



ARENA RESTART PROTOCOLS 2020/21





***MECHANICAL / HVAC-R
SYSTEMS POLICY***

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design. For clarity, the testing of individual VAV boxes and distribution ductwork in occupied spaces is not a requirement.

In addition, please be advised of the following recommendations:

- All areas planned for occupancy should be analyzed to determine total Air Changes per Hour (ACH) and Outdoor Air Changes per Hour (OACH), and an air change rate table for each occupied space should be developed to indicate the current rates for analysis. Expected occupancy counts for these areas should be provided as part of this overall review.
- Review central and local air filtration including Minimum Efficiency Reporting Values (MERV) ratings on existing filters to ensure they are within service life and appropriately installed. Review filter maintenance and replacement schedule as indicated in filter manufacturer's published operations manual.
- Consider independent review of supply and exhaust systems and controls including exhaust fan inspections by a mechanical contractor or commissioning agent.

Venue operators both **of NHL Arenas and Club Practice Facilities** are encouraged to use a professional engineer to do an overall evaluation of the above considerations. The analysis of each venue may take between 2-4 weeks, or longer, based on industry demand and scope of work.

AIRFLOW MANAGEMENT: VENTILATION AND FILTRATION

The NHL recommends improving airflow (demonstrated by increasing ACH as compared to existing performance levels) and increasing outdoor air flow rates to all occupied spaces, based on an analysis of the venue's existing configuration of the HVAC-R system and current air balance report with analysis by a professional engineer.

Recommendations:

- Calibrate HVAC-R system controls and airflow measurement devices to coordinate with increased outdoor airflow rates, particularly in areas such as team spaces (visiting and home) back-of-house staff areas, and the main bowl area.
- Any mechanical system allowing for potentially contaminated exhaust air to bypass into the incoming outdoor air stream is not recommended and should be disabled. Proper separation of exhaust sources and intakes should be maintained, and energy recovery should be carefully controlled to limit any bypass airflow⁵.
- Venues should consider disabling automatic demand-controlled ventilation (DCV) system configurations.
- CO₂ Monitoring: Venues should consider monitoring CO₂ levels in occupied spaces to account for any air pollution (parts per million) due to the increased outside air intake⁶.
 - A note on CO₂ Sensor Applications: Venues are encouraged to establish baseline CO₂ concentrations by monitoring each space, while unoccupied, prior to planned occupancy. If possible, simulate event occupancy of each space and chart CO₂ levels at different occupancy counts. Establish maximum occupancy count such that CO₂ levels are maintained below 1,000

⁵ ASHRAE Position Document on Infectious Aerosols, April 14, 2020 Section 4.1

⁶ ASHRAE Technical Resources: Filtration / Disinfection

⁷ ASHRAE 62.1 2016 Ventilation for Acceptable Indoor Air Quality Appendix D



- 1. Ultra-Violet (UV) Germicidal Irradiation.** Such technologies include unit mounted UV, in-duct UV, and Upper-Air UV. Unit mounted UV has proven to be effective at reducing organics on unit components such as cooling coils. The use of in-duct UV systems for airstream applications requires careful review of air velocities, which must be kept low for the UV to be effective. Upper-Air UV has long been considered effective against infectious aerosols within occupied spaces but requires careful design to prevent occupants from being exposed to the UV source. Manufacturers offer UV at multiple wavelengths with varying degrees of potential danger to occupants. We recommend consulting both the manufacturers and experienced professional engineers when evaluating which options may be appropriate in a specific venue.
- 2. Photo-Catalytic Oxidation (PCO).** This technology uses UV lamps along with a photo catalyst surface to create hydroxyl radicals which oxidize contaminants onto the catalytic surface. This equipment is effective at removing contaminants within the targeted airstream but has limited effectiveness in occupied spaces.
- 3. Bi-Polar Ionization (BPI).** This technology utilizes energy to produce positive and negative ions, which then react with particles and contaminants to remove them from the air and ultimately to improve air quality. Some manufacturers claim the ions also deactivate viruses although limited industry testing is available to independently validate these claims. Manufacturers indicate independent testing procedures are under development. These products may produce ozone which can be harmful to occupants. When considering BPI technology ensure the equipment carries a UL 2998 listing as “zero ozone emission.”
- 4. Photo-Hydro Ionization (PHI).** Like PCO, this technology utilizes UV lamps along with a catalytic target to create hydroxyl radicals which oxidize contaminants. However, PHI produces hydroxyl radicals in gaseous form, and this “gaseous hydrogen peroxide” travels with the airstream into the occupied spaces. Some manufacturers produce PHI equipment meant for direct installation in the occupied space, and this equipment may prove useful in targeted locations within a particular venue. Testing suggests PHI is effective at killing viruses within an occupied zone, but there is limited independent research available and currently no industry standard to measure efficacy. Manufacturers suggest such standards are currently under development. Like Bi-Polar ionization, PHI equipment should carry a UL 2998 listing as “zero ozone emission.”
- 5. Dry Hydrogen Peroxide (DHP).** DHP is very similar to PHI, with patented variations in the combination of UV and catalyst material. This technology is often deployed through equipment installed at, or near, the occupied space. Like PHI, manufacturers indicate testing and efficacy standards are under development. DHP equipment, if used, should carry a UL 2998 listing as “zero ozone emission.”

