the design meets the performance requirements per MAHC 4.6.2.7:

1. Building layout identifying the geographic location of the indoor aquatic facility;
2. Indoor aquatic facility size including area in square feet and height ~~air volume in cubic feet;~~
3. The area in square feet for Dry deck, PERIMETER DECK, POOL DECK, pool water surface and for stadium seating sections(should add up to total area in item 2);
4. Theoretical peak occupancy per aquatic venue, spectator, and deck spaces;
5. Placement of air handling system and other building outdoor air intakes exterior to the building;
6. Placement of air handling system and other building exhaust vents exterior to the building;
7. Placement of return air intakes within the indoor aquatic facility;
8. Placement of supply air locations within the indoor aquatic facility;
9. Identify system capabilities, if ~~utilized~~ provided, to automatically or manually modulate the amount of outdoor air for the purposes of reducing the number of cfm of outdoor air when occupancy in stadium seating sections is lower than theoretical peak occupancy; and
10. Identify system design to maintain negative air pressure in the indoor aquatic facility relative to the indoor areas external to it, and/or to the outside of the facility.
11. Heating, Cooling, and Dehumidification Load Calculations including design envelope sensible cooling loads, envelope heating loads, ventilation sensible and latent loads, spectator sensible and latent loads (if applicable) and pool evaporation loads.

Commented [ME-C5]: The MAHC has this as a numbered list, but the CR did not, so numbers were inserted into the CR.

4.6.2.6.5 Theoretical Peak Occupancy for Ventilation Air

Commented [ME-C6]: From 4.1.2.3.5?

The technical design specifications for each aquatic facility and each aquatic venue shall include theoretical peak occupancy, respectively.

4.6.2.6.5.1 Used for Designing Systems The theoretical peak occupancy for Ventilation Air

Commented [ME-C7]: From 4.1.2.3.5.1?

for an aquatic venue shall be used for designing systems that serve bathers and patrons. (Note: The specified density factors *in the ASHRAE 62.1 Standard are the lower limits for determining theoretical peak occupancy.)* ***Note that Theoretical Peak Occupancy for Bathers in the pool is not used for ASHRAE 62.1 compliance. It can be used for Non-Water related areas and spectator areas.***

4.6.2.6.5.2 Incorporate Non-Water Related Areas The theoretical peak occupancy for Ventilation Air for an aquatic facility shall be used for designing systems that serve bathers and patrons and shall incorporate non-water related areas within the same open room such as decks and other adjacent portions of the aquatic facility not associated with the aquatic venue.

Commented [ME-C8]: From 4.1.2.3.5.2?

4.6.2.6.6 Equipment Characteristics and Rating The technical specifications and supplemental engineering data for each aquatic facility and each aquatic venue shall include:

Commented [ME-C9]: From 4.1.2.3.6

- Detailed information on the type, size, operating characteristics, and rating of all mechanical and electrical equipment;
- ~~Hydraulic computations for head loss in all piping and recirculation equipment;~~
- ~~Pump curves that demonstrate that the selected recirculation pump(s) are adequate for the calculated required flows; and~~
- For indoor aquatic facilities, documentation that demonstrates that the indoor aquatic facility is designed to meet the acoustic design criteria contained in MAHC 4.6.11.
- ~~Documentation per MAHC 4.7.3.2.2.3 to demonstrate that the selected disinfectant feeders/equipment are of sufficient size and capacity, including evaluation of the chlorine demand factors in MAHC 4.7.3.2.2.2.1.~~

4.6.2.6.7 Air Delivery Rate ~~Recirculation Rate and Turnover~~

Commented [ME-C10]: I think this section should be deleted since it doesn't appear as a separate CR and it is an incomplete repeat of 4.6.2.7.4-0001.

The technical specifications for each room that includes a body of water shall include the air circulation rate per hour provided by the air handler system plus any other dedicated air moving device in this space. The total shall meet the minimum circulation rate as specified in the 2019 version of the ASHRAE Applications Handbook on Natatorium Design.~~The technical specifications for each aquatic venue shall include the recirculation rate and turnover time~~.

