Town of Littleton School Committee

33 Shattuck St. * P.O. Box 1486 * Littleton, MA 01460-4486 *
Phone: (978) 540-2500 * Fax: (978) 486-9581 * Website: www.littletonps.org

MATTHEW HUNT, Vice Chair
BRAD AUSTIN, Member
MIKE FONTANELLA, Chair
TIMALYN RASSIAS, Secretary
JUSTIN MCCARTHY, Member

6:30 I. ORGANIZATION
1. Call to Order

6:35 II. EXECUTIVE SESSION
1. Motion to move into Executive Session for the purpose of contract negotiations with intention to return to Open Session.

SCHOOL COMMITTEE MEETING

You are invited to a Zoom webinar.
September 24, 2020
7:00 PM
Please click the link below to join the webinar:
https://littletonma.zoom.us/j/93715352424?pwd=a2tYRHl3em5PNVk5RlVaZXppaTdWdz09
Passcode: 503536
Or iPhone one-tap :
US: +13017158592,,93715352424# or +13126266799,,93715352424#
Or Telephone:
Dial(for higher quality, dial a number based on your current location):
US: +1 301 715 8592 or +1 312 626 6799 or +1 929 205 6099 or +1 253 215 8782 or +1 346 248 7799 or +1 669 900 6833
Webinar ID: 937 1535 2424
International numbers available: https://littletonma.zoom.us/u/aeDhJiPrYi

** *A G E N D A* * *

Our mission is to foster a community of learners who strive for excellence and prepare each student to be a successful, contributing citizen in a global society.

7:00 I. ORGANIZATION
1. Call to Order
2. Consent Agenda
-Minutes – September 10, 2020
-Oath to Bills -
and Payroll

It is the policy of the Littleton Public Schools not to discriminate on the basis of race, gender, religion, national origin, color, homelessness, sexual orientation, gender identity age or disability in its educational programs, services, activities or employment practices. Further information may be obtained by contacting Lyn Snow,, District Equity Coordinator at 978-540-2500, lsnow@littletonps.org or 33 Shattuck Street, P.O. Box 1486, Littleton, MA 01460.

7:05 II. INTERESTED CITIZENS

7:10 III. NEW BUSINESS

1. **School Opening**: Superintendent Kelly Clenchy and Building Principals will provide an update on the first week of school.
2. **MASC/MASS Joint Conference, November 6, 2020 Official Delegate Form**: In the event a School Committee member attends the MASC Conference and would like to vote at the Annual Business meeting, it is necessary that an official delegate be designated and form submitted by October 16, 2020.

7:20 IV. PRESENTATION

1. **HVAC Study:** Presentation on the HVAC Study by BLW Engineers, Inc.
2. **Public Health Metrics:** *Chair, Mike Fontanella will give an update to the Public Health Metrics.*

7:40 V. INTERESTED CITIZENS

8:00 VI. SUBCOMMITTEE REPORTS

1. **PMBC**
2. **Budget Subcommittee**
3. **Policy Subcommittee: (see LPS website to view all policies)** http://www.littletonps.org/school-committee/school-committee-polices

8:05 VII. ADJOURNMENT/EXECUTIVE SESSION

Motion to move into Executive Session for the purpose of contract negotiations with no intention to return to Open Session.

Next School Committee Meeting
October 1, 2020
7:00 PM

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MATTHEW HUNT, Vice Chair — MICHAEL FONTANELLA, Chair — TIMALYN RASSIAS, Secretary
BRAD AUSTIN, Member — JUSTIN MCCARTHY, Member

SCHOOL COMMITTEE
MINUTES
September 10, 2020
7:00 PM

PRESENT: Mike Fontanella
Matthew Hunt
Brad Austin
Timalyn Rassias
Justin McCarthy

ALSO PRESENT: Kelly Clenchy
Steve Mark
Dorothy Mulone

NOT PRESENT:

CALL TO ORDER

Mike Fontanella called the meeting to order at 7:00p.m.

> On a motion by Matthew Hunt, and seconded by Justin McCarthy, it was voted to approve the Aug. 27, 2020 consent agenda as presented. (AYE: Unanimous). Motion carried. Roll Call Vote: Matthew Hunt, AYE; Timalyn Rassias, AYE; Brad Austin, AYE; Justin McCarthy, AYE; and Mike Fontanella, AYE.

INTERESTED CITIZENS

None

OLD BUSINESS:

1. **Board of Health:** Mike Fontanella: We met with the BOH last week jointly. The two boards, Public Health Agent and Administration will be who decides to open schools and BOH and Public Health really are the drivers on how we respond to positive tests. School Nurses will be involved with contact tracing and will work with the BOH and Public Health Agent. BOH really has the roll in validating the various aspects and guidance of opening the schools. BOH will be a big resource to the schools.

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2. **HVAC**: **Steve Mark** discussed the progress. HVAC company ENE technician has completed all unit ventilators; worked over the holiday weekend, completing SL. All have been cleaned and checked and running at this point and time. All filters have been changed. Some MERV Filters have been installed. Still some remain on back order.
   Mike Fontanella: What level filtration do we have on hand to use?
   Steve Mark: MERV 13's, MERV 8's, and MERV 11's. The supply chain is keeping us on back orders. Typically, we run MERV 8's. As the 11's and 13's come in we are swapping them out.
   Brad Austin: What is the timeline for the arrival of all new filters?
   Steve Mark: We ordered months ago. They are on backorder. We have hired BLW Engineering. They have been onsite for a few weeks. We should expect a report on the current status of our systems from BLW. They will make recommendations on how to work with our current systems. Our goal is to have a report in time to go over the results with BLW and have them report back at our next SC Meeting.
   INTERESTED CITIZEN: JoAnn Dery: Engineering Company results. Will these results be posted on the LPS website for the community to review?
   Mike Fontanella: Yes. We will have them in the SC Packet at the next SC meeting as well as the website.

NEW BUSINESS

1. Dr. Clenchy: First day back. We welcomed the staff back. We have over 200 staff back in the buildings. Every first day back of a new school year we start off with a morning meeting. We had over 200 staff members on a Zoom meeting, it was great to see everyone. I discussed with the staff that we need to focus to pull together and work together during these challenging times. Important that we all know we have got this. We are all here to support each other. Theme of the morning was in the music as music is very soothing. I shared a song by Thomas Rett titled Be a Light. It speaks through many challenges we all need to deal with. We played the video/song put together by a local student. There is always a light at the end of the tunnel, just not sure how long that tunnel is. In a World Full of Hate Be a Light. Special Thanks to Tyler Minoit. Dr. Clenchy discussed the responsibility we have as a staff to our community. We are here to educate. There will be times we will take a risk, there are times we will be exhausted. We will get through this and meet the needs of our students. We are here to give a quality education.
   We need to pull together as a community for success. We shared a slide show to our staff titled Pulling Together that speaks to the need for interdependency to make a healthy society. Together we will continue to prosper.
2. Professional Development: Director of Curriculum, Elizabeth Steele gave an update on the PD that the Faculty and Staff have been pursuing during the extended 10 days allocated for PD. September 1st. All members gathered together for our kickoff meeting. Welcomed new staff, celebrated years of service. We have already seen staff engage on individual and school-based PD. Time has been dedicated to room set up, lesson planning, team and department collaboration, review of curriculum standards, practicing and implementing new technology programs and how to teach safely in a hybrid and remote classroom. Making many adjustments. Been very innovative. District wide PD opportunities Staff signed up for Two Tech, apps and tools PD sessions in house. We have many experts in each school who are willing to share with colleagues. Google Classroom basics, Flipgrid etc.. Tech Team was able to set up doc cameras so staff could use the devices to practice. Teachers are learning. It has been a bit like riding a bike. It is not always smooth at the beginning but the more you practice the more they improve. Teachers will be riding smoothly in no time. Accommodations and modifications in a virtual world. Lyn Snow provided an overview of what these are. Provided Ideas on how we can differentiate our instruction to ensure that we can use it with all of our students. Dr. Kalise Wornum, virtual session to the Faculty. Her mission is to eradicate all forms of racism in the classroom. Information and impart practices that encourage and allow educators to become culturally proficient within the schools. We will be welcoming her back in October. Teachers have had many choices to prepare for the first day of school. They are ready. Although it has been difficult, teachers seem very eager to have their students into their classrooms.

Brad Austin: Pleased with the curriculum . Great approach giving the time. Glad we are focusing on the cultural response of teaching in our PD. Very pleased to hear these things.

Justin McCarthy: Feedback from another district that went remote. Anxiety from parents. When will I get a dry run for our students? How do I log in? Will we have practice time to set up so not to have technical difficulties?

Dr. Clenchy stated that this information with opportunities to practice should be out by Monday.

Cheryl Temple: SL and RSS just posted teacher assignments and teachers are starting to reach out to families and students on their class lists.

Michelle Kane: Tech department we will be deploying all information to K-2 families, students.

Timalyn Rassias: Can students use their own devices, or should they be using the school chrome book?

Cheryl Temple: It is best if they use the device given to them from the school. Expectation is students need to bring their devices back and forth. If you want them to bring your device back and forth to school then that is up to you. If using at home device is successful then yes.

Mike Fontanella: School Committee perspective is that we recognize the challenges that all are taking on. We are committed as a SC to continue to evaluate and adjust. We are excited to see how this lifts off. We will continue to make adjustments as we move forward. Some will be decided by the BOH on how we open up our schools. Delivery of curriculum is different. We realize this will be a process with a lot of feedback. We will make decisions together. We appreciate the staff for all they are doing.

Teacher accommodation and Leaves: Dr Clenchy stated that we have been meeting with teachers to discuss accommodating their needs. The FFCRA, childcare leave. Staff members can take 12 weeks of leave to find daycare. Two teachers have been granted this. We have a total of 12 staff that we have created accommodations ranging from PPE, to room assignment changes. We have allowed a few to teach remotely at home. Medical-3 FMLA leaves. This is not atypical. Unpaid LOA-2 of these. We provided these accommodations out of 135 teachers in our district.

Brad Austin: With the 12 accommodations will they be instructing Littleton students?

Dr. Clenchy: Yes

School Bldg. Preparations

Michelle Kane: Shaker Lane building is coming alive. Everyone is supporting each other. We are so grateful for all of the unique twists and spins our teachers have come forward to make this a better experience. Two new staff members are interviewing tomorrow for a 1 year kindergarten level. Working with Tech Team along with Tech team working with families. Chromebook deployment will continue. School nurse has been phenomenal working and informing all with CDC protocols.

Cheryl Temple: Great to see staff. Many members have been in early to set up their classrooms and bulletin boards. One new hire. We started the excellence coin which was awarded to Andrea Romano. We will continue this token of excellence, curious to see who Andrea Romano will choose next. Staff meeting outdoors to start off the long weekend. Very positive meeting. We have a canopy set up for outdoor space and mask breaks, perhaps lunch space. Custodians are made up of only two people come in all summer.

Custodial staff said, if they had time they would complete the painting. They completed their list for opening day, working very hard. Café' system is all set up for students to order lunches. We have had focus PD time, sharing information. Remote only teachers will be handing out packets for curbside pickup. Chromebook deployment will continue. 600 Pizza boxes have been filled with art supplies for students so they can be ready for their art classes, very creative ideas. Been an amazing time.

Brad Austin: Having remote only teachers. Can you give us the breakdown of numbers?

Michelle Kane: SL two full remote K , 1st and 2nd grade. Class sizes; K is 14-15 with in person being 17. Another grade similar.

Cheryl Temple: RSS have balanced numbers. Largest remote class is 23 then 20 then 21. Two remote at each level.

Jason Everhart: Echo a lot of Michelle and Cheryl, staff has been great, getting more comfortable. The staff comradery has been great. Shawn Ryan, custodian. Working effortlessly getting all together. Chromebook deployment has been completed. Office staff out in the rain helping deploy. Staff meeting, great feedback, PD has been great. Confident and happy with our progress. PTA has been fantastic. Bringing snacks in and giving a great sense of community all around.

John Harrington: Many shout outs to all faculty and staff. Task force has been great. Heighten anxiety all around not just Littleton but having open discussions all around. All supporting each other. Custodians have been pulling together, we are all working together. Confident that all classrooms will be pulled together. Café' staff has been awarded the Paul Harris award from the Rotary Club of Littleton for providing meals all summer long. accolades to them. Signage has been put up everywhere with directions on how to navigate throughout the school. Learning curve but everyone is coming together. School Nurse has been and will implement guidelines for all, collaborating with other school building nurses, all working together. We have some vacancies to fill, working our way through it.

Brad Austin: Boston Magazine. Boston Magazine has ranked Littleton Public Schools as the 2nd best schools. Congratulations, something to celebrate.

Steve Mark: Bus routes will be posted Friday afternoon on our website. Additional information will be posted on the website as well. Bus passes will be distributed to students once completed. Please be patient.

PRESENTATION:

1. **Public Health Metrics:** Chair Mike Fontanella updated the community on public health metrics for Covid-19. The numbers are holding for now.

Number of Cases Per Capita – 2.1 cases in Littleton, still in the green
Percent Change in New Cases Per Capita
Rate of Positive Tests – Goal is to be less than 3%, Littleton is at .6
Percent Change in Positive Tests
Hospitalizations Per Capita
Deaths Per Capita

DESE Guidance for Number of Cases Per Capita Per 14 Day Rolling Average

- Littleton is green
    - 3 cases in the last 14 days
    - Average daily cases per 100k population = 2.1

- Percent positivity in last 14 days = 0.6%

FINANCES: YTD Financial Report. % are low as it is a two-month report only. Fiscal year runs from July 1 to June 30th. Steve Mark discussed the financial report in depth with the cost center report and appropriate budget report. Discussed the revolving funds. Balance going down due to spending. Last year a bit different due to COVID, funds have been carried over to this year. Funds are available each year.
PPE: We have spent a Littleton over $84,000.00 on PPE this far.