Limited testing and lack of industry standards or consensus throughout the HVAC-R industry makes it impossible to specifically recommend the technologies noted above. Because of this, the NHL recommends consulting engineering professionals to evaluate options specific to each venue.

For more up-to-date information and guidance on these technologies, please visit **ASHRAE Technical Resources: Filtration and Disinfection:** <https://www.ashrae.org/technical-resources/filtration-disinfection#mechanical>

MECHANICAL / HVAC-R SYSTEMS POLICY



COMPLIANCE

On or before February 15, 2021, each NHL Arena and Practice Facility shall submit to [REDACTED] and [REDACTED] a certification that:

1. An independent ventilation analysis and air balance report (air handling unit-level Testing Adjusting Balancing (TAB) report) has been conducted for all occupied spaces, which will confirm supply, outdoor air and exhaust ventilation rates by a certified TAB contractor, and establish whether the existing system is performing to the basis of its design. For clarity, the testing of individual VAV boxes and distribution ductwork in occupied spaces is not a requirement.
2. The following requirement set forth in this policy has been met:
 - a. In Team Spaces, prior to each occupancy by Players and staff (e.g., Groups 1 and 2A-C), flushing all home and visiting Team Spaces with outdoor air for a time **required** to achieve three air changes of outdoor air¹⁸ (3 OAC).
 - i. For HVAC-R systems serving such occupied spaces that are unable to achieve 3 OAC, the venue must attempt to achieve six air changes per hour¹⁹ (6 ACHs). Venues shall seek assistance from a professional engineer, infectious disease specialist or industrial hygienist to assess their specific needs for this evaluation.
3. If the above points 1 and/or 2 have not been met, provide an explanation of when they are expected to be met, or if they cannot be met.
4. The recommendations to
 - a. review and increase airflow (ACH) and outdoor air flow rates to all occupied spaces based on an analysis of the venue's existing configuration of the HVAC-R system and the current air balance report and
 - b. improve central air and other local HVAC-R filtration above code minimums to MERV-13 (ASHRAE 2017b) or the highest level achievable, without impacting system air flow and pressure based on existing HVAC-R system configurationhave been reviewed and met, where practicable.

Compliance forms will be provided for this purpose.

¹⁸ ASHRAE Guidance for Reopening Buildings; Section: Pre- or Post-Occupancy Flushing Strategy

¹⁹ CDC Ventilation requirements for areas affecting patient care in hospitals and outpatient facilities Appendix B. Air - Section 4 Table B-2



MECHANICAL HVAC-R SYSTEM POLICY CERTIFICATION

FORM 1 CERTIFICATION



ARENA RESTART PROTOCOLS 2020/21 SEASON MECHANICAL HVAC-R SYSTEM POLICY CERTIFICATION

Please return via email to _____ and _____)
on or before February 15, 2021.

I hereby certify that _____ has completed the following
[Game Arena or Practice Facility Name]

actions below as required by the NHL Mechanical / HVAC-R Systems Policy:

Please note that this certification must be submitted for the Game Arena **and**
Practice Facility.

- [] 1 An independent ventilation analysis and air balance report (air handling unit-level Testing Adjusting Balancing (TAB) report) has been conducted for all occupied spaces, which will confirm supply, outdoor air and exhaust ventilation rates by a certified TAB contractor, and establish whether the existing system is performing to the basis of its design. For clarity, the testing of individual VAV boxes and distribution ductwork in occupied spaces is not a requirement.
- [] 2 The following requirement set forth in this policy has been met:
 - a. In Team Spaces, prior to each occupancy by Players and staff (e.g., Groups 1 and 2A-C), flushing all home and visiting Team Spaces with outdoor air for a time required to achieve three air changes of outdoor air (3 OAC).
 - i. For HVAC-R systems serving such occupied spaces that are unable to achieve 3 OAC, the venue must attempt to achieve six air changes per hour (6 ACHs). Venues shall seek assistance from a professional engineer, infectious disease specialist or industrial hygienist to assess their specific needs for this evaluation.
- [] 3 If the above points 1 and/or 2 have not been met, provide an explanation of when they are expected to be met, or if they cannot be met here:

Explanation: _____

FORM 1 CERTIFICATION



- [] 4 The recommendations to
- a. review and increase airflow (ACH) and outdoor air flow rates to all occupied spaces based on an analysis of the venue's existing configuration of the HVAC-R system and the current air balance report and
 - b. improve central air and other local HVAC-R filtration above code minimums to MERV-13 (ASHRAE 2017b) or the highest level achievable, without impacting system air flow and pressure based on existing HVAC-R system configuration
- have been reviewed and met, where practicable.

Signature

Print Name

Title

Date