4.6.2.6.8 Equipment Specifications

4.1.2.3.9-0001* TSC No TRC Yes

The technical specifications for each AQUATIC VENUE shall include information on each piece of equipment associated with that AQUATIC VENUE. For air handling equipment, the specifications shall include the following items at a minimum. Sensible cooling capacity, Sensible Heating Capacity, Moisture Removal Capacity (MRC) in lbs.hr, Moisture Removal Efficiency (MRE) as listed in the AHRI Standard 920, CFM of outside air, CFM of Exhaust Air, CFM of Supply Air, voltage, power requirements, design temperature & humidity.

4.6.2.6.9 Indoor Aquatic Facility Air Pressure

4.2.2.3.3-0001* TSC No TRC Yes

Indoor Aquatic Facility Air Pressure shall be relative to the areas external to it (such as adjacent indoor spaces or outdoor ambient space). The AQUATIC FACILITY AIR HANDLING SYSTEM design, construction,

and installation shall comply with the 20119 negative pressure recommendation as outlined in the ASHRAE Applications Handbook on ~~Natatorium~~ Indoor Pool Design and the ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality, and/or applicable local CODES.

4.6.2.6.9.1 Chemical Storage Space Air Pressure

Air handling system design for chemical storage spaces shall conform to the International Mechanical Code or Uniform Mechanical Code, and either the International Fire Code or the NFPA 1 Fire Code, and any applicable local codes.

4.6.2.6.9.1.1

4.2.2.3.3.1-0001*

This air handling system is independent from the Aquatic Facility Climate Control System and shall not be interconnected.

4.6.2.6.10 ~~Air Handling System Design~~ Temperature and Humidity Control

4.6.2.6.10.1 Condensation Prevention

4.2.2.2.1-0001*

Indoor aquatic facility building envelope construction shall include a vapor-retarder/insulation arrangement to assist in preventing the condensation of water on inside pool room envelope building surfaces and within any wall, ceiling, glass or floor structure under the coldest outdoor conditions based on the ASHRAE climate data for the project locale or nearest reporting city and the highest design indoor relative humidity

4.6.2.6.10.2 Weather Data.

4.2.2.2.1.1-0001*

The ASHRAE Dehumidification Weather Data for the facility geographical location shall be used when calculating the effects of the ventilation air to the space it is being introduced. This shall be added to the evaporation load of all water surfaces, and occupant (includes spectators, swimmers and non-swimmers on the deck) latent moisture when sizing the climate control equipment.

4.6.2.6.10.3 Insulated Duct ~~Exterior~~

~~4.2.2.3.4.1-0001* TSC Yes~~

Any system duct work located in an area not being conditioned ~~Ducts~~ shall be insulated on the exterior of the duct with a mold-resistant material where the surface temperature of the duct is capable of being less than the airstream temperature within the duct.

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Deleted: with additional requirements as stated in section MAHC 4.6.2

Commented [ME-C11]: 4.2.2.2.1-0001, slight wording change “inside envelope of the pool room building”

4.6.2.6.10.4 Relative Humidity

4.6.2.7.6-0001* TSC Yes

The air handling system shall maintain the relative humidity in the space as defined in ASHRAE Handbook: HVAC Applications, 201~~1~~9, Chapter 6 ~~Places of Assembly, Natatoriums.~~

4.6.2.6.10.5 Dew Point

4.6.2.7.6.1-0001*

The air handling system shall be designed to maintain the dew point as defined in Technical Details section 4.6.2.6.3 item 5. The design team shall consider that the enclosure is designed to limit condensation on interior surfaces of the interior ~~space less than the dew point of the interior walls~~ as prescribed by the architect to ensure condensation is avoided on wall, ceiling, glass and floor interior surface as well as the interior structure of these building components ~~interior surfaces~~ at all times so as to prevent damage to structural members and to prevent biological growth on walls.

Commented [ME-C12]: 4.6.2.7.6.1-0001. Crosshatch words that are part of the new text were removed for clarity.