INTERESTED CITIZENS
Joann Dery: Harwood Avenue: Concerned about the plan for lunches with students in the classroom with masks off. Concerned about an airborne disease and a new group of students entering the room.
Dr. Clenchy: Thank you for bringing this up. There have been discussions of using alternative spaces for outdoor use and lunches. DESE recommendations say we can use classrooms for lunches. Our intention is to have them out of the classroom when possible.
Joann Dery: I hope that this becomes firm.

Eileen Wedegartner: Maple Hurst Road: If teachers are not supposed to be in the classroom during lunch, where are teachers going to have their breaks?
Dr. Clenchy: Staff lounges. They can utilize them if they like. Lunches are staggered so not all teachers will be together at the same time. There will be the 6ft. mandated distance.

Shayna Garlisi: Boxwood Drive: Teacher: First let me say thank you to the administration for all that they have done over the summer, working very hard, everyone pulling together. Although we as faculty feel we have not gotten support as much as we had wanted we are happy that things are turning. Concerns in regard to the chemicals that are being used during the day. Heavy duty chemicals? Teachers are being asked to stay in the school while they are cleaning. If students can't use the wipes for sanitizing, what level is it safe for staff to be in the building on cleaning days.
Mike Fontanella: When there is deep cleaning, we will not be doing the more aggressive cleaning. We will not be doing this until the building is empty. We are very aware. There could be a chance that we may not have staff in the building while the cleaning is going on, however again we will not be doing the aggressive cleaning when staff are in the building.
Steve Mark: The products that we are using during the day are EPA approved green chemicals that we have been using for the last five years in all of our school buildings. The more aggressive cleaning will not be happening until all staff and students are out of the building, including Tigers' Den. The products that we use in the misting machines have been approved by the BOH, we will continue the use of them.
Shayna Garlisi: Reporting of positive cases that may have not come into the building. Cases are on the rise. If we attempt with 6ft apart, our cohorts will be changing with Tigers' Den staff and students coming together. 6ft is average for particles to drop.
Mike Fontanella: The CDC guidelines what they are defining as close contact. This is not what will be using for close contact. These guidelines are for determining how contact tracing is conducted and how the BOH would be reaching out to people to tell them that the CDC has reported to us; these are the steps that we will need to take. Our reporting on any cases will be different and appropriate in what we need to do to keep our community informed. Some of these are topics in negotiation discussions and other committees. We are going to do what we have to do to communicate properly to our community, we will continue to inform.
Mike Colson – Spectacle Pond Road: Thank you to the administration. Negotiations: I know you can't speak publicly but how are negotiations going overall?
Mike Fontanella: Negotiations are moving along. We have 2 more meetings prior to school opening.
Mike Colson: As the President in Westford, we finished weeks ago. As a parent I find this concerning that you are still in negotiations. Want to share with the public that I am concerned that we do not have an agreement

before we start. It must be disconcerting to our teachers. Looks pretty remote that we will have an agreement by next Wednesday.
Mike Fontanella: We can't speculate when this will be ratified. We have been meeting regularly. Our lawyer has said that she has settled a few schools, but not all. I appreciate your concerns, but teachers can check with their union to check the status of the MOA.

Sarah Tryjanskowski: Harvard Road: As a parent trying to plan for next week. Confirming that Kindergarten cohort B will be taking the bus.
Michelle Kane: All of the kids will be taking the bus on Thursday. Yes, we will be open for in person instruction and all students will be on the bus.

Sarah Belcher: Whitetail Way: COVID questionnaire we are to fill out. Will this be on line?
Dr. Clenchy: Lyn Snow could answer this.
Lyn Snow: This is not to be expected to be filled in every day. It is more of a guidance for whether or not you should send your child to school. Children will not be asked questions when they come into school as to how they feel.
Sarah Belcher: What kind of support will the school nurse have? Will they have additional support? If our nurses are geared up in PPE; with now a possibility of exposure, who will take over for them.
Lyn Snow: Yes, we will have additional support for our nurses. We are in the process of hiring 2 LPNs to move throughout the schools for support. We also have access to a Nurse Staffing company if needed as well.
Mike Fontanella: If a nurse is geared up in PPE. Who will come in and support her?
Lyn Snow: We will utilize our newly hired staff or staffing company.

Linda Ficociello: Cleaning follow up: CDC guidelines state that kids should not be cleaning their desks. We received in a newsletter today that students will be cleaning.
Dr. Clenchy: There is some controversy with CDC guidelines and what we are able to do. All principals have been in contact and we are working on other ways of working around having students not have to clean.

Rebecca Mawn: Nashua: Teacher at SL: Shoutout to Shaker Lane, working incredibly hard supporting staff. On behalf of the folks at Shaker Lane, we would like to invite the School Committee members to come by and see what we have done. Being a reading specialist, I work with children from all different classrooms. I'm going with 1st and 2nd graders, picking them up back and forth to my room. This means as a staff member I am going all around the school. If I were to get sick I am going around the building into many rooms. Looking for a solution to this.

Eileen Wedegartner: Maplehurst Road: Number of teachers that were not granted accommodations? Looking at schoolspring.com it looks like there are 19 positions open. What is the likelihood of these positions being filled, how many staff members were denied accommodations?
Dr. Clenchy: We have worked very hard to accommodate. 12 accommodations are still working with us. Most of these positions have already been filled, if not we have subs to fill them for now. Some teacher leave notifications have been coming in late. We are doing all we can to get these filled.
Eileen Wedegartner: Will there be more openings coming up. Will there be more teachers leaving?
Dr. Clenchy: This is what we have now and where we are at with our staff. We cannot foresee what will happen moving forward.

Kelly Cusik: Silverbirch Lane: In all the planning, when it came to the conclusion as to why not half day as opposed to a full day and go home for lunch.
Dr. Clenchy: Challenge with half day model is time on learning. We would have to extend the school day and have to go into negotiations again to do so. Bus ride 45 minutes to school and then again 45 minutes home, not

much school time in between for time on learning when half time. The task force did take all of this into consideration.

SUBCOMMITTEE REPORTS: None, but we will be working together to start pulling our committees together.

ADJOURNMENT

On a motion by Timalyn Rassias and seconded by Brad Austin it was voted to adjourn at 8:55:PM. Roll Call Vote: Matthew Hunt, AYE; Timalyn Rassias, AYE; Brad Austin, AYE; Justin McCarthy, AYE; and Mike Fontanella, AYE.

NEXT MEETING DATE
School Committee
September 24, 2020
7:00PM
Zoom Meeting

DOCUMENTS AS PART OF MEETING

Public Health Metrics for Covid-19
Financial Reports

masc

Massachusetts Association of School Committees, Inc.

One McKinley Square, Boston, Massachusetts 02109
(617) 523-8454 (800) 392-6023 fax: (617) 742-4125 www.masc.org

Deborah Davis, President
Glenn Koocher, Executive Director

March 20, 2020

TO: School Committee Members

SUBJECT: **MASC ANNUAL BUSINESS MEETING**
Will be held during the Joint Conference on **FRIDAY, NOVEMBER 6, 2020**, 3:15pm.

RESORT and CONFERENCE CENTER at HYANNIS
Voting Delegate
Resolutions

Enclosed is the Official Delegate Form for registering your voting delegate for the MASC annual business meeting. This year's meeting will be in Hyannis during the joint conference. The form must be received in the MASC office by Friday, October 16, 2020.

MASC adopts its formal positions from decisions made by our membership. The resolution process is the primary vehicle for measuring feedback and developing legislative positions and action. Enclosed is the form, and instructions for submitting a resolution for consideration at the annual meeting. The deadline for submission of resolutions for review by the Resolutions Committee is June 1, 2020.

masc

Massachusetts Association of School Committees, Inc.
One McKinley Square, Boston, Massachusetts 02109
(617) 523–8454 (800) 392–6023 fax: (617) 742–4125 www.masc.org
Deborah Davis, President

Date: March 2020

To: MASC member school committees, c/o superintendent of schools

Re: Voting delegate to annual business meeting

Date: **DURING JOINT CONFERENCE. FRIDAY, NOVEMBER 6, 3:15PM**

Location: **RESORT AND CONFERENCE CENTER AT HYANNIS, HYANNIS**

FIRST NOTICE

In order for your school committee to have a vote at the annual business meeting of the Massachusetts Association of School Committees, it is necessary that an official delegate be designated in pursuance of Article IX, Sec. 6 of the By-Laws, as follows:

> *All members of the Association, and all members of school committees which are active members of the Association, may attend and speak at any meeting of the Association. Only active members shall be entitled to vote on the election of officers or on any other matter as to which members of the Association shall have the right to vote and each active member shall have one vote. No later than seven days prior to each meeting of the Association each active member shall, by written notice to the Executive Director, designate one of its members as its voting delegate and may by such notice designate one of its members as its alternate voting delegate. All ballots and other votes cast by an active member at any meeting of the Association shall be cast by and only by its voting delegate or if the delegate be absent, by its alternate voting delegate if one shall have been designated.*

PLEASE NOTE:

- An official delegate is only that delegate whose school committee has complied with annual dues regulations as spelled out in Article IV of the MASC By-Laws.
- Deadline for receipt of delegate forms by the Executive Director for the 2020 annual meeting is October 16, 2020.

Official Delegate Form

For the school committee of _____

The official voting delegate is: _____

_____

The alternate voting delegate is: _____

_____

Signed _____

NOTE: In order to register for the annual business meeting, delegates must send in this form in addition to the conference registration form.

Littleton Public Schools
Shaker Lane Elementary
Littleton, MA

2020

HVAC System Evaluation

Prepared For:

Littleton Public Schools
33 Shattuck Street
Littleton, MA 01460

Prepared By:

BLW Engineers, Inc.
311 Great Road
Post Office Box 1551
Littleton, MA 01460

September 11, 2020

EXECUTIVE SUMMARY

General

Littleton Public Schools engaged BLW Engineers to evaluate the building HVAC system relative to its current operating conditions, re-opening to the building to the public and potential considerations relative to Covid-19. Kenneth R. Beck, PE, Principal-In-Charge, visited each site, reviewed building documentation and prepared the following evaluation.

While at the site, BLW Engineers met with the facilities operator who reported the HVAC systems receives regular preventative maintenance which includes filter replacement, grease motors and bearings, replace fan belts and verify damper and valve operation.

The Shaker Lane Elementary School is located at 35 Shaker Lane; was constructed in 1961 and was last renovated in 1998. The school comprises approximately 66,000 square feet of educational space.

Shaker Lane Elementary School Planned Reopening

The Littleton Public Schools plans on the following school re-opening:

- School is to be occupied by 50% of students on Monday/Tuesday, Wednesday will be a disinfection/cleaning day and then occupied by 50% of students on Thursday/Friday.
- Classrooms seating will be reorganized to provide recommended social distancing; typically, classrooms sizes will be reduced to 14 occupants (students and a teacher).
- Cafeteria will not be used in normal fashion; students will eat lunches at their desk.
- Gym will not be used in normal fashion.
- Library room will not be used in normal fashion; it will be used primarily as classroom space.

Recommendations

Based on applicable guidelines (ASHRAE, State of Massachusetts Re-opening Guidelines, Massachusetts Teachers Association, etc.), the Shaker Lane Elementary School is safe to occupy and should consider the following best practice operation of the current HVAC system in an effort to provide an environment to best protect the occupants and visitors to the building during the pandemic:

Tier 1 Recommendations: Tier 1 recommendations are immediate revisions to system operation prior to start of classroom and until the start of the heating season.

1. Create an "Epidemic Mode" sequence of operation that can be turned on, shut down or override, if needed, by manual selection of the operator
2. Replace the unit filters with the best filters available that will not impact the heating capacity of the units and develop a filter replacement plan; unit ventilators, air handling units and rooftop units will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
3. Filter upgrades will require more frequent changes due to pressure drop of filter and particulates that “dirty” the filters.

4. Continued operation (24 hours a day, 7 days a week) of heating and cooling systems is recommended.
5. Operate toilet exhaust fans 24 hours a day, 7 days a week.; other fans shall operate two hours prior and two hours post occupied hours.
6. Monitor Carbon Dioxide (CO2) levels in occupied areas of the building by building personal on an intermittent basis.
7. Should building exhaust exit building through sidewall louvers subject to pedestrian traffic, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.
8. Operate the building in occupied mode with mechanical ventilation prior and two hours post occupied hours; where mechanical ventilation and exhaust are not currently provided, utilize operable windows.
9. Operate the building in the occupied mode during disinfection and cleaning operations.
10. Operate Classroom unit ventilators at maximum outdoor air for ventilation. Based on reduced classroom sizes, the classroom current system can provide more than 32 CFM/occupant which exceeds current code requirements (10 CFM per occupant plus 0.12 CFM/SF), MTA Guidelines and can be supplemented by operable windows.
11. Operate Health unit ventilator (HUV-1) at maximum outdoor air for ventilation; the unit have the capability of providing 32/CFM per occupant for 3 occupants.
12. Operate OT and Speech unit ventilator at maximum outdoor air for ventilation; OT could accommodate up to 7 occupants at 32 cfm/occupant ventilation rate and Speech could accommodate up to 3 occupants at 32 cfm/occupant ventilation rate.
13. Operate Teachers unit ventilator (CUV-2) at maximum outdoor air for ventilation; the unit have the capability of providing 32/CFM per occupant for 8 occupants.
14. Operate Cafeteria rooftop unit (RTU-1) at maximum outdoor air for ventilation; the unit have the capability of providing 32/CFM per occupant for 32 occupants.
15. Operate Library/Cafeteria rooftop unit (RTU-2) at maximum outdoor air for ventilation; the unit have the capability of providing 32/CFM per occupant for 32 occupants and the Library could accommodate up to 13 occupants at 32 cfm/occupant ventilation rate; the Computer Room could accommodate up to 6 occupants at 32 cfm/occupant ventilation rate.
16. Operate Gymnasium air handling unit outdoor air flow for ventilation should be field measured and determine its occupancy by dividing that airflow by 20 CFM.
17. Operate Administration through wall air conditioning units (IUV-1) at maximum outdoor air for ventilation; the Main Office could accommodate up to 4 occupants at 32 cfm/occupant ventilation rate and the Principal's Office could accommodate up to 2 occupants at 32 cfm/occupant ventilation rate.
18. In Conference Room, SPED and Guidance areas without mechanical ventilation, use operable windows with supplemental electric heat and portable HEPA filtration.
19. At the commencement of school and until the heating season, the rooftop units, unit ventilators and air handling units can be run in the "economizer mode" with 100% outdoor air and no recirculation.
20. During the heating season, operate rooftop units, unit ventilators and air handling units to the level above the ventilation design capacity based on outdoor air temperature and the acceptable indoor air temperature acceptable to the occupant comfort.
21. Eliminate zones that are not occupied to better use outdoor air in occupied areas.
22. Relocate occupants from areas that do not have mechanical ventilation or operable windows.
23. Use operable windows when outdoor air conditions allow.

