Ventilation: response to COVID-19 pandemic

Memorial recognizes ventilation is another control to minimize the spread of COVID-19 An important consideration is that good ventilation is just one of the many layers of protection against virus spread, which includes high vaccination rates, proper wearing of masks, use of rapid testing, staying home if you have symptoms, physical distancing, proper cough etiquette and more.

The Office of the Chief Risk Officer (OCRO) established a COVID-19 Heating, Ventilation and Air Conditioning (HVAC) working group to review and consider implementation of technical recommendations to enhance building ventilation systems and reduce the risk of airborne aerosol exposure. The working group includes representatives from: Facilities Management on St. John's, Marine Institute and Grenfell campuses and OCRO.

There are numerous sources of information regarding ventilation and transmission; during the COVID-19 pandemic Memorial is following guidance from multiple sources including the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) pandemic taskforce recommendations, Public Health Agency of Canada and the Centre for Disease Control.

Literature sources consistently recommend an approach of:

- Increasing air filtration, while still maintaining comfortable indoor air temperature and humidity
- Regular maintenance of building HVAC systems; and
- Opening windows or doors where possible or feasible

Types of mechanical ventilation

Memorial has many types of buildings from the new state of the art Core Science Facility to original buildings built in the 1950s. Some buildings are mechanically ventilated; others rely on natural ventilation (e.g. windows) and some have a combination of both. Of those buildings that have mechanical ventilation systems, some buildings have 100% fresh air supply, others have re-circulated air with filters at various design amounts; a building with mechanical ventilation may or may not have air conditioning; some buildings have humidification systems and some building systems have carbon dioxide detectors, which can increase fresh air into a space.

Memorial has conducted ventilation assessments of all identified classrooms on the St. John's, Grenfell and Marine Institute campuses to determine the type of ventilation. Classrooms have various ventilation types either mechanical or natural (operable windows), that meet or exceed recommended guidelines. Maintenance is conducted on mechanical ventilation systems to ensure the filters are changed and the system is operating as intended. Facilities Management has also replaced the MERV 8 filters where possible with higher rated MERV 13 filters. This improves the efficiency of capturing any small particles in the air.

Building ventilation systems are designed for occupant health and comfort; and they take into account factors such as the space use, number of people that will occupy the space, and

heating/cooling requirements. **Air exchange rates or air changes per hour (ACH) are generally not used as a principle design target except in special areas such as laboratories and animal care facilities, which have regulated ACH rates**.

In addition to various measures to improve ventilation to mitigate COVID-19 risk, experts on the ASHRAE Epidemic Task Force for Core Recommendations for Reducing Airborne Infectious Aerosol Exposure recommends HVAC systems when necessary to flush spaces between occupied periods, operate systems for a time required to achieve three air changes of equivalent clean air supply.

Mechanical ventilation systems at Memorial

Memorial has implemented a comprehensive process to review all HVAC systems on campus to ensure they meet COVID-19 public health and safety guidelines. The following table summarizes the type of changes being made to the mechanical ventilation systems:

	PRE-COVID-19 BUILDING HVAC CONDITION	COVID-19 BUILDING HVAC CONDITION (a)
HVAC Maintenance Schedule	Scheduled Maintenance	HVAC System Inspection, Enhancement, Ongoing Maintenance
HVAC Filtration	MERV-8 Filters 3 to >10 micron particles	MERV-13 (a) Filters 0.3 to >10 micron particles
HVAC Runtime/Occupied **Schedule**	12-16 Hour Runtime	Increased by 1-3 hours

a. **ASHRAE recommends ensuring HVAC systems can handle filter and ventilation upgrades without negative impacts to pressure differentials and/or air flow rates.**

Risk based approach

To ensure a safe indoor environment, the working group has prioritized our campus teaching spaces. Memorial has a risk matrix to guide decision making for the use of classrooms and teaching spaces on campus. **List of assessed teaching spaces is available (Appendix A)**

	Mechanical Ventilation	**Natural Ventilation (Windows)**	**No Ventilation**
Classrooms	Use at pre-pandemic capacity and/or less than 100 in space	Up-graded with additional measures to use at pre-pandemic capacity and/or have specific occupant instructions	Not used until further re-assessment
Wet Labs	Use at pre-pandemic capacity	Not used until further re-assessment	Not used until further re-assessment

Risk Level: Low Moderate High

Types of spaces and recommendations for occupants

Types of Spaces	Recommendations for Occupants
Teaching spaces: **Classrooms and Teaching labs**	▪ A summary of teaching spaces equipped with mechanical ventilation, teaching spaces that have been upgraded, and teaching spaces that are not being used for regular teaching activities for Winter 2022 is maintained. ▪ As of January 31, 2022, all teaching spaces with mechanical ventilation are available for use at pre-pandemic capacity. Limited or no mechanical ventilated spaces are being assessed.
Mechanically ventilated spaces: **Spaces designed with mechanical ventilation that is driven by fans or other mechanical equipment within a building**	▪ Where mechanical system design allows, main air handling units are equipped with MERV 13 air filtration. Air filters are on a preventative maintenance schedule for replacement ▪ Where possible, HVAC systems with CO2 monitoring are set to bring in outside air if CO2 levels rise. ▪ Where possible, operating HVAC systems for an additional time for pre or post occupancy flush, and reviewing the time of day main air handling units are scheduled to turn off and on and mirror them with the times the building is primarily occupied. Systems continue to run at low levels after hours where possible. ▪ Wet labs are designed with systems to provide adequate ACH.
Naturally ventilated spaces: **Spaces without mechanical ventilation systems equipped with operable windows.**	▪ Occupants should open windows and doors to bring in as much fresh air without compromising occupant comfort (temperature) or security. ▪ Do not leave windows open when you vacate the room or overnight as it may result in too much cold air, security risks and rodents entering the building. ▪ Refer to Memorial's Natural Ventilation Guideline
Non-mechanically ventilated spaces without windows: **Spaces without mechanical ventilation systems and are not equipped with windows or where windows don't open**	▪ Limit use of space to one user. ▪ Open doors in area as long as possible without compromising security. ▪ If needed, contact EHS at health.safety@mun.ca to arrange a ventilation assessment of your naturally ventilated space with no windows or windows that do not open. Requests should only be made by supervisors.