4.6.2.6.11 Other Air Handling Systems

Air handling system design for chemical storage spaces, mechanical, toilet, shower, and dressing rooms are not included in the scope of this section of the code, but shall be considered for their effects on the performance requirements of MAHC 4.6.2.7 such as maintaining negative pressure, temperature differences, and contribution to the air volume of the indoor aquatic facility.

4.6.2.6.12

4.6.2.6.4-P0313*

~~**High Volume, Low Speed Fans Air handling system design may not consider mechanical fans used to push air within the space as part of the outdoor air calculations for the indoor aquatic facility as defined in MAHC 4.6.2.7.2**~~

4.6.2.6.12. Air Delivery Rate

4.6.2.6.4.1-0001*

Mechanical fans used to push air within the space may be used in the calculation for air delivery rate per MAHC 4.6.2.7.5 ~~(turnover).~~

4.6.2.6.13 Occupied and Open All Seasons

Air handling system design may include natural ventilation calculated in accordance with the ASHRAE Handbooks to substitute the corresponding portion of mechanical ventilation only if all the calculated exterior openings will be continuously controlled open during all times the indoor aquatic facility is occupied, regardless of season.

4.6.2.6.14 Air Distribution Design

The design of the distribution of supply air and distribution of exhaust or return air shall consider obstacles such as support columns, architectural structures, and aquatic features.

4.6.2.7 Performance Requirements for Air Handling Systems

4.6.2.7.1

4.6.2.7-0001*

The air handling system shall be designed to maintain the space temperature, relative humidity and dewpoint as defined in Section 4.6.2.6.3. The design shall achieve the following objectives:

1. Maintaining homogeneous air quality, space temperature, relative humidity, and negative space pressure
2. Delivering outside air to the breathing zone of swimmers, people on the deck, and spectators
3. Provide low velocity airflow low across water surfaces to prevent build-up of DBPs Note: If the air velocity is greater than 30fpm across the water surface, the empirical Equation 1 Evaporation Formula as listed in the ASHRAE 2019 Applications Handbook, Indoor Pool Chapter must be used. This evaporation formula allows the entry of the actual air velocity across the water surface.
4. Assist in removing DBPs from the space
5. Provide a comfortable environment for occupants in all zones of the natatorium (with an emphasis on swimmers

4.6.2.7.2 Minimum Outdoor Air Requirements

4.6.2.7.1-0001*

The air handling system shall have a design capability to supply no less than the minimum outdoor air requirements using ASHRAE Standard 62.1 201~~3~~6, Ventilation for Acceptable Indoor Air Quality.

4.6.2.7.2.1 The Minimum Outdoor Air Requirements may be higher than the amount calculated using ASHRAE Standard 62.1 2016, Table 6.2.2.1, as determined by the Registered Design Professional.

4.6.2.7.3 System Alarm

4.6.2.7.2-0001*

The AIR HANDLING SYSTEM design shall provide system features to notify the operator if the outdoor air flow rate entering the INDOOR AQUATIC FACILITY is below ~~0.48 cfm/ft2 (1.8 m3/h)~~ the minimum amount as designated by the Design Professional for each mode of operation (e.g. occupied normal mode, occupied meet mode, unoccupied mode).

4.6.2.7.4 Real-Time Occupancy

4.6.2.7.3-0001*

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Design of the air handling system for stadium seating areas shall meet the requirements in ASHRAE 62.1-2019 for the Area Outdoor Air Rate (0.06 cfm/ft2 and the People Outdoor Air Rate (7.5 cfm/person) ~~shall meet the requirements for the number of cfm/ft^2~~ based on the theoretical peak occupancy of the stadium seating area..

4.6.2.7.4.1 Method to Determine

4.6.2.7.3.1-0001*

If a method to determine real-time actual occupancy is available for stadium seating areas, then the system may modulate to reduce outdoor air cfm to meet the requirement for the actual occupancy for the associated time frame.