24. Keep conference room doors open as much as possible or open windows when feasible.
25. Increase regular maintenance of all mechanical heating, ventilating and air conditioning equipment.
26. Monitor the heating, ventilating and air conditioning operation of the building on a continual basis.
27. Follow recommendations of holistic view of building recommendations in General Recommendations noted hereinafter.

Tier 2 Recommendations: Tier 2 recommendations are supplemental revisions/additions to the existing systems that may be required for the heating season when systems will need to utilize recirculated air to maintain space temperature setpoints.

1. Provide additional filtration with portable HEPA filter units (100 cfm/250 SF) or UV filtration units for unit ventilators, air handling unit or rooftop units with large percentages of recirculation air when operated under 32 CFM per occupant.
2. Install portable humidifiers or retrofit existing equipment with humidifiers for local humidity control should humidity become an issue.
3. Add plug-in type supplemental electric heat as required for increased ventilation requirements through equipment or operable windows.
4. Apply and use outdoor air quality sensors or reliable web-based data for outdoor pollution information as part of the new ventilation operation.
5. Consider UV decontamination lights on highly touched surfaces.

Notes:

1. These recommendations are based on guidance provided by applicable agencies and publications for best practices for protection of occupants and visitors to the building but do not provide absolute protection from the pandemic.
2. These recommendations will have a significant impact on the operating and maintenance related costs of the HVAC systems.

HVAC SYSTEM EVALUATION

The existing building is provided with heating hot water by two gas fired , cast iron sectional hot water boilers, a two-pipe heating water distribution piping system, unit ventilators, exhaust fans, and miscellaneous heating terminal equipment.

The dual fired, 80% efficient, boilers are located in the mechanical room. The boilers provide heating hot water for the building through the two pipe distribution system through two lead/lag/standby hot water distribution pumps with variable speed drives. The boiler room is in good operating condition.

The classrooms are provided with unit ventilators and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that typically provide 1250 cfm of total supply air; most unit ventilators have been replaced with newer units in the past 15 years. Air flow to classroom varies based on type and size. Typically, 450 cfm of outdoor air is provided to each classroom. Vertical unit ventilators receive air directly from the outdoors through a

sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 450 CFM per classroom. Some of the classrooms have been provide with split system air conditioning units comprised of an outdoor air cooled condensing interconnected with refrigerant piping to indoor ductless wall mounted units. The Classrooms could accommodate up to 14 occupants at 32 cfm/occupant ventilation rate.

The Cafeteria is provided a rooftop unit (RTU-1) that provides conditioned air through a low pressure insulated duct system units to ceiling supply diffusers. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 7,800 CFM of total conditioned air supply and 6,000 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 7.5 CFM x Occupant + 0.18 CFM x SF). Heating is provided through the rooftop unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor. The Cafeteria could accommodate up to 187 occupants at 32 cfm/occupant ventilation rate.

The Library and Computer Room is provided a rooftop unit (RTU-2) that provides conditioned air through a low pressure insulated duct system units to ceiling supply diffusers. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 3,200 CFM of total conditioned air supply and 640 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 7.5 CFM x Occupant + 0.18 CFM x SF). Heating is provided through the rooftop unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor. The Library could accommodate up to 13 occupants at 32 cfm/occupant ventilation rate; the Computer Room could accommodate up to 6 occupants at 32 cfm/occupant ventilation rate.

The Kitchen is provided with a make-up air unit (MUA-1) to provide heating and ventilation to the kitchen; the unit was designed to provide 3,200 CFM of outdoor air for makeup air to the kitchen. The kitchen is also provided with a kitchen hood exhaust fan (EF-9) rated for 2,500 CFM of grease hood exhaust and a dishwasher exhaust fan (EF-2) rated for 1,200 CFM of dishwasher hood exhaust.

The Gymnasium is provided with an air handling unit above the stage to provide heating and ventilation; operating information on air handling unit was not available. Heating is provided through the unit's hot water heating coil interconnected to the building hot water piping distribution system.

The administration area rooms are provided with through wall air conditioning units and common exhaust fan systems to provide hot water heating, ventilation and air conditioning. The Main Office is provided with two through wall air conditioning units (IUV-1) that provide 70 CFM for ventilation each; the Principals Office is provided with one through wall air conditioning unit (IUV-1) that provide 70 CFM for ventilation. The Main Office could accommodate up to 4 occupants at 32 cfm/occupant ventilation rate; the Principal's Office could accommodate up to 2 occupants at 32 cfm/occupant ventilation rate.

The Head End Room is provided with split system air conditioning and operable windows heating, cooling and ventilation. The split system air conditioning consists of an outdoor air cooled condensing interconnected with refrigerant piping to indoor ductless wall mounted units.

The Teachers Room is provided with a unit ventilator (CVU-2) and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator provides 750 cfm of total supply air and 250 CFM of outdoor air for ventilation. The Teachers Room could accommodate up to 8 occupants at 31 cfm/occupant ventilation rate.

The OT and Speech are provided with a unit ventilator (HUV-1) and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator provides 750 cfm of total supply air and 250 CFM of outdoor air for ventilation. The OT is provided with 167 CFM of outdoor air for ventilation and Speech is provided with 83 CFM of outdoor air for ventilation each. The OT could accommodate up to 7 occupants at 32 cfm/occupant ventilation rate and Speech could accommodate up to 3 occupants at 32 cfm/occupant ventilation rate.

The Conference Room, Guidance and SPED Room is provided with hot water fintube radiation for heating and operable windows for ventilation.

Bathrooms, Janitor's Closets, Storage, etc. are provided by exhaust registers, exhaust duct distribution system and roof exhaust fans.

Miscellaneous spaces have been provided with hot water terminal equipment interconnected with the hot water distribution piping system.

The building is controlled by electric and pneumatic controls.

GENERAL PUBLICATION RECOMMENDATIONS

Publications referenced include ASHRAE and State of Massachusetts Re-opening Guidelines for schools.

Operating school buildings under epidemic conditions requires a holistic framework during the crisis and the restoration to potentially a new "normal" after the public health emergency has ended. Considerations include:

- Review of current operational practices
- Holistic view for owner/operator

Review of current operational practices

- Modes of operation of HVAC systems
    - sequences of operations
    - set points
    - schedules
- Verification that equipment and systems are properly functioning and have the enhanced capabilities to address public health considerations, with a focus building air circulating systems.
- Understanding that infected people who are asymptomatic may enter buildings, increasing the likelihood of the spread of virus through air systems to other occupants.

Holistic view for owner/operator

Owners and operators should take a holistic view of their buildings and:

1. Develop a pandemic preparedness plan
2. Review indoor and outdoor environment
3. Review the space types
4. Operate and maintain HVAC
    - Air-Conditioning and Ventilation systems
    - Exhaust systems
5. Check Elevator Control
6. Check BAS and Access Control Systems

Develop a Pandemic Preparedness Plan

Consider these possible goals:

- Reduce the spread of infection among building occupants,
- Maintain HVAC and Building Service Systems in safe and healthy conditions,
- Minimize impact on building occupants and visitors,
- Communicate risks and precautions being taken with occupants transparently
- Implement measures that help make occupants feel secure:
    - Require occupants, visitors and maintenance personnel to wear appropriate PPE per CDC,
    - Screen, monitor and control the circulation of occupants and guests to help avoid transmission of disease,
    - Increase frequency for surface disinfection on frequently touched surfaces, such as door handles, handrails, door bells and elevator buttons.

Ensure continuity of supply chains and have backup plans.

- Identify your critical suppliers, e.g. filters, cleaners, disinfectants, parts, PPE, etc.,
- Identify vendors who could negatively affect your operation if they fail to deliver,
- Review current service provider agreements to see if alternate suppliers can be engaged in the event of a supply disruption, for example, equipment service providers, and understand contract limitations and restrictions on using alternative providers,
- Ask critical suppliers to share their pandemic plans:
    - What does their plan include?
    - Have they tested their plan? When was it updated?
    - Set boundaries with suppliers – ask that they do not send staff who may be showing signs of illness to your property.

Review contract agreements:

- Review contract agreements: Review contracts with service providers, utilities, and suppliers to determine what rights and remedies they have because of disruptions due to unforeseeable circumstances that prevent fulfillment of a contract.

Establish a communication protocol and continuity of operations plan:

- Identify key contacts and publish normal and emergency contact information,

- Document the chain of command and communication requirements, and provide instructions and outline expectations for how all responses are to be documented and what records shall be maintained and distributed.

Provide staff with:

- PPE per CDC and OSHA requirements,
- Training on the proper use and disposal of PPE and waste,
- Training on infection prevention and control measures,
- Cross training to ensure critical building functions are maintained in an emergency, and
- Instruction to staff to stay at home if they are feeling sick.

Check with insurance providers to determine whether there are special measures that can be taken to preserve coverage or lower premiums.

Next Steps:

1. Notify staff, tenants and visitors about the plan
2. Follow all local, state and federal executive orders, statutes, regulations, guidelines, restrictions and limitations on use, occupancy and separation
3. Follow OSHA Guidelines, especially the portion in the guide regarding filter and outside air.
4. Ensure that custodial staff and service providers job descriptions includes performing proper cleaning procedures based EPA and CDC guidance using approved products and methods:
    - Disinfect high touch areas of HVAC and other Building Service systems such as on/off switches, and thermostats;
    - Consider UV light disinfection devices of high touch counters in public spaces.
    - Disinfect interiors of refrigerated devices, such as refrigerators, coolers and vending machines where the virus can survive for potentially long periods of time.
5. Consider installing a thermal camera at building entrances to help screen visitors for elevated body temperatures. Note that that infected individuals may show no signs of being ill, including having no fever, and can be responsible for much of the transmission. In such cases, thermal imaging may not be effective.
6. Provide MERV13 or higher filters for air handling equipment that recirculate air when equipment has the capacity; however, most existing air handling equipment will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
7. The HVAC systems that are physical or capacity limited for better filtration and UV decontamination systems in the return airstream, consider installing portable filtration and air cleaning devices such as UVGI (Ultraviolet Germicidal Irradiation), especially if seniors or anyone with other health issues or compromised immune systems may be located, or, in mission critical areas where required.
8. Provide automatic hand sanitizer dispensers in the high touch areas and other common areas, including spaces where equipment where frequent maintenance is required, and ensure dispensers are serviced often and remain operational.
9. Post signage in prominent locations that contain information and instructions to educate and remind staff about proper procedures to maintain personal protection while cleaning, replacing filters and moving or using other equipment that maybe contaminated

10. Consider providing antimicrobial door mats at high traffic entrances to the building.
11. Institute additional cleaning procedures to ensure proper disinfection of bathrooms, kitchens and common areas. Educate cleaning and maintenance staff on proper personal protection and PPE use including following OSHA worker exposure guidelines.

Review Indoor and Outdoor Environment

- Maintain dry bulb temperatures within the comfort ranges indicated in ANSI/ASHRAE Standard 55-2017
- Maintain relative humidity between 40% and 60% through the use of the air conditioning systems.

In Cold Climates
i. HVAC systems with no humidification may not achieve the minimum humidity indicated, ii. Observe building assemblies and finishes frequently for condensation when indoor dew points rise above the surface temperatures of the assemblies and finishes, iii. Excessive humidity may lead to condensation, indoor mold growth, and degradation of indoor air quality.

Review the space types

Conference Rooms	Keep doors to be opened to promote good ventilation where possible. If doors must be closed, consider local air filtration and cleaning devices and appliances such as portable air filters, or provide local exhaust fans discharging directly to the outside to improve ventilation.
Pantries/Storage Rooms	Provide local exhaust, or portable air filtration and cleaning appliances, especially if refrigerators, or similar appliances, are presented.
Public/Large Assembly Spaces	Where there can be a large assembly of people, consider air treatment, e.g. upper-room UVGI lamps.

Operate and maintain the HVAC system

Building owners and service professionals should follow the requirements of ASHRAE Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial HVAC Systems which has tables to show the typical maintenance required for equipment that has been in operation. Consider PPE when maintaining ventilation materials including filters, condensate. Consult additional guidance before duct cleaning. Check specifically:

- Dampers, filter, and economizers seals and frames are intact and clean, are functional and are responding to control signals. MERV13 or higher filters are required for capture of airborne viruses; however, most existing equipment will not be able to support the associated pressure drop of these filters and equipment should be provided with only the highest MERV rating that does not affect the heating and cooling capacity of the units.
- Zone and air temperature are calibrated and accurately reporting environmental conditions to the BAS or local controllers.
- Exhaust fans are functional and venting to the outdoors.
- Check outside air intake regularly for any potential risk such as exhaust nearby and provide proper clearance if assessible by pedestrians, etc.

