REQUEST FOR PROPOSAL

The Council for the Model Aquatic Health Code (CMAHC) and the Association of Aquatic Professionals (AOAP) are collaborating to complete Phase 3 of the CMAHC Indoor Air Quality Study for Natatoriums. CMAHC and AOAP are jointly issuing this Request for Proposals (RFP).

Background

Indoor air quality (IAQ) issues have been a topic of great discussion, particularly the impact on bather health and performance by competitive swimmers. The impact of chloramines has been well documented by anecdotal reports and field experience by various aquatics professionals, educators, educational organizations, designers, and competitive swimmers.

The Centers for Disease Control and Prevention (CDC) states on the Healthy Swimming website that:

> *"Chlorine is used at aquatic venues to kill germs, but when it binds to the body waste swimmers bring into pools, it can form chemicals called chloramines. Chloramines in the water irritate skin, eyes, and the respiratory tract (including the nose) when they turn into gas into the air above the water, particularly indoors. Chloramines will accumulate in the air without proper ventilation, creating an unhealthy environment for swimmers, spectators, and staff."*

In a study conducted by the IAQ Mission, 91% of swim coaches and competitive swimmers have experienced adverse health effects from pool indoor air quality, and 86% reported knowing an individual who uses an inhaler as a result of poor indoor air quality. Various European studies have noted an increased risk of childhood asthma, as well as the development of asthma and bronchial disorders in elite swimmers. Poor indoor air quality, specifically chloramines, have been known to produce multiple negative health effects including:

- Eye and skin irritation,
- Respiratory tract irritation,
- Chronic respiratory issues such as Asthma, and
- Hypersensitivity Pneumonitis

In addition to the impacts of chloramine in natatorium air, other compounds such as Volatile Organic Compounds (VOCs) and Trihalomethanes (THMs) may also be present in natatorium air. These compounds may cause additional negative health impacts such as:

- Increased risk of cancer,
- Reproductive disorders,
- Chronic Obstructive Pulmonary Disorder (COPD), and
- Central Nervous System (CNS) and other specific organ damage

While the effects of chloramines, VOCs, and THMs are well known, there are still varying obstacles to the detection and monitoring of these compounds, specifically trichloramines. In recent years, various monitoring devices have been developed to detect and measure trichloramine levels. It should be noted that the availability of these devices is somewhat limited with only two providers of monitoring systems as of the release of this RFP. Of obvious challenge is that these systems monitor chloramine levels, but do not provide a mechanism to predict future trichloramine levels.

In 2018, the Council for the Model Aquatic Health Code (CMAHC) provided grant funding to the Lyles School of Engineering at Purdue University under the direction of Dr. Ernest "Chip" Blatchley. The resulting research provided confirmation of commonly accepted aspects of indoor air quality as well as providing significant insights. This research was documented in *Real-Time Measurements of Gas-Phase Trichloramine (NCl3) in an Indoor Aquatic Center* by Wu, et al and *Dynamic Behavior of Gas-Phase NCl3 and CO2 in Indoor Pool Facilities* by Lee, et al.

The work by Wu, et al. and Lee, et al. provided a fundamental basis for what is occurring in natatorium air. Of obvious challenge to the qualified operator of natatoriums is the ability to predict the development of trichloramines in order to be proactive in their approach to preventing their formation.

Deliverables

AOAP expects the following deliverables:

1. The development of a numerical model of indoor air quality dynamics with the intent of predicting outcomes that could be used to inform aquatic facility operations, especially under conditions when poor indoor air quality might be expected. This model is expected to be used intuitively by the average qualified operator of a natatorium with clear user instructions. This model should have high prediction accuracy for the formation of airborne trichloramines and other volatile organic compounds (VOCs) shown to have negative health effects on bathers.
2. Manuscript submission and publication in an appropriate journal such as *Water*, *The Journal of Environmental Health, Science and Technology for the Built Environment*, or other journal as appropriate.
3. An editable PowerPoint presentation with speaker notes that CMAHC, AOAP, and others can use to provide aquatics industry education.
4. In-person presentation of research findings at the AOAP International Aquatics & Water Safety Conference and Exposition or other conference of AOAP's choosing.

Eligibility

Eligible applicants must be registered as not-for-profit. These may include:

- Accredited colleges and universities
- Research institutes or centers affiliated with an accredited academic institution
- Public health entities with appropriate research experience

For-Profit entities may be listed as appropriate, provided they function in a supporting role only and have no financial interest in the outcome of this work.

Proposed Scope of Services

The research proposal should include the following:

- A description of the methodology to be used in the course of this research not to exceed 5 pages including, but not limited to:
    - Devices used to measure indoor air quality for trichloramine and other VOCs identified as being harmful to bather health
    - A description of how the proposal will evaluate indoor air quality
    - A description of the varying types, sizes, and intended uses of natatoriums across the contiguous United States, including target regions and monitoring duration

- A detailed description of each deliverable
- A proposed timeline and fee schedule, including a budget of how grant monies will be spent
- Key personnel information: (1) National Science Foundation biosketch for the principal researcher and any others on the research team, and (2) key personnel outlining specific duties, and (3) who will be authoring and submitting the research for publication, and (4) relevant point of contact information for the lead researcher, and financial and administrative personnel

RFP Point-of-Contact

Respondents shall restrict all contact and questions regarding this RFP and selection process to:

Julene Hefter
Executive Director, CMAHC and AOAP
julienehefter@cmahc.org

Questions concerning technical specifications shall be directed to:

Dewey Case
Technical Advisor, CMAHC
deweycase@cmahc.org

Respondents and their agents are strictly prohibited from lobbying AOAP staff and board, CMAHC staff and Advisory Council or anyone connected to this RFP at any time in the application and selection process. Failure to comply with this clause shall be grounds for rejection of their RFP as non-responsive.