Appendix A

Assessed teaching spaces

St. John's Campus

A 1002	BN 3007	ED 1014	ED 4011
A 1043	BN 3010	ED 1020	ED 4014
A 1045	BN 3037	ED 1023	ED 4015
A 1046	C 2003	ED 2002	ED 4034
A 1049	C 2004	ED 2003	ED 4051
A 2065	C 2022	ED 2004	ED 5006 and 5007
A 2071	C 2024	ED 2018A	ED 5012
A 3017	C 2026	ED 2018B	ED 5021
A 3018	C 2033	ED 3005	EN 1000
A 3020	C 2045	ED 3008	EN 1001
A 3033	C 3033	ED 3011	EN 1002
A 4004	C 3053	ED 3023	EN 1003
A 4049D	C 3055	ED 3030	EN 1004
A 5014	C 4002	ED 3034A	EN 1019
A 5032	C 4011	ED 3034B	EN 1020
BN 1008	C 4036	ED 3048	EN 1040
BN 1009	CS 1009	ED 4008	EN 1051
BN 1010	CS 1019	ED 4009	EN 1052
BN 2028	ED 1005	ED 4010	EN 1054

EN 2006	ER 3008B	H 3454	MED 1M102
EN 2007	ER 3009B	HH 3013	MED 1M109
EN 2022	ER 3010	HH 3015	MED 1M111
EN 2040	ER 4000	HH 3017	MED 1M112
EN 2043	ER 5000	IIC 1033	MED 1M113
EN 2048	H 1622	IIC 1035	MED 1M114
EN 2050	H 1758	IIC 2001	MED 1M115
EN 2056	H 2768	IIC 2002	MED 1M116
EN 2078	H 2815	J 2008	MED 1M117
EN 3000 and 3029	H 2860	J 2014	MED 1M118
EN 4008	H 2862	J 3004	MED 2767
EN 4020	H 2864	J 3008	MED 2815
EN 4033	H 2908	J 3014	MED 2819
EN 4034	H 2910	J 3015	MED 2820
EN 4035	H 2911	L 1006	MED 2821
ER 3005B	H 2956	L 2028	MED 2824
ER 3006A	H 3427	MED 1849	MED 2826
ER 3007B	H 3444	MED 1852	MED 2827
ER 3007C	H 3446	MED 1M101	MED 2828
MED 2829	MED 4M119	PE 2001	SN 3125A
MED 2860	MED 5209	PE 2028	SN 4038

MED 2862	MED 5227	QC 1000	SN 4040
MED 2864	MED 5M100	QC 1004	SN 4063
MED 2865	MED 5M101	QC 4028	SN 4068
MED 2866	MED THEATRE A	SN 1103	SN 4073
MED 2868	MED THEATRE D	SN 2018	SN 4078
MED 2J549	MED MAIN AUDITORIUM	SN 2036	SN 4083
MED 2J618	MU 1001	SN 2041	SN 4087
MED 2J619	MU 1026	SN 2064	SN 4110
MED 2M114	MU 1032	SN 2067	SN 4116F
MED 2M218	MU 1034	SN 2098	UC 2001
MED 2M240	MU 1045	SN 2101	UC 4005
MED 3M101	MU 1050	SN 2105	UC 4007G
MED 3M203	MU 2017	SN 2109	UC 4010A
MED 3M300	MU 2021	SN 3038	UC 4010B
MED 3M626	MU 2025	SN 3042	UC 4011
MED 4M117	MU 2033	SN 3058	UC 4015
MED 4M118	1 PE 2000	SN 3060	UC 4016

MED 3M300	MU 2021	SN 3038	UC 4010B
MED 3M626	MU 2025	SN 3042	UC 4011
MED 4M117	MU 2033	SN 3058	UC 4015
MED 4M118	PE 2000	SN 3060	UC 4016

QC-3005	QC-2011
BN 3002	QC 2013
BN 3008	QC 3004
BN 3009	QC-2003
BN 2015	ED 2031
	SN 1019

Grenfell Campus

AS 228	AS 326	AS 2016
AS 229	AS 328	AS 2026
AS 304	AS 329	AS 3003
AS 305	AS 350	FC 3019
AS 324	AS 375	FC 3024
AS 325	AS 378	LC 202
AS 3005	AS 379	LC 301
AS 3009	AS 383	FA 223
AS 3032	AS 2011	FA 224
		FC 2014

Marine Institute

E1310
E1300
E1302
E1306C
E1307
E1320
E1321
E2317
E3300
E3301
E3303

E2302
E1311
E1319
W1000D
W1003
W1006
W1016
W1018
W1019
W1021
W1023

W2032
W2034
W2036
W2040
W2048
W2054
W3004
W2026
W3005
W3010/12
W3029/31

W3033/35
W1039
W1119

E3327
E3206
E1303
E2300
E2304A

E2327
E3315
E2305
E2311
E2313

C3226
C3228
E3323
C3208
E2325

W1004
W1002
W1008
W2046
C3208
W3018A

W1004B