4.6.2.7.5 Air Delivery Rate

4.6.2.7.4-0001*

The air handling system shall supply an air delivery rate as defined in ASHRAE Handbook – HVAC Applications 201~~1~~9, ~~Places of Assembly , Natatoriums~~ Indoor Pool Design. The Air Delivery Rate is the supply cfm of the air handler system(s) comprised of a combination of outside air, return air minus any exhaust air if exhausted within the air handler itself. The air delivery rate shall be sufficient to meet the latent and sensible cooling loads and the heating loads of the space, and to meet the requirements of the Air Distribution System defined in Sections 4.6.2.7.6 through 4.6.2.7.9

4.6.2.7.6 ~~Consistent~~ Constant Air Flow

4.6.2.7.5-0001*

Indoor aquatic facility air handling system shall be designed to provide ~~consistent~~ continuous air flow through all parts of the indoor aquatic facility to ~~preclude~~ minimize ~~any~~ stagnant areas, stratification of temperature and humidity, and provide homogeneous air quality, space temperature, relative humidity, and pressure throughout the space..

4.6.2.7.7 Condensation & Mold Control

4.6.2.7.6.2-0001* TSC Yes

The air handling Distribution system shall be designed ~~to achieve several objectives~~ to inhibit condensation and mold by ~~including~~:

(1) Maintaining homogeneous space conditions,
(2) Flushing the outside walls and windows, which can have the lowest surface temperature and therefore the greatest chance for condensation.

Deleted: <#>~~Delivering the outside air to the breathing area, and~~¶

Commented [ME-C13]: 4.6.2.7.6.2-0001,
The version here in 4.6.2 was missing its numbers, so that was added.

4.6.2.7.8 Negative Air Pressure

4.6.2.7.7-0001* TSC Yes, withdrawn

Air handling system and/or independent exhaust systems air flow shall be designed to maintain negative air pressure in the indoor aquatic facility relative to the areas external to it (such as adjacent indoor spaces and outdoor ambient space).

4.6.2.7.9 Disinfection By-Product Removal

4.6.2.7.8-0002* TSC Yes

Sufficient return/exhaust air intakes shall be placed near aquatic venue surfaces such that they remove the highest concentration of airborne DBP contaminated air.

4.6.2.7.9.1 Airflow Across Water Surface

The air handling system shall be designed considering airflow across the water surface to promote removal of DBPs.

4.6.2.7.9.1.1

4.6.2.7.8.1-0002*

Sufficient return air intakes shall be placed low in the space near aquatic venue surfaces such that they draw air across the water surfaces and pull in the highest concentration of airborne DBP contaminated air.

4.6.2.7.9.1.2

4.6.2.7.8.1-0003*

Where a source capture exhaust system is provided, the AIR HANDLING SYSTEM shall be designed to help move the air on the water surface towards the exhaust. This exhaust air should not be allowed to mix with any return airflow in the AIR HANDLING SYSTEM

4.6.2.7.9.1.3

4.6.2.7.8.1-0004*

Air velocities shall not exceed 30 feet per minute (FPM) so as not to increase the evaporation rate and dehumidification requirement, unless adjustments are made to the evaporation rate as stated in section 4.6.2.7.1.

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4.6.2.7.10 Re-Entrainment of Exhaust and Contaminants

4.6.2.7.9-0001* TSC Yes

Air handling system outdoor air intakes shall be located ~~placed~~ to ~~minimize~~ avoid re- entrainment of exhaust air and contaminants from building systems including Air Handling System exhaust back into the facility.

4.6.2.7.10.1 ***System Exhaust***

Air handling system exhaust from chemical storage spaces, mechanical, toilet, shower, and dressing rooms shall not be directed into the aquatic facility.

4.6.2.7.11 Access Control

The air handling system shall be designed to provide a means to limit physical or electronic access to system control to the operator and anyone the operator deems to have access.

4.6.2.7.12 Purge

The air handling system shall have the capability to periodically purge air for air quality maintenance or for emergency situations.

4.6.2.7.12.1 Purge Capacity

4.6.2.7.11.1-0001* TSC Yes

The air handling system shall have a purge capacity equal or greater than two times the ASHRAE Standard 62.1 201~~3~~9 level.