Operate and maintain the HVAC system – Air conditioning and ventilation systems

- Continued operation of all systems is recommended.
- For offices with fan coil units, open windows 2 hours before and after occupied periods.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: General information

- For central or floor-by-floor VAV systems that have the capacity to operate with 100% outside air, such as an economizer cycle, close return air dampers and open outdoor air dampers to 100% or to the maximum setting that the HVAC system can accommodate and still maintain acceptable indoor conditions.
- If there are heating and cooling coils to temper the air, it can provide comfort and eliminate recirculation (in the mild weather seasons this will have smaller impacts to energy consumption, thermal comfort, or humidity control, however, using 100% outside can be more difficult in extreme weather conditions).
- Considerations also should be given in areas with dry outside air that may lower the relative humidity to below 40%.
- Prioritize increasing outside air over humidity (see concerns about operating at indoor humidity outside the range of 40%-60%).

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Floor-by-floor

- In floor-by-floor VAV systems that have only minimum outside air damper positions or openings, open outside air damper to its maximum position (the same cautions and concerns stated above apply).
- If outside air is supplied centrally from outside air handling units (typically at mechanical levels) to all floors, and there are unoccupied tenant floors, divert the outside air to the occupied floors.
- Consider changing the floor level VAV air handling units' discharge air temperature setpoint the maximum (typically no higher than 60º F).

- This will cause VAV terminal units (boxes) to open to try and satisfy space cooling loads which will increase the number of air changes in the space being served.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Cooling coils

- Cooling coils, heating coils and condensate drain pans inside air handling equipment can become contaminated.
- Therefore, consider adding UVGI for coil surface and drain pan disinfection are encouraged as it will reduce the needs and frequency for in-person coil surface disinfection.
- These devices and systems should be monitored often and regular and emergency maintenances should continue.
- Provide PPE protection for building operators, maintenance technicians and anyone else who must inspect or come in contact with the device or equipment.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Operable windows

- In buildings with operable windows, when outside air thermal and humidity conditions and outdoor air quality are acceptable, open windows where appropriate during occupied hours.
- Disabling the interlock between opening windows and air conditioning system lockout or shut down if this feature is provided for in the Building Automation System.
- Monitor indoor spaces for possible contaminants entering through the windows such as toilets exhaust located nearby or for windows accessible to public and high traffic on adjacent streets and walkways.
- Exposure to seasonal and other outdoor allergens (pollen and mold spores) may occur with windows opened.
- Special ductwork cleaning, or, changing filters more often than normal is not necessary.

Domestic Heating Water systems:

- Keep heating water systems circulating and maintain temperatures above 140°F to avoid microbial incursion. Do not let water temperature to drop below 120°F.

Operate and maintain the HVAC system - Exhaust systems

- Exhaust system for toilets should run 24/7. Do not open operable windows in toilets.
- Other exhaust systems should continue to run as normal. Run exhaust systems 2 hours before and after occupied periods.
- If there are exhaust outlets located in pedestrian areas outside, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.

Elevator Control

1. Turn on elevator cab (lift) ventilation fans, where possible
2. Encourage occupants to take stairs, where possible, especially when elevator lobbies are crowded.
3. Allow elevators to run at high speed to minimize time in elevator.

4. Close elevator lobby vestibule doors, if available.
5. Consider local air treatment devices in frequently used lifts.

Building Automation System and Access Control System Programming

Building Automation Systems:

- Automate the control sequences in this document as a "Epidemic Mode" operation that can be turned on, shut down or override, if needed, by manual selection of the operator.
- Provide remote access to staff and trusted service providers who are responsible for operating and maintain Building Automation Systems, security, access control, information technology, fire alarm and life safety systems. Have written procedures and test remote access and secure access levels and permissions for all individuals prior to an emergency, if possible.

Access Control Systems:

- Post signage and communicate to tenants, and post visitors' procedures for entering and leaving the building that will minimize the time spent in public spaces.
- Use touchless assess control system if available and where possible.
- Require and enforce social distancing within public and shared spaces using signage.
- Ensure that workspaces are situated to accommodate social distancing recommendations.

Littleton Public Schools
Russell Street Elementary
Littleton, MA

2020

HVAC System Evaluation

Prepared For:

Littleton Public Schools
33 Shattuck Street
Littleton, MA 01460

Prepared By:

BLW Engineers, Inc.
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September 18, 2020

EXECUTIVE SUMMARY

General

Littleton Public Schools engaged BLW Engineers to evaluate the building HVAC system relative to its current operating conditions, re-opening to the building to the public and potential considerations relative to Covid-19. Kenneth R. Beck, PE, Principal-In-Charge, visited each site, reviewed building documentation and prepared the following evaluation.

While at the site, BLW Engineers met with the facilities operator who reported the HVAC systems receives regular preventative maintenance which includes filter replacement, grease motors and bearings, replace fan belts and verify damper and valve operation.

The Russell Street School is located at 55 Russell Street; was constructed in 2007. The school comprises approximately 72,000 square feet of educational space.

Russell Street School Planned Reopening

The Littleton Public Schools plans on the following school re-opening:

- School is to be occupied by 50% of students on Monday/Tuesday, Wednesday will be a disinfection/cleaning day and then occupied by 50% of students on Thursday/Friday.
- Classrooms seating will be reorganized to provide recommended social distancing; typically, classrooms sizes will be reduced to 14 occupants (students and a teacher).
- Cafeteria will not be used in normal fashion; students will eat lunches outdoors when possible and use other locations throughout the building to maximize social distancing protocols.
- Gym will not be used in normal fashion.
- Library room will not be used in normal fashion; it will be used primarily as classroom space.

Recommendations

Based on applicable guidelines (ASHRAE, State of Massachusetts Re-opening Guidelines, Massachusetts Teachers Association, etc.), the Russel Street Elementary School is safe to occupy and should consider the following best practice operation of the current HVAC system in an effort to provide an environment to best protect the occupants and visitors to the building during the pandemic:

Tier 1 Recommendations: Tier 1 recommendations are immediate revisions to system operation prior to start of classroom and until the start of the heating season.

1. Create an "Epidemic Mode" sequence of operation that can be turned on, shut down or override, if needed, by manual selection of the operator
2. Replace rooftop air handling units (AHU-1, 2) MERV12 filters with MERV13 filters.
3. Replace the unit filters with the best filters available that will not impact the heating capacity of the units and develop a filter replacement plan; unit ventilators and heating/ventilating units will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.

4. Filter upgrades will require more frequent changes due to pressure drop of filter and particulates that "dirty" the filters.
5. Continued operation (24 hours a day, 7 days a week) of heating and cooling systems is recommended.
6. Operate toilet exhaust fans 24 hours a day, 7 days a week.; other fans shall operate two hours prior and two hours post occupied hours.
7. Monitor Carbon Dioxide (CO2) levels in occupied areas of the building by building personal on an intermittent basis.
8. Should building exhaust exit building through sidewall louvers subject to pedestrian traffic, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.
9. Operate the building in occupied mode with mechanical ventilation prior and two hours post occupied hours; where mechanical ventilation and exhaust are not currently provided, utilize operable windows.
10. Operate the building in the occupied mode during disinfection and cleaning operations.
11. Operate Classroom unit ventilators at maximum outdoor air for ventilation; the units have the capability of providing 32/CFM per occupant for 12 occupants.
12. Operate Computer Classroom unit ventilator at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 12 occupants.
13. Operate Teachers Room unit ventilator at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 12 occupants.
14. Operate Tigers Den Classroom, Music Room and Large SPED unit ventilator at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 9 occupants.
15. Operate Case Office unit ventilator at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 1 occupant.
16. Operate Library rooftop air handling unit (AHU-1) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 50 occupants.
17. Operate Administration rooftop air handling unit (AHU-1) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 23 occupants.
18. Operate Cafeteria rooftop air handling unit (AHU-2) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 187 occupants.
19. Operate Gym heating/ventilating unit (HV-1, 2) at maximum outdoor air for ventilation; the units have the capability of providing 32 CFM per occupant for 137 occupants.
20. Operate Cafeteria heating/ventilating unit (HV-3) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 203 occupants.
21. Operate Locker Room heating/ventilating units (HV-4, 5) and associated exhaust fan (EF-18) continuously at 100% outdoor air.
22. In spaces without mechanical ventilation, use operable windows with supplemental electric heat and portable HEPA filtration.
23. At the commencement of school and until the heating season, the rooftop units, unit ventilators and air handling units can be run in the "economizer mode" with 100% outdoor air and no recirculation.
24. During the heating season, operate rooftop units, unit ventilators and heating/ventilating units to the level above the ventilation design capacity based on outdoor air temperature and the acceptable indoor air temperature acceptable to the occupant comfort.
25. Eliminate zones that are not occupied to better use outdoor air in occupied areas.
26. Relocate occupants from areas that do not have mechanical ventilation or operable windows.

27. Do not use free standing fans or operate ceiling destratification fans that provide velocity air flow across one occupant to another.
28. Use operable windows when outdoor air conditions allow.
29. Keep conference room doors open as much as possible or open windows when feasible.
30. Increase regular maintenance of all mechanical heating, ventilating and air conditioning equipment.
31. Monitor the heating, ventilating and air conditioning operation of the building on a continual basis.
32. Follow recommendations of holistic view of building recommendations in General Recommendations noted hereinafter.

Tier 2 Recommendations: Tier 2 recommendations are supplemental revisions/additions to the existing systems that may be required for the heating season when systems will need to utilize recirculated air to maintain space temperature setpoints.

1. Provide additional filtration with portable HEPA filter units (100 cfm/250 SF) or UV filtration units for unit ventilators, heating/ventilating units or rooftop units with large percentages of recirculation air when operated under 32 CFM per occupant.
2. Install portable humidifiers or retrofit existing equipment with humidifiers for local humidity control should humidity become an issue.
3. Add plug-in type supplemental electric heat as required for increased ventilation requirements through equipment or operable windows.
4. Apply and use outdoor air quality sensors or reliable web-based data for outdoor pollution information as part of the new ventilation operation.
5. Consider UV decontamination lights on highly touched surfaces.

Notes:

1. These recommendations are based on guidance provided by applicable agencies and publications for best practices for protection of occupants and visitors to the building but do not provide absolute protection from the pandemic.
2. These recommendations will have a significant impact on the operating and maintenance related costs of the HVAC systems.

HVAC SYSTEM EVALUATION

The existing building is provided with heating hot water by two gas fired, high efficiency hot water boilers, a two-pipe heating water distribution piping system, a two pipe chilled water distribution piping system, unit ventilators, energy recovery units, rooftop units, heating ventilating units, fan coil units, exhaust fans, and miscellaneous heating terminal equipment.

The gas fired, high efficiency boilers are located in the mechanical room. The boilers provide heating hot water for the building through the two pipe distribution system through two lead/standby hot water distribution pumps with variable speed drives. The boiler room is in good operating condition.

The chilled water system consists of a 195-ton air cooled chiller located outside the mechanical room. The chilled water is provided to the building through primary/secondary chilled water piping system with chiller pumps (lead/lag) and building chilled water pumps (lead/standby) with variable speed drives to the two-pipe chilled water distribution piping system.

The classrooms are provided with unit ventilators and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that typically provide 400 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system back to the air handling unit heat recovery unit typically exhausts 400 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The Tigers Den Classrooms, SPED Classrooms, Music Room and Case Collaborative Room are provided with a unit ventilator and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that provide 300 CFM of outdoor air for ventilation. Unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The small SPED Classroom is provided with a unit ventilator and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator is a constant volume unit that provides 150 CFM of outdoor air for ventilation. Unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The Teachers Room is provided with a unit ventilator and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator is a constant volume unit that provides 400 CFM of outdoor air for ventilation. Unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The Case Office provided with a unit ventilator and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator is a constant volume unit that provides 50 CFM of outdoor air for ventilation. The unit ventilator receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through

the unit hot water coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The Administrative Offices, Nurses, Lobby, Corridors and Library are served by a variable air volume air handling unit (AHU-1) through a medium pressure insulated duct system to variable air volume terminal units with hot water reheat coils; from variable air volume terminal units to ceiling supply diffusers. Air is returned to the unit though return registers into a low pressure return/exhaust air is duct distribution system. The original design provides 1,900 CFM of total conditioned air supply and 760 CFM of outdoor air for ventilation for the Library which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.12 CFM x SF) and 4,000 CFM of total conditioned air supply and 1,600 CFM of outdoor air for ventilation for the Administrative Offices which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.06 CFM x SF) and. Heating is provided through the variable air volume terminal units; the variable air volume terminal reheat coils interconnected to the hot water distribution piping system; air conditioning through the air handling unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor for each zone. AHU-1 was originally designed for MERV12 filters and could accommodate MERV13 filters.

The Cafeteria served by a rooftop air handling unit (AHU-2) through a duct system to ceiling supply diffusers. Air is returned to the unit though return registers into a low pressure return/exhaust air is duct distribution system. The original design provides 9,000 CFM of total conditioned air supply and 6,000 CFM of outdoor air for ventilation for the Library which exceeds current code requirements (Ventilation = 7.5 CFM x Occupant + 0.18 CFM x SF). Heating is provided through the air handling unit hot water coil to the hot water distribution piping system; air conditioning through the air handling unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor for each zone. The Cafeteria has been provided with a CO2 wall mounted sensor. AHU-2 was originally designed for MERV12 filters and could accommodate MERV13 filters.