Proposal Funding

AOAP has existing allocated funding for this RFP. While a proposal may be accepted by AOAP, no work is to begin without full funding being available.

Proposal Reviews & Selection

A panel of experts in areas including but not limited to legal, natatorium design, aquatic operations, and indoor air quality will review the proposals and make a ranked-choice recommendation to AOAP. AOAP reserves the right to interview grantees prior to awarding the grant.

Proposal selection will be weighed toward respondents that demonstrate:

1. Specialized experience of the lead researcher
2. Relationship and expansion upon prior research found in:
    a. *Real-Time Measurements of Gas-Phase Trichloramine (NCl3) in an Indoor Aquatic Center* by Wu, et al. and
    b. *Dynamic Behavior of Gas-Phase NCl3 and CO2 in Indoor Pool Facilities* by Lee, et al.
3. Understanding of the formation and impact of mono, di, and trichloramines as it pertains to natatoriums, bather health, and equipment
4. Understanding of ASHRAE design standards for HVAC and dehumidification systems

Consideration is expected to be given, but is not guaranteed to be given, to the weighted criteria listed above. AOAP reserves the right to reject any and all proposals, to waive any and all formalities outlined within this RFP and in the selection process and generally to make the award that in its judgment, will best meet the objectives stated in this RFP.

Upon notification of selection by the Review Committee, the successful respondent is required to execute and deliver a contract within two weeks of notification. If the successful respondent is unwilling or unable to execute the agreement as required by the RFP, AOAP has the right to request another respondent to enter into the contract with AOAP. All dates in the RFP are subject to change at the discretion of AOAP, and notice of any changes will be provided to all respondents.

Intellectual Property, Data, and Publication Terms

Pre-Existing Materials

Each party will retain ownership of intellectual property developed independently of this project. The selected respondent must identify in its proposal any pre-existing software, models, methods, data sets, instruments, or other materials that it expects to incorporate into the work and must describe any restrictions on AOAP's and CMAHC's use of those materials.

Project Deliverables and License

The selected respondent will retain ownership of original scholarly works and research methods developed under the project, subject to the terms of the final contract. The selected respondent must grant AOAP and CMAHC a perpetual, worldwide, nonexclusive, royalty-free license to use, reproduce, display, distribute, adapt, and create derivative works from the final reports, numerical model, user documentation, educational materials, and presentation files for nonprofit research, education, public-health, and aquatic-industry purposes. AOAP and CMAHC may authorize others to use those materials for the same purposes with appropriate attribution.

The final contract must identify ownership and permitted use of project-specific source code, executable files, formulas, algorithms, model documentation, and updates. The selected respondent must not include third-party materials unless it has secured rights sufficient to provide AOAP and CMAHC the uses described in this section.

Research Data

The selected respondent must provide AOAP and CMAHC with the final data set and sufficient supporting materials to understand and reproduce the reported results, including a data dictionary, metadata, collection protocols, quality-control records, analytical methods, and model input and output files. Data must be provided in commonly used, nonproprietary formats unless AOAP approves another format in writing.

The selected respondent must obtain all required approvals and permissions for data collection and use. Before delivery or publication, it must remove or appropriately protect personally identifiable, confidential, proprietary, or otherwise restricted information. The proposal must describe any anticipated data-use restrictions, retention requirements, security controls, or limitations on public release.

Confidentiality

Each party must protect confidential information received from another party and may use it only for this project. This obligation does not apply to information that is publicly available through no breach of confidentiality, was lawfully known without restriction, is received lawfully from a third party, or is independently developed without use of the confidential information. Legally required disclosures must be handled in accordance with the final contract.

Publication and Public Communications

The selected respondent is expected to prepare and submit the research for publication in an appropriate peer-reviewed journal. Authorship and acknowledgment must follow the journal's requirements and accepted scholarly standards. Publications and presentations

must acknowledge AOAP and CMAHC support and identify other project funding as required.

At least 30 calendar days before submitting or publicly releasing a manuscript, abstract, presentation, report, press release, or other project communication, the selected respondent must provide it to AOAP and CMAHC for review. Review is limited to identifying confidential information, factual errors, required acknowledgments, and potentially patentable subject matter; it is not intended to suppress or alter research conclusions. AOAP or CMAHC may request a delay of up to 60 additional calendar days to permit filing of a patent application or protection of other intellectual property.

Publication costs, open-access requirements, conference expenses, and responsibility for responding to peer-review comments must be addressed in the proposed budget and finalized in the contract. If a journal declines the manuscript, the selected respondent must consult with AOAP and CMAHC before submitting it to another journal.

Final Contract

These terms establish the minimum expectations for proposals. The final contract will control if it includes more specific or different provisions approved by AOAP, CMAHC, and the selected respondent.

Proposal Submission Deadline

Deadline for Submission Proposals should be received no later than January 15, 2027, by 5:00 p.m. EST. Proposals should be emailed to:

Julene Hefter
CMAHC Executive Director/ President
julienehefter@cmahc.org

Expenses incurred by the respondents in replying to the RFP or in making any appearance before the Review Committee are at the respondents' own expense and risk.