4.6.2.7.12.1.1 Manual Activation

This purge shall be capable of being manually activated.

4.6.2.7.12.2 Outdoor Air

4.6.2.7.11.2-0001*

Outdoor air required for purge shall ~~not~~ be required to be heated or otherwise treated to maintain the design space temperature to prevent condensation in the duct system, the AIR HANDLING SYSTEM, and the building surfaces.

4.6.2.7.13 Air Handling System Filters

The air handling system design shall include filters for outdoor air and recirculated air with a MERV rating of 8.

4.6.2.7.13.1 Air Filter Media

4.1.2.3.14-0002*

The air filters used should be suitable for elevated humidity levels.

Deleted: ~~The technical specifications for each aquatic venue shall include information on the filter media such as diatomaceous earth, sand, gravel or other approved material.~~

4.6.2.8 Air Handling System Installation

4.6.2.8.1 Air Handling System ~~Procedures~~

4.6.2.8.1-0001*

The contractor installing the indoor aquatic facility air handling system shall provide the aquatic facility owner with an ~~operating~~ operation and maintenance manual. ~~from the manufacturer which includes~~ Information to be included:

1) Mechanical drawings and specifications
2) All manufacturers' operation and maintenance manuals.
~~1~~3) All equipment ~~S~~startup and shutdown procedures;
~~2~~4) Purging and other safety procedures;
~~3~~5) Cleaning procedures;
~~4~~6) General maintenance requirements with standard replaceable parts listings and frequency of maintenance (i.e., filter cleaning frequencies, motor bearing maintenance);
~~5~~7 Pressure differential specifications for filter replacement, filter replacement type, and frequency of cleaning or replacement;
~~6~~8) Troubleshooting processes;
~~7~~9) Frequency of required calibration of equipment;
~~8~~10) Descriptions of general operating schemes; and
~~9~~11) Contact information for ~~the~~ all manufacturers, local representative or authorized service company.

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Commented [ME-C15]: 4.6.2.8.1-0001
Numbering was added to be consistent with 4.6.2.8.1-0001.

4.6.2.9 Air Handling System Commissioning

4.6.2.9.1 System Commissioning

A qualified, licensed professional shall commission the air handling system to verify that the installed system is operating properly in accordance with the system design.

4.6.2.9.2 Written Statement

4.6.2.9.2-0001*

A written statement of commissioning shall be provided to the aquatic facility owner including but not limited to:

1) The ~~number of cfm of~~ cfm outdoor air flowing into the indoor aquatic facility during all modes of operation shall be verified at the time of commissioning;
2) The ~~number of cfm of~~ exhaust air cfm flowing through the system during all modes of operation shall be verified at the time of commissioning; and,
3) ~~A statement that the amount of outdoor air meets the performance requirements of MAHC 4.6.2.7~~. The supply air cfm flowing into the space and resulting air changes per hour during all modes of operation shall be verified at the time of commissioning; and
4) Air velocity measurements at 6 different locations around the pool deck area at 12 inches above the deck surface.

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Commented [ME-C17]: 4.6.2.9.2-0001
Numbering added to be consistent with this CR.

No public comments

TSC: No. Acceptable only with modification. Additional research/improvement needed.

We agree with the concept of relocating all of the MAHC design criteria in one location.

The proposed language includes suggested changes from several other Change Requests. The final version of this Change Request can not be written until all of the other relevent Change Requests have been ratified by the CMAHC membership.

The CR indicates that several sections have been relocated or combined into a single section. The author should identify the previous section number in addition to the proposed section number so that those sections can be deleted from their original locations within the MAHC.

Several sections within the Annex will also require relocation and renumbering.

No substantiating data or supporting information was provided.

The TSC does not recommend approval without identification of the previous section numbers and listing all of the required updates to the Annex.

Champion: Yes, with the changes noted above in the individual CRs. Annex work does not need to be completed within the scope of the CMAHC voting process. To aid voters, this summary document could be made available.