The Kitchen is provided with a hot water heating cabinet heater to provide heating to the kitchen. The kitchen is also provided with a kitchen hood exhaust fan (EF-18) rated for 6,000 CFM of grease hood exhaust and dishwasher exhaust fan (EF-10) provides 600 CFM of exhaust from dishwasher.

The Gymnasium is provided with two hot water heating heating/ventilating units (HV-1, 2) and two roof exhaust fans (EF-5, 6) that provide heating and ventilation. The original design provides a total of 8,000 CFM of total conditioned air supply and 4,400 CFM of outdoor air for ventilation which exceeds current code tempered requirements (Ventilation = 7.5 CFM x Occupant + 0.06 CFM x SF). Heating is provided through the rooftop unit gas furnaces and a wall mounted space temperature sensor. The Gymnasium is also provided with destratification fans.

Tiger Den Offices and Band practice rooms are provided with ducted 4-pipe fan coil units for heating, ventilating and air conditioning; outdoor is ducted from a wall vent to the return side of the fan coil unit. Heating is provided through the unit heating coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor for each zone

The Head End Room and IDF Rooms are provided with split system air conditionings and operable windows for heating and cooling. The split system air conditioning consists of an outdoor air cooled condensing interconnected with refrigerant piping to indoor ductless wall mounted units.

The Computer Lab provided with an unit ventilator, split system air conditionings and operable windows for heating and cooling. The unit ventilator is constant volume unit that provides 400 CFM of outdoor air for ventilation. Unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system; air conditioning through the unit chilled water coil interconnected to the chilled water distribution piping system; and a wall mounted space temperature sensor. The split system air conditioning consists of an outdoor air cooled condensing interconnected with refrigerant piping to indoor ductless wall mounted units.

Bathrooms, Janitor's Closets, Storage, etc. are provided by exhaust registers, exhaust duct distribution system and roof exhaust fans.

Miscellaneous spaces have been provided with hot water terminal equipment interconnected with the hot water distribution piping system.

The building is controlled by electronic controls (Delta Controls).

GENERAL PUBLICATION RECOMMENDATIONS

Publications referenced include ASHRAE and State of Massachusetts Re-opening Guidelines for schools.

Operating school buildings under epidemic conditions requires a holistic framework during the crisis and the restoration to potentially a new "normal" after the public health emergency has ended. Considerations include:

- Review of current operational practices
- Holistic view for owner/operator

Review of current operational practices

- Modes of operation of HVAC systems
  - sequences of operations
  - set points
  - schedules
- Verification that equipment and systems are properly functioning and have the enhanced capabilities to address public health considerations, with a focus building air circulating systems.
- Understanding that infected people who are asymptomatic may enter buildings, increasing the likelihood of the spread of virus through air systems to other occupants.

Holistic view for owner/operator

Owners and operators should take a holistic view of their buildings and:

1. Develop a pandemic preparedness plan

2. Review indoor and outdoor environment
3. Review the space types
4. Operate and maintain HVAC
    - Air-Conditioning and Ventilation systems
    - Exhaust systems
5. Check Elevator Control
6. Check BAS and Access Control Systems

Develop a Pandemic Preparedness Plan

Consider these possible goals:

- Reduce the spread of infection among building occupants,
- Maintain HVAC and Building Service Systems in safe and healthy conditions,
- Minimize impact on building occupants and visitors,
- Communicate risks and precautions being taken with occupants transparently
- Implement measures that help make occupants feel secure:
    - Require occupants, visitors and maintenance personnel to wear appropriate PPE per CDC,
    - Screen, monitor and control the circulation of occupants and guests to help avoid transmission of disease,
    - Increase frequency for surface disinfection on frequently touched surfaces, such as door handles, handrails, door bells and elevator buttons.

Ensure continuity of supply chains and have backup plans.

- Identify your critical suppliers, e.g. filters, cleaners, disinfectants, parts, PPE, etc.,
- Identify vendors who could negatively affect your operation if they fail to deliver,
- Review current service provider agreements to see if alternate suppliers can be engaged in the event of a supply disruption, for example, equipment service providers, and understand contract limitations and restrictions on using alternative providers,
- Ask critical suppliers to share their pandemic plans:
    - What does their plan include?
    - Have they tested their plan? When was it updated?
    - Set boundaries with suppliers – ask that they do not send staff who may be showing signs of illness to your property.

Review contract agreements:

- Review contract agreements: Review contracts with service providers, utilities, and suppliers to determine what rights and remedies they have because of disruptions due to unforeseeable circumstances that prevent fulfillment of a contract.

Establish a communication protocol and continuity of operations plan:

- Identify key contacts and publish normal and emergency contact information,

- Document the chain of command and communication requirements, and provide instructions and outline expectations for how all responses are to be documented and what records shall be maintained and distributed.

Provide staff with:

- PPE per CDC and OSHA requirements,
- Training on the proper use and disposal of PPE and waste,
- Training on infection prevention and control measures,
- Cross training to ensure critical building functions are maintained in an emergency, and
- Instruction to staff to stay at home if they are feeling sick.

Check with insurance providers to determine whether there are special measures that can be taken to preserve coverage or lower premiums.

Next Steps:

1. Notify staff, tenants and visitors about the plan
2. Follow all local, state and federal executive orders, statutes, regulations, guidelines, restrictions and limitations on use, occupancy and separation
3. Follow OSHA Guidelines, especially the portion in the guide regarding filter and outside air.
4. Ensure that custodial staff and service providers job descriptions includes performing proper cleaning procedures based EPA and CDC guidance using approved products and methods:
    - Disinfect high touch areas of HVAC and other Building Service systems such as on/off switches, and thermostats;
    - Consider UV light disinfection devices of high touch counters in public spaces.
    - Disinfect interiors of refrigerated devices, such as refrigerators, coolers and vending machines where the virus can survive for potentially long periods of time.
5. Consider installing a thermal camera at building entrances to help screen visitors for elevated body temperatures. Note that that infected individuals may show no signs of being ill, including having no fever, and can be responsible for much of the transmission. In such cases, thermal imaging may not be effective.
6. Provide MERV13 or higher filters for air handling equipment that recirculate air when equipment has the capacity; however, most existing air handling equipment will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
7. The HVAC systems that are physical or capacity limited for better filtration and UV decontamination systems in the return airstream, consider installing portable filtration and air cleaning devices such as UVGI (Ultraviolet Germicidal Irradiation), especially if seniors or anyone with other health issues or compromised immune systems may be located, or, in mission critical areas where required.
8. Provide automatic hand sanitizer dispensers in the high touch areas and other common areas, including spaces where equipment where frequent maintenance is required, and ensure dispensers are serviced often and remain operational.
9. Post signage in prominent locations that contain information and instructions to educate and remind staff about proper procedures to maintain personal protection while cleaning, replacing filters and moving or using other equipment that maybe contaminated

10. Consider providing antimicrobial door mats at high traffic entrances to the building.
11. Institute additional cleaning procedures to ensure proper disinfection of bathrooms, kitchens and common areas. Educate cleaning and maintenance staff on proper personal protection and PPE use including following OSHA worker exposure guidelines.

Review Indoor and Outdoor Environment

- Maintain dry bulb temperatures within the comfort ranges indicated in ANSI/ASHRAE Standard 55-2017
- Maintain relative humidity between 40% and 60% through the use of the air conditioning systems.

In Cold Climates
i. HVAC systems with no humidification may not achieve the minimum humidity indicated, ii. Observe building assemblies and finishes frequently for condensation when indoor dew points rise above the surface temperatures of the assemblies and finishes, iii. Excessive humidity may lead to condensation, indoor mold growth, and degradation of indoor air quality.

Review the space types

Conference Rooms	Keep doors to be opened to promote good ventilation where possible. If doors must be closed, consider local air filtration and cleaning devices and appliances such as portable air filters, or provide local exhaust fans discharging directly to the outside to improve ventilation.
Pantries/Storage Rooms	Provide local exhaust, or portable air filtration and cleaning appliances, especially if refrigerators, or similar appliances, are presented.
Public/Large Assembly Spaces	Where there can be a large assembly of people, consider air treatment, e.g. upper-room UVGI lamps.

Operate and maintain the HVAC system

Building owners and service professionals should follow the requirements of ASHRAE Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial HVAC Systems which has tables to show the typical maintenance required for equipment that has been in operation. Consider PPE when maintaining ventilation materials including filters, condensate. Consult additional guidance before duct cleaning. Check specifically:

- Dampers, filter, and economizers seals and frames are intact and clean, are functional and are responding to control signals. MERV13 or higher filters are required for capture of airborne viruses; however, most existing equipment will not be able to support the associated pressure drop of these filters and equipment should be provided with only the highest MERV rating that does not affect the heating and cooling capacity of the units.
- Zone and air temperature are calibrated and accurately reporting environmental conditions to the BAS or local controllers.
- Exhaust fans are functional and venting to the outdoors.
- Check outside air intake regularly for any potential risk such as exhaust nearby and provide proper clearance if assessible by pedestrians, etc.

Operate and maintain the HVAC system – Air conditioning and ventilation systems

- Continued operation of all systems is recommended.
- For offices with fan coil units, open windows 2 hours before and after occupied periods.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: General information

- For central or floor-by-floor VAV systems that have the capacity to operate with 100% outside air, such as an economizer cycle, close return air dampers and open outdoor air dampers to 100% or to the maximum setting that the HVAC system can accommodate and still maintain acceptable indoor conditions.
- If there are heating and cooling coils to temper the air, it can provide comfort and eliminate recirculation (in the mild weather seasons this will have smaller impacts to energy consumption, thermal comfort, or humidity control, however, using 100% outside can be more difficult in extreme weather conditions).
- Considerations also should be given in areas with dry outside air that may lower the relative humidity to below 40%.
- Prioritize increasing outside air over humidity (see concerns about operating at indoor humidity outside the range of 40%-60%).

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Floor-by-floor

- In floor-by-floor VAV systems that have only minimum outside air damper positions or openings, open outside air damper to its maximum position (the same cautions and concerns stated above apply).
- If outside air is supplied centrally from outside air handling units (typically at mechanical levels) to all floors, and there are unoccupied tenant floors, divert the outside air to the occupied floors.
- Consider changing the floor level VAV air handling units' discharge air temperature setpoint the maximum (typically no higher than 60º F).

- This will cause VAV terminal units (boxes) to open to try and satisfy space cooling loads which will increase the number of air changes in the space being served.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Cooling coils

- Cooling coils, heating coils and condensate drain pans inside air handling equipment can become contaminated.
- Therefore, consider adding UVGI for coil surface and drain pan disinfection are encouraged as it will reduce the needs and frequency for in-person coil surface disinfection.
- These devices and systems should be monitored often and regular and emergency maintenances should continue.
- Provide PPE protection for building operators, maintenance technicians and anyone else who must inspect or come in contact with the device or equipment.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Operable windows

- In buildings with operable windows, when outside air thermal and humidity conditions and outdoor air quality are acceptable, open windows where appropriate during occupied hours.
- Disabling the interlock between opening windows and air conditioning system lockout or shut down if this feature is provided for in the Building Automation System.
- Monitor indoor spaces for possible contaminants entering through the windows such as toilets exhaust located nearby or for windows accessible to public and high traffic on adjacent streets and walkways.
- Exposure to seasonal and other outdoor allergens (pollen and mold spores) may occur with windows opened.
- Special ductwork cleaning, or, changing filters more often than normal is not necessary.

Domestic Heating Water systems:

- Keep heating water systems circulating and maintain temperatures above 140°F to avoid microbial incursion. Do not let water temperature to drop below 120°F.

Operate and maintain the HVAC system - Exhaust systems

- Exhaust system for toilets should run 24/7. Do not open operable windows in toilets.
- Other exhaust systems should continue to run as normal. Run exhaust systems 2 hours before and after occupied periods.
- If there are exhaust outlets located in pedestrian areas outside, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.

Elevator Control

1. Turn on elevator cab (lift) ventilation fans, where possible
2. Encourage occupants to take stairs, where possible, especially when elevator lobbies are crowded.
3. Allow elevators to run at high speed to minimize time in elevator.

4. Close elevator lobby vestibule doors, if available.
5. Consider local air treatment devices in frequently used lifts.

Building Automation System and Access Control System Programming

Building Automation Systems:

- Automate the control sequences in this document as a "Epidemic Mode" operation that can be turned on, shut down or override, if needed, by manual selection of the operator.
- Provide remote access to staff and trusted service providers who are responsible for operating and maintain Building Automation Systems, security, access control, information technology, fire alarm and life safety systems. Have written procedures and test remote access and secure access levels and permissions for all individuals prior to an emergency, if possible.

Access Control Systems:

- Post signage and communicate to tenants, and post visitors' procedures for entering and leaving the building that will minimize the time spent in public spaces.
- Use touchless assess control system if available and where possible.
- Require and enforce social distancing within public and shared spaces using signage.
- Ensure that workspaces are situated to accommodate social distancing recommendations.

Littleton Public Schools
Littleton Middle School
Littleton, MA

2020

HVAC System Evaluation

Prepared For:

Littleton Public Schools
33 Shattuck Street
Littleton, MA 01460

Prepared By:

BLW Engineers, Inc.
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Littleton, MA 01460

September 18, 2020

EXECUTIVE SUMMARY

General

Littleton Public Schools engaged BLW Engineers to evaluate the building HVAC system relative to its current operating conditions, re-opening to the building to the public and potential considerations relative to Covid-19. Kenneth R. Beck, PE, Principal-In-Charge, visited each site, reviewed building documentation and prepared the following evaluation.

While at the site, BLW Engineers met with the facilities operator who reported the HVAC systems receives regular preventative maintenance which includes filter replacement, grease motors and bearings, replace fan belts and verify damper and valve operation.

The Littleton Middle School is located at 55 Russell Street; was constructed in 2007. The school comprises approximately 75,000 square feet of educational space.

Littleton Middle School Planned Reopening

The Littleton Public Schools plans on the following school re-opening:

- School is to be occupied by 50% of students on Monday/Tuesday, Wednesday will be a disinfection/cleaning day and then occupied by 50% of students on Thursday/Friday.
- Classrooms seating will be reorganized to provide recommended social distancing; typically, classrooms sizes will be reduced to 14 occupants (students and a teacher).
- Cafeteria will not be used in normal fashion; students will eat lunches outdoors when possible and use other locations throughout the building to maximize social distancing protocols.
- Gym will not be used in normal fashion.
- Library room will not be used in normal fashion; it will be used primarily as classroom space.

Recommendations

Based on applicable guidelines (ASHRAE, State of Massachusetts Re-opening Guidelines, Massachusetts Teachers Association, etc.), the Littleton Middle School is safe to occupy and should consider the following best practice operation of the current HVAC system in an effort to provide an environment to best protect the occupants and visitors to the building during the pandemic:

Tier 1 Recommendations: Tier 1 recommendations are immediate revisions to system operation prior to start of classroom and until the start of the heating season.

1. Create an "Epidemic Mode" sequence of operation that can be turned on, shut down or override, if needed, by manual selection of the operator
2. Replace the unit filters with the best filters available that will not impact the heating capacity of the units and develop a filter replacement plan; unit ventilators, heating/ventilating units and rooftop units will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
3. Filter upgrades will require more frequent changes due to pressure drop of filter and particulates that “dirty” the filters.

4. Continued operation (24 hours a day, 7 days a week) of heating and cooling systems is recommended.
5. Operate toilet exhaust fans 24 hours a day, 7 days a week.; other fans shall operate two hours prior and two hours post occupied hours.
6. Monitor Carbon Dioxide (CO2) levels in occupied areas of the building by building personal on an intermittent basis.
7. Should building exhaust exit building through sidewall louvers subject to pedestrian traffic, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.
8. Operate the building in occupied mode with mechanical ventilation prior and two hours post occupied hours; where mechanical ventilation and exhaust are not currently provided, utilize operable windows.
9. Operate the building in the occupied mode during disinfection and cleaning operations.
10. Operate Classroom unit ventilators at maximum outdoor air for ventilation; the units have the capability of providing 32/CFM per occupant for 14 occupants.
11. Operate Computer Classroom unit ventilators (UV-1, 22) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 15 occupants.
12. Operate Teachers Room unit ventilator (UV-5) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 8 occupants.
13. Operate Resource unit ventilator (UV-8) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 7 occupants.
14. Operate Health unit ventilator (UV-12) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 4 occupants.
15. Operate Science unit ventilator (UV-23) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 15 occupants.
16. Operate Teachers Planning unit ventilator (UV-28) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 6 occupants.
17. Operate Library rooftop unit (RTU-1) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 28 occupants.
18. Operate Administration rooftop unit (RTU-2) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 17 occupants.
19. Operate Band/Choral heating/ventilating unit (HV-2) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 25 occupants.
20. Operate Cafeteria heating/ventilating unit (HV-3) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 203 occupants.
21. Operate Locker Room heating/ventilating units (HV-4, 5) and associated exhaust fan (EF-18) continuously at 100% outdoor air.
22. In spaces without mechanical ventilation, use operable windows with supplemental electric heat and portable HEPA filtration.
23. At the commencement of school and until the heating season, the rooftop units, unit ventilators and air handling units can be run in the “economizer mode” with 100% outdoor air and no recirculation.
24. During the heating season, operate rooftop units, unit ventilators and heating/ventilating units to the level above the ventilation design capacity based on outdoor air temperature and the acceptable indoor air temperature acceptable to the occupant comfort.
25. Eliminate zones that are not occupied to better use outdoor air in occupied areas.
26. Relocate occupants from areas that do not have mechanical ventilation or operable windows.

27. Do not use free standing fans or operate ceiling destratification fans that provide velocity air flow across one occupant to another.
28. Use operable windows when outdoor air conditions allow.
29. Keep conference room doors open as much as possible or open windows when feasible.
30. Increase regular maintenance of all mechanical heating, ventilating and air conditioning equipment.
31. Monitor the heating, ventilating and air conditioning operation of the building on a continual basis.
32. Follow recommendations of holistic view of building recommendations in General Recommendations noted hereinafter.

Tier 2 Recommendations: Tier 2 recommendations are supplemental revisions/additions to the existing systems that may be required for the heating season when systems will need to utilize recirculated air to maintain space temperature setpoints.

1. Provide additional filtration with portable HEPA filter units (100 cfm/250 SF) or UV filtration units for unit ventilators, heating/ventilating units or rooftop units with large percentages of recirculation air when operated under 32 CFM per occupant.
2. Install portable humidifiers or retrofit existing equipment with humidifiers for local humidity control should humidity become an issue.
3. Add plug-in type supplemental electric heat as required for increased ventilation requirements through equipment or operable windows.
4. Apply and use outdoor air quality sensors or reliable web-based data for outdoor pollution information as part of the new ventilation operation.
5. Consider UV decontamination lights on highly touched surfaces.

Notes:

1. These recommendations are based on guidance provided by applicable agencies and publications for best practices for protection of occupants and visitors to the building but do not provide absolute protection from the pandemic.
2. These recommendations will have a significant impact on the operating and maintenance related costs of the HVAC systems.

HVAC SYSTEM EVALUATION

The existing building is provided with heating hot water by two gas fired , cast iron sectional hot water boilers, a two-pipe heating water distribution piping system, unit ventilators, energy recovery units, rooftop units, heating ventilating units, fan coil units, exhaust fans, and miscellaneous heating terminal equipment.

The gas fired, 80% efficient, boilers are located in the mechanical room. The boilers provide heating hot water for the building through the two pipe distribution system through two lead/standby hot water distribution pumps with variable speed drives. The boiler room is in good operating condition.

The classrooms are provided with unit ventilators and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that typically provide 1000 cfm of total supply air and 375 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 375 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The Computer Classrooms are provided with unit ventilators (UV-1, 22), 3-ton air cooled condensing units and common exhaust fan systems to provide hot water heating, ventilation, air conditioning and exhaust. The unit ventilators are constant volume units that provide 1250 cfm of total supply air and 500 cfm of outdoor air is provided to each classroom. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 500 CFM per classroom.

The Resource Room is provided with a unit ventilator (UV-5) and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that provides 750 cfm of total supply air and 260 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Teachers Dining is provided with a unit ventilator (UV-8) and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that provides 750 cfm of total supply air and 225 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Health Suite provided with unit ventilator (UV-12), a 2-ton air cooled condensing unit and common exhaust fan systems to provide hot water heating, ventilation, air conditioning and exhaust. The unit ventilators are constant volume units that provide 590 cfm of total supply air and 140 cfm of outdoor air for ventilation. Th unit ventilator receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Science Classroom is provided with a unit ventilator (UV-23) and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that provides 1250 cfm of total supply air and 500 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system

typically exhausts 500 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor. The classrooms have CO2 wall mounted sensors.

The Library is provided with a gas heating/DX cooling rooftop unit (RTU-1) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 5,000 CFM of total conditioned air supply and 900 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.12 CFM x SF). Heating is provided through the rooftop unit gas furnace system and a wall mounted space temperature sensor.

The Teachers planning is provided with a unit ventilator (UV-8) and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that provides 750 cfm of total supply air and 200 CFM of outdoor air for ventilation. Uunit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Administration Offices are provided with a gas heating/DX cooling rooftop unit (RTU-2) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 2,000 CFM of total conditioned air supply and 575 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.06 CFM x SF). Heating is provided through the rooftop unit gas furnace system and a wall mounted space temperature sensor.

The Tutorial, Teachers Planning and corridors provided with ducted horizontal fan coil units with outdoor air though roof to vent hoods. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Kitchen is provided with a gas heating heating/ventilating unit (HV-1) to provide heating and ventilation to the kitchen; the unit was designed to provide 3,000 CFM of outdoor air for makeup air to the kitchen. The kitchen is also provided with a kitchen hood exhaust fan (EF-13) rated for 7,760 CFM of grease hood exhaust. Heating is provided through the heating/ventilating unit gas furnace system and a wall mounted space temperature sensor.

The Band/Choral Classrooms are provided with a gas heating heating/ventilating unit (HV-2) to provide heating and ventilation to the space. The original design provides 2,310 CFM of total tempered air supply and 800 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 10 CFM x Occupant + 0.12 CFM x SF). Heating is provided through the heating/ventilating unit gas furnace system and a wall mounted space temperature sensor.

The Cafeteria is provided with a gas heating heating/ventilating unit (HV-3) to provide heating and ventilation to the space. The original design provides 11,000 CFM of total conditioned air supply and 6,300 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 7.5

CFM x Occupant + 0.18 CFM x SF). Heating is provided through the heating/ventilating unit gas furnace system and a wall mounted space temperature sensor.

The Locker Rooms are provided with gas heating heating/ventilating units (HV-4,5) and roof exhaust fan (EF-18) to provide heating, ventilation and exhaust to the spaces. The original design provides 1,500 CFM of total tempered air supply and 1,500 CFM of outdoor air for ventilation which exceeds current code requirements Heating is provided through the heating/ventilating unit gas furnace system and a wall mounted space temperature sensor.

The Gymnasium is provided with two gas heating energy recovery rooftop units (ERV-1, 2) that provide heating and ventilation; The original design provides a total of 16,000 CFM of total conditioned air supply and 8,000 CFM of outdoor air for ventilation which exceeds current code tempered requirements (Ventilation = 7.5 CFM x Occupant + 0.06 CFM x SF). Heating is provided through the rooftop unit gas furnaces and a wall mounted space temperature sensor. The Gymnasium is also provided with destratification fans.

The Computer Rooms are provided with split system air conditionings and operable windows for heating, cooling and ventilation. The split system air conditioning consists of an outdoor air cooled condensing interconnected with refrigerant piping to indoor ductless wall mounted units.
Bathrooms, Janitor's Closets, Storage, etc. are provided by exhaust registers, exhaust duct distribution system and roof exhaust fans.

Miscellaneous spaces have been provided with hot water terminal equipment interconnected with the hot water distribution piping system.

The building is controlled by electronic controls (Delta Controls).

GENERAL PUBLICATION RECOMMENDATIONS
Publications referenced include ASHRAE and State of Massachusetts Re-opening Guidelines for schools.

Operating school buildings under epidemic conditions requires a holistic framework during the crisis and the restoration to potentially a new "normal" after the public health emergency has ended.
Considerations include:

- Review of current operational practices
- Holistic view for owner/operator

Review of current operational practices

- Modes of operation of HVAC systems
    - sequences of operations
    - set points
    - schedules
- Verification that equipment and systems are properly functioning and have the enhanced capabilities to address public health considerations, with a focus building air circulating systems.
- Understanding that infected people who are asymptomatic may enter buildings, increasing the likelihood of the spread of virus through air systems to other occupants.

Holistic view for owner/operator

Owners and operators should take a holistic view of their buildings and:

1. Develop a pandemic preparedness plan
2. Review indoor and outdoor environment
3. Review the space types
4. Operate and maintain HVAC
    - Air-Conditioning and Ventilation systems
    - Exhaust systems
5. Check Elevator Control
6. Check BAS and Access Control Systems

Develop a Pandemic Preparedness Plan

Consider these possible goals:

- Reduce the spread of infection among building occupants,
- Maintain HVAC and Building Service Systems in safe and healthy conditions,
- Minimize impact on building occupants and visitors,
- Communicate risks and precautions being taken with occupants transparently
- Implement measures that help make occupants feel secure:
    - Require occupants, visitors and maintenance personnel to wear appropriate PPE per CDC,
    - Screen, monitor and control the circulation of occupants and guests to help avoid transmission of disease,
    - Increase frequency for surface disinfection on frequently touched surfaces, such as door handles, handrails, door bells and elevator buttons.

Ensure continuity of supply chains and have backup plans.

- Identify your critical suppliers, e.g. filters, cleaners, disinfectants, parts, PPE, etc.,
- Identify vendors who could negatively affect your operation if they fail to deliver,
- Review current service provider agreements to see if alternate suppliers can be engaged in the event of a supply disruption, for example, equipment service providers, and understand contract limitations and restrictions on using alternative providers,
- Ask critical suppliers to share their pandemic plans:
    - What does their plan include?
    - Have they tested their plan? When was it updated?
    - Set boundaries with suppliers – ask that they do not send staff who may be showing signs of illness to your property.

Review contract agreements:

- Review contract agreements: Review contracts with service providers, utilities, and suppliers to determine what rights and remedies they have because of disruptions due to unforeseeable circumstances that prevent fulfillment of a contract.

Establish a communication protocol and continuity of operations plan:

- Identify key contacts and publish normal and emergency contact information,
- Document the chain of command and communication requirements, and provide instructions and outline expectations for how all responses are to be documented and what records shall be maintained and distributed.

Provide staff with:

- PPE per CDC and OSHA requirements,
- Training on the proper use and disposal of PPE and waste,
- Training on infection prevention and control measures,
- Cross training to ensure critical building functions are maintained in an emergency, and
- Instruction to staff to stay at home if they are feeling sick.

Check with insurance providers to determine whether there are special measures that can be taken to preserve coverage or lower premiums.

Next Steps:

1. Notify staff, tenants and visitors about the plan
2. Follow all local, state and federal executive orders, statutes, regulations, guidelines, restrictions and limitations on use, occupancy and separation
3. Follow OSHA Guidelines, especially the portion in the guide regarding filter and outside air.
4. Ensure that custodial staff and service providers job descriptions includes performing proper cleaning procedures based EPA and CDC guidance using approved products and methods:
    - Disinfect high touch areas of HVAC and other Building Service systems such as on/off switches, and thermostats;
    - Consider UV light disinfection devices of high touch counters in public spaces.
    - Disinfect interiors of refrigerated devices, such as refrigerators, coolers and vending machines where the virus can survive for potentially long periods of time.
5. Consider installing a thermal camera at building entrances to help screen visitors for elevated body temperatures. Note that that infected individuals may show no signs of being ill, including having no fever, and can be responsible for much of the transmission. In such cases, thermal imaging may not be effective.
6. Provide MERV13 or higher filters for air handling equipment that recirculate air when equipment has the capacity; however, most existing air handling equipment will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
7. The HVAC systems that are physical or capacity limited for better filtration and UV decontamination systems in the return airstream, consider installing portable filtration and air cleaning devices such as UVGI (Ultraviolet Germicidal Irradiation), especially if seniors or anyone with other health issues or compromised immune systems may be located, or, in mission critical areas where required.
8. Provide automatic hand sanitizer dispensers in the high touch areas and other common areas, including spaces where equipment where frequent maintenance is required, and ensure dispensers are serviced often and remain operational.

9. Post signage in prominent locations that contain information and instructions to educate and remind staff about proper procedures to maintain personal protection while cleaning, replacing filters and moving or using other equipment that maybe contaminated
10. Consider providing antimicrobial door mats at high traffic entrances to the building.
11. Institute additional cleaning procedures to ensure proper disinfection of bathrooms, kitchens and common areas. Educate cleaning and maintenance staff on proper personal protection and PPE use including following OSHA worker exposure guidelines.

Review Indoor and Outdoor Environment

- Maintain dry bulb temperatures within the comfort ranges indicated in ANSI/ASHRAE Standard 55-2017
- Maintain relative humidity between 40% and 60% through the use of the air conditioning systems.

In Cold Climates
i. HVAC systems with no humidification may not achieve the minimum humidity indicated, ii. Observe building assemblies and finishes frequently for condensation when indoor dew points rise above the surface temperatures of the assemblies and finishes, iii. Excessive humidity may lead to condensation, indoor mold growth, and degradation of indoor air quality.

Review the space types

Conference Rooms	Keep doors to be opened to promote good ventilation where possible. If doors must be closed, consider local air filtration and cleaning devices and appliances such as portable air filters, or provide local exhaust fans discharging directly to the outside to improve ventilation.
Pantries/Storage Rooms	Provide local exhaust, or portable air filtration and cleaning appliances, especially if refrigerators, or similar appliances, are presented.
Public/Large Assembly Spaces	Where there can be a large assembly of people, consider air treatment, e.g. upper-room UVGI lamps.

Operate and maintain the HVAC system

Building owners and service professionals should follow the requirements of ASHRAE Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial HVAC Systems which has tables to show the typical maintenance required for equipment that has been in operation. Consider PPE when maintaining ventilation materials including filters, condensate. Consult additional guidance before duct cleaning. Check specifically:

- Dampers, filter, and economizers seals and frames are intact and clean, are functional and are responding to control signals. MERV13 or higher filters are required for capture of airborne viruses; however, most existing equipment will not be able to support the associated pressure drop of these filters and equipment should be provided with only the highest MERV rating that does not affect the heating and cooling capacity of the units.
- Zone and air temperature are calibrated and accurately reporting environmental conditions to the BAS or local controllers.
- Exhaust fans are functional and venting to the outdoors.
- Check outside air intake regularly for any potential risk such as exhaust nearby and provide proper clearance if assessible by pedestrians, etc.

Operate and maintain the HVAC system – Air conditioning and ventilation systems

- Continued operation of all systems is recommended.
- For offices with fan coil units, open windows 2 hours before and after occupied periods.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: General information

- For central or floor-by-floor VAV systems that have the capacity to operate with 100% outside air, such as an economizer cycle, close return air dampers and open outdoor air dampers to 100% or to the maximum setting that the HVAC system can accommodate and still maintain acceptable indoor conditions.
- If there are heating and cooling coils to temper the air, it can provide comfort and eliminate recirculation (in the mild weather seasons this will have smaller impacts to energy consumption, thermal comfort, or humidity control, however, using 100% outside can be more difficult in extreme weather conditions).
- Considerations also should be given in areas with dry outside air that may lower the relative humidity to below 40%.
- Prioritize increasing outside air over humidity (see concerns about operating at indoor humidity outside the range of 40%-60%).

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Floor-by-floor

- In floor-by-floor VAV systems that have only minimum outside air damper positions or openings, open outside air damper to its maximum position (the same cautions and concerns stated above apply).
- If outside air is supplied centrally from outside air handling units (typically at mechanical levels) to all floors, and there are unoccupied tenant floors, divert the outside air to the occupied floors.

- Consider changing the floor level VAV air handling units' discharge air temperature setpoint the maximum (typically no higher than 60º F).
- This will cause VAV terminal units (boxes) to open to try and satisfy space cooling loads which will increase the number of air changes in the space being served.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Cooling coils

- Cooling coils, heating coils and condensate drain pans inside air handling equipment can become contaminated.
- Therefore, consider adding UVGI for coil surface and drain pan disinfection are encouraged as it will reduce the needs and frequency for in-person coil surface disinfection.
- These devices and systems should be monitored often and regular and emergency maintenances should continue.
- Provide PPE protection for building operators, maintenance technicians and anyone else who must inspect or come in contact with the device or equipment.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Operable windows

- In buildings with operable windows, when outside air thermal and humidity conditions and outdoor air quality are acceptable, open windows where appropriate during occupied hours.
- Disabling the interlock between opening windows and air conditioning system lockout or shut down if this feature is provided for in the Building Automation System.
- Monitor indoor spaces for possible contaminants entering through the windows such as toilets exhaust located nearby or for windows accessible to public and high traffic on adjacent streets and walkways.
- Exposure to seasonal and other outdoor allergens (pollen and mold spores) may occur with windows opened.
- Special ductwork cleaning, or, changing filters more often than normal is not necessary.

Domestic Heating Water systems:

- Keep heating water systems circulating and maintain temperatures above 140°F to avoid microbial incursion. Do not let water temperature to drop below 120°F.

Operate and maintain the HVAC system - Exhaust systems

- Exhaust system for toilets should run 24/7. Do not open operable windows in toilets.
- Other exhaust systems should continue to run as normal. Run exhaust systems 2 hours before and after occupied periods.
- If there are exhaust outlets located in pedestrian areas outside, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.

Elevator Control

1. Turn on elevator cab (lift) ventilation fans, where possible

2. Encourage occupants to take stairs, where possible, especially when elevator lobbies are crowded.
3. Allow elevators to run at high speed to minimize time in elevator.
4. Close elevator lobby vestibule doors, if available.
5. Consider local air treatment devices in frequently used lifts.

Building Automation System and Access Control System Programming

Building Automation Systems:

- Automate the control sequences in this document as a "Epidemic Mode" operation that can be turned on, shut down or override, if needed, by manual selection of the operator.
- Provide remote access to staff and trusted service providers who are responsible for operating and maintain Building Automation Systems, security, access control, information technology, fire alarm and life safety systems. Have written procedures and test remote access and secure access levels and permissions for all individuals prior to an emergency, if possible.

Access Control Systems:

- Post signage and communicate to tenants, and post visitors' procedures for entering and leaving the building that will minimize the time spent in public spaces.
- Use touchless assess control system if available and where possible.
- Require and enforce social distancing within public and shared spaces using signage.
- Ensure that workspaces are situated to accommodate social distancing recommendations.

Littleton Public Schools
Littleton High School
Littleton, MA

2020

HVAC System Evaluation

Prepared For:

Littleton Public Schools
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Prepared By:

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September 18, 2020

EXECUTIVE SUMMARY

General

Littleton Public Schools engaged BLW Engineers to evaluate the building HVAC system relative to its current operating conditions, re-opening to the building to the public and potential considerations relative to Covid-19. Kenneth R. Beck, PE, Principal-In-Charge, visited each site, reviewed building documentation and prepared the following evaluation.

While at the site, BLW Engineers met with the facilities operator who reported the HVAC systems receives regular preventative maintenance which includes filter replacement, grease motors and bearings, replace fan belts and verify damper and valve operation.

The Littleton High School is located at 56 King Street; was constructed in 2001. The school comprises approximately 125,000 square feet of educational space.

Littleton High School Planned Reopening

The Littleton Public Schools plans on the following school re-opening:

- School is to be occupied by 50% of students on Monday/Tuesday, Wednesday will be a disinfection/cleaning day and then occupied by 50% of students on Thursday/Friday.
- Classrooms seating will be reorganized to provide recommended social distancing; typically, classrooms sizes will be reduced to 14 occupants (students and a teacher).
- Cafeteria will not be used in normal fashion; students will eat lunches outdoors when possible and use other locations throughout the building to maximize social distancing protocols.
- Gym will not be used in normal fashion.
- Library room will not be used in normal fashion; it will be used primarily as classroom space.

Recommendations

Based on applicable guidelines (ASHRAE, State of Massachusetts Re-opening Guidelines, Massachusetts Teachers Association, etc.), the Littleton High School is safe to occupy and should consider the following best practice operation of the current HVAC system in an effort to provide an environment to best protect the occupants and visitors to the building during the pandemic:

Tier 1 Recommendations: Tier 1 recommendations are immediate revisions to system operation prior to start of classroom and until the start of the heating season.

1. Create an "Epidemic Mode" sequence of operation that can be turned on, shut down or override, if needed, by manual selection of the operator
2. Replace the unit filters with the best filters available that will not impact the heating capacity of the units and develop a filter replacement plan; unit ventilators, heating/venitlating units and rooftop units will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
3. Filter upgrades will require more frequent changes due to pressure drop of filter and particulates that “dirty” the filters.

4. Continued operation (24 hours a day, 7 days a week) of heating and cooling systems is recommended.
5. Operate toilet exhaust fans 24 hours a day, 7 days a week.; other fans shall operate two hours prior and two hours post occupied hours.
6. Monitor Carbon Dioxide (CO2) levels in occupied areas of the building by building personal on an intermittent basis.
7. Should building exhaust exit building through sidewall louvers subject to pedestrian traffic, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.
8. Operate the building in occupied mode with mechanical ventilation prior and two hours post occupied hours; where mechanical ventilation and exhaust are not currently provided, utilize operable windows.
9. Operate the building in the occupied mode during disinfection and cleaning operations.
10. Operate Conference, Small Classroom and Special Ed unit ventilators (UV-1) at maximum outdoor air for ventilation; the units have the capability of providing 32/CFM per occupant for 9 occupants.
11. Operate Classroom unit ventilators (UV-2) at maximum outdoor air for ventilation; the units have the capability of providing 32/CFM per occupant for 14 occupants.
12. Operate Special Ed Large Classroom unit ventilators (UV-3) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 15 occupants.
13. Operate Art unit ventilators (2/UV-4) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 37 occupants.
14. Operate Teachers Dining ventilator (UV-4) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 18 occupants.
15. Operate Remedial Classroom unit ventilator (UV-5) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 9 occupants.
16. Operate Biology and Life Science classroom unit ventilators (UV-7) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 18 occupants.
17. Operate Chemistry classroom unit ventilator (2/UV-8) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 46 occupants.
18. Operate Library rooftop unit (RTAC-1) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 92 occupants.
19. Operate Auditorium rooftop unit (RTAC-2) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 353 occupants.
20. Operate KIVA rooftop unit (RTAC-3) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 32 occupants.
21. Operate TV Studio rooftop unit (RTAC-4) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 23 occupants.
22. Operate Administration rooftop unit (RTAC-5) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 132 occupants.
23. Operate Band rooftop unit (RTAC-6) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 46 occupants.
24. Operate Locker Room rooftop heating/ventilating unit (RTHV-1) and associated exhaust fan (EF-12) continuously at 100% outdoor air.
25. Operate Weight/Athletics heating/ventilating unit (RTHV-2) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 125 occupants.

26. Operate Cafeteria heating/ventilating units (RTHV-3A, 3B) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 145 occupants.
27. Operate Gymnasium heating/ventilating units (RTHV-4, 5) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 187 occupants.
28. Operate Grand Stair and Lobby heating/ventilating unit (RTHV-6) at maximum outdoor air for ventilation.
29. Operate Main Lobby heating/ventilating unit (RTHV-7) at maximum outdoor air for ventilation.
30. Operate Auxiliary Gym heating/ventilating unit (RTHV-8) at maximum outdoor air for ventilation; the unit has the capability of providing 32 CFM per occupant for 56 occupants.
31. Operate Computer Lab and Computer Art split systems (FCU-1/ACCU-2; FCU-2/ACCU-5) at maximum outdoor air for ventilation.
32. In spaces without mechanical ventilation, use operable windows with supplemental electric heat and portable HEPA filtration.
33. At the commencement of school and until the heating season, the rooftop units, unit ventilators and air handling units can be run in the “economizer mode” with 100% outdoor air and no recirculation.
34. During the heating season, operate rooftop units, unit ventilators and heating/ventilating units to the level above the ventilation design capacity based on outdoor air temperature and the acceptable indoor air temperature acceptable to the occupant comfort.
35. Eliminate zones that are not occupied to better use outdoor air in occupied areas.
36. Relocate occupants from areas that do not have mechanical ventilation or operable windows.
37. Do not use free standing fans or operate ceiling destratification fans that provide velocity air flow across one occupant to another.
38. Use operable windows when outdoor air conditions allow.
39. Keep conference room doors open as much as possible or open windows when feasible.
40. Increase regular maintenance of all mechanical heating, ventilating and air conditioning equipment.
41. Monitor the heating, ventilating and air conditioning operation of the building on a continual basis.
42. Follow recommendations of holistic view of building recommendations in General Recommendations noted hereinafter.

Tier 2 Recommendations: Tier 2 recommendations are supplemental revisions/additions to the existing systems that may be required for the heating season when systems will need to utilize recirculated air to maintain space temperature setpoints.

1. Provide additional filtration with portable HEPA filter units (100 cfm/250 SF) or UV filtration units for unit ventilators, heating/ventilating units or rooftop units with large percentages of recirculation air when operated under 32 CFM per occupant.
2. Install portable humidifiers or retrofit existing equipment with humidifiers for local humidity control should humidity become an issue.
3. Add plug-in type supplemental electric heat as required for increased ventilation requirements through equipment or operable windows.
4. Apply and use outdoor air quality sensors or reliable web-based data for outdoor pollution information as part of the new ventilation operation.
5. Consider UV decontamination lights on highly touched surfaces.

Notes:

1. These recommendations are based on guidance provided by applicable agencies and publications for best practices for protection of occupants and visitors to the building but do not provide absolute protection from the pandemic.
2. These recommendations will have a significant impact on the operating and maintenance related costs of the HVAC systems.

HVAC SYSTEM EVALUATION

The existing building is provided with heating hot water by two gas fired, cast iron sectional hot water boilers, a two-pipe heating water distribution piping system, unit ventilators, rooftop units, heating ventilating units, fan coil units, exhaust fans, and miscellaneous heating terminal equipment.

The gas fired, 80% efficient, boilers are located in the mechanical room. The boilers provide heating hot water for the building through the two pipe distribution system through two lead/standby hot water distribution pumps with variable speed drives. The boiler room is provided with a hot water heating/ventilating unit that provides 5,000 CFM of tempered combustion air to the boiler room. The boiler room is in good operating condition.

The small classrooms, Conference Room and Special Ed are provided with unit ventilators (UV-1), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that provide 750 cfm of total supply air and 300 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. The common exhaust fan system typically exhausts 300 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The classrooms are provided with unit ventilators (UV-2), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that typically provide 1000 cfm of total supply air and 450 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 450 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The larger Special Ed classroom is provided with a unit ventilator (UV-3), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator is constant volume units that provide 1500 cfm of total supply air and 500 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. The common exhaust fan system exhausts 500 CFM from the space. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Teachers Dining is provided with a unit ventilator (UV-4), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator is constant volume units that provide 1500 cfm of total supply air and 600 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. The common exhaust fan system exhausts 600 CFM from the space. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Art is provided with two unit ventilators (UV-4), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. Each unit ventilator is constant volume units that provide 1500 cfm of total supply air and 600 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. The common exhaust fan system exhausts 1200 CFM from the space. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Remedial classroom is provided with a unit ventilator (UV-5), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilator is constant volume units that provide 750 cfm of total supply air and 300 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements. The common exhaust fan system exhausts 300 CFM from the space. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Biology and Earth Science classrooms are provided with unit ventilators (UV-7), fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The unit ventilators are constant volume units that typically provide 1500 cfm of total supply air and 600 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 600 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Computer and Computer Arts Classrooms are provided with unit ventilators (UV-8), 4-ton air cooled condensing units and common exhaust fan systems to provide hot water heating, ventilation, air conditioning and exhaust. The unit ventilators are constant volume units that provide 1500 cfm of total supply air and 500 cfm of outdoor air is provided to each classroom. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 500 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Chemistry classroom is provided with two unit ventilators (UV-9), fumehood exhaust, fintube radiation and common exhaust fan systems to provide hot water heating, ventilation and exhaust. The

unit ventilators are constant volume units that typically provide 2000 cfm of total supply air and 750 CFM of outdoor air for ventilation. Vertical unit ventilators receive air directly from the outdoors through a sidewall louver. The original ventilation design exceeds current code requirements (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 SF classroom with 25 occupants that would be 370 CFM). The common exhaust fan system typically exhausts 500 CFM per classroom. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Library is provided with a hot water heating/DX cooling rooftop unit (RTAC-1) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets; the system provided with six heating and cooling zones with hot water reheat coils and wall mounted thermostats. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 10,000 CFM of total conditioned air supply and 2,945 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.12 CFM x SF).

The Auditorium is provided with a hot water heating/DX cooling rooftop unit (RTAC-2) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 9,500 CFM of total conditioned air supply and 4,250 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.12 CFM x SF). Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The KIVA is provided with a hot water heating/DX cooling rooftop unit (RTAC-3) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 3,000 CFM of total conditioned air supply and 1,000 CFM of outdoor air for ventilation which exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The TV Studio is provided with a hot water heating/DX cooling rooftop unit (RTAC-4) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 3,000 CFM of total conditioned air supply and 750 CFM of outdoor air for ventilation which exceeds current code requirements. Heating is provided through the unit hot water coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Administration is provided with a hot water heating/DX cooling rooftop unit (RTAC-5) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets; the system provided with heating and cooling zones with hot water reheat coils and wall mounted thermostats. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 9,500 CFM of total conditioned air supply and 4,250 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 5 CFM x Occupant + 0.12 CFM x SF).

The Band is provided with a hot water heating/DX cooling rooftop unit (RTAC-6) that provides heating, ventilating and air conditioning through a low pressure insulated duct system units to ceiling supply air outlets; the system provided with heating and cooling zones with hot water reheat coils and wall mounted thermostats. Air is returned to the unit though ceiling register into a low pressure return air is duct distribution system. The original design provides 1,500 CFM of total conditioned air supply and 750 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 10 CFM x Occupant + 0.12 CFM x SF).

The Kitchen is provided with a gas heating makeup air/exhaust unit (KHMU-1) to provide heating and ventilation to the kitchen; the unit was designed to provide 3,600 CFM of outdoor air for makeup air to the kitchen and 6,000 CFM grease exhaust from the kitchen hood exhaust fan. The kitchen is also provided with a roof mounted exhaust fan (REF-24) that provides 600 CFM of exhaust from dishwasher hood. Heating is provided through the heating/ventilating unit gas furnace system and a wall mounted space temperature sensor.

The Locker Rooms are provided with a rooftop hot water heating/ventilating unit (RTHV-1) and a rooftop exhaust fan (EF-12) to provide heating and ventilation to the space; the system provided with heating zones with hot water reheat coils and wall mounted thermostats. The original design provides 7,000 CFM of total tempered air supply and 7,000 CFM of outdoor air for ventilation which exceeds current code requirements.

The Weight Room and Storage Room are provided with a hot water heating/ventilating rooftop unit (RTHV-2) to provide heating and ventilation to the space; the system provided with heating zones with hot water reheat coils and wall mounted thermostats. The original design provides 10,000 CFM of total tempered air supply and 4,000 CFM of outdoor air for ventilation which exceeds current code requirements.

The Cafeteria is provided with hot water heating/ventilating rooftop units (RTHV-3A, 3B) to provide heating and ventilation to the space; the system provided with heating zones with hot water reheat coils and wall mounted thermostats. The original design provides a total of 4,000 CFM of total conditioned air supply and 4,650 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 7.5 CFM x Occupant + 0.18 CFM x SF). Heating is provided through the heating/ventilating unit gas furnace system and a wall mounted space temperature sensor.

The Gymnasium is provided with two hot water heating/ventilating rooftop units (RTHV-4, 5) that provide heating and ventilation. The original design provides a total of 18,000 CFM of total tempered air supply and 6,000 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 7.5 CFM x Occupant + 0.06 CFM x SF). Heating is provided through the rooftop unit hot water heating coils interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Grand Stair and Lobby are provided with a hot water heating/ventilating rooftop unit (RTHV-6) that provides heating and ventilation the system provided with heating zones with hot water reheat coils and wall mounted thermostats. The original design provides a total of 3,000 CFM of total tempered air supply and 7500 CFM of outdoor air for ventilation which exceeds current code requirements.

The Main Lobby are provided with a hot water heating/ventilating rooftop unit (RTHV-7) that provides heating and ventilation. The original design provides a total of 3,000 CFM of total tempered air supply and 7500 CFM of outdoor air for ventilation which exceeds current code requirements. Heating is provided through the rooftop unit hot water heating coil interconnected to the hot water distribution piping system and a wall mounted space temperature sensor.

The Auxiliary Gym is provided with a hot water heating/ventilating rooftop unit (RTHV-8) that provides heating and ventilation the system provided with heating zones with hot water reheat coils and wall mounted thermostats. The original design provides a total of 5,000 CFM of total tempered air supply and 1,800 CFM of outdoor air for ventilation which exceeds current code requirements (Ventilation = 7.5 CFM x Occupant + 0.06 CFM x SF).

The Computer Lab and Computer Arts Classrooms are provided with split system air conditionings and operable windows for heating, cooling and ventilation. The split system air conditioning consists of an outdoor air cooled condensing interconnected with refrigerant piping to indoor ductless wall mounted units.

Bathrooms, Janitor's Closets, Storage, etc. are provided by exhaust registers, exhaust duct distribution system and roof exhaust fans.

Miscellaneous spaces have been provided with hot water terminal equipment interconnected with the hot water distribution piping system.

The building is controlled by electronic controls (Delta Controls).

GENERAL PUBLICATION RECOMMENDATIONS

Publications referenced include ASHRAE and State of Massachusetts Re-opening Guidelines for schools.

Operating school buildings under epidemic conditions requires a holistic framework during the crisis and the restoration to potentially a new "normal" after the public health emergency has ended. Considerations include:

- Review of current operational practices
- Holistic view for owner/operator

Review of current operational practices

- Modes of operation of HVAC systems
    - sequences of operations
    - set points
    - schedules
- Verification that equipment and systems are properly functioning and have the enhanced capabilities to address public health considerations, with a focus building air circulating systems.
- Understanding that infected people who are asymptomatic may enter buildings, increasing the likelihood of the spread of virus through air systems to other occupants.

Holistic view for owner/operator

Owners and operators should take a holistic view of their buildings and:

1. Develop a pandemic preparedness plan
2. Review indoor and outdoor environment
3. Review the space types
4. Operate and maintain HVAC
    - Air-Conditioning and Ventilation systems
    - Exhaust systems
5. Check Elevator Control
6. Check BAS and Access Control Systems

Develop a Pandemic Preparedness Plan

Consider these possible goals:

- Reduce the spread of infection among building occupants,
- Maintain HVAC and Building Service Systems in safe and healthy conditions,
- Minimize impact on building occupants and visitors,
- Communicate risks and precautions being taken with occupants transparently
- Implement measures that help make occupants feel secure:
    - Require occupants, visitors and maintenance personnel to wear appropriate PPE per CDC,
    - Screen, monitor and control the circulation of occupants and guests to help avoid transmission of disease,
    - Increase frequency for surface disinfection on frequently touched surfaces, such as door handles, handrails, door bells and elevator buttons.

Ensure continuity of supply chains and have backup plans.

- Identify your critical suppliers, e.g. filters, cleaners, disinfectants, parts, PPE, etc.,
- Identify vendors who could negatively affect your operation if they fail to deliver,
- Review current service provider agreements to see if alternate suppliers can be engaged in the event of a supply disruption, for example, equipment service providers, and understand contract limitations and restrictions on using alternative providers,
- Ask critical suppliers to share their pandemic plans:
    - What does their plan include?
    - Have they tested their plan? When was it updated?
    - Set boundaries with suppliers – ask that they do not send staff who may be showing signs of illness to your property.

Review contract agreements:

- Review contract agreements: Review contracts with service providers, utilities, and suppliers to determine what rights and remedies they have because of disruptions due to unforeseeable circumstances that prevent fulfillment of a contract.

Establish a communication protocol and continuity of operations plan:

- Identify key contacts and publish normal and emergency contact information,
- Document the chain of command and communication requirements, and provide instructions and outline expectations for how all responses are to be documented and what records shall be maintained and distributed.

Provide staff with:

- PPE per CDC and OSHA requirements,
- Training on the proper use and disposal of PPE and waste,
- Training on infection prevention and control measures,
- Cross training to ensure critical building functions are maintained in an emergency, and
- Instruction to staff to stay at home if they are feeling sick.

Check with insurance providers to determine whether there are special measures that can be taken to preserve coverage or lower premiums.

Next Steps:

1. Notify staff, tenants and visitors about the plan
2. Follow all local, state and federal executive orders, statutes, regulations, guidelines, restrictions and limitations on use, occupancy and separation
3. Follow OSHA Guidelines, especially the portion in the guide regarding filter and outside air.
4. Ensure that custodial staff and service providers job descriptions includes performing proper cleaning procedures based EPA and CDC guidance using approved products and methods:
    - Disinfect high touch areas of HVAC and other Building Service systems such as on/off switches, and thermostats;
    - Consider UV light disinfection devices of high touch counters in public spaces.
    - Disinfect interiors of refrigerated devices, such as refrigerators, coolers and vending machines where the virus can survive for potentially long periods of time.
5. Consider installing a thermal camera at building entrances to help screen visitors for elevated body temperatures. Note that that infected individuals may show no signs of being ill, including having no fever, and can be responsible for much of the transmission. In such cases, thermal imaging may not be effective.
6. Provide MERV13 or higher filters for air handling equipment that recirculate air when equipment has the capacity; however, most existing air handling equipment will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
7. The HVAC systems that are physical or capacity limited for better filtration and UV decontamination systems in the return airstream, consider installing portable filtration and air cleaning devices such as UVGI (Ultraviolet Germicidal Irradiation), especially if seniors or anyone with other health issues or compromised immune systems may be located, or, in mission critical areas where required.
8. Provide automatic hand sanitizer dispensers in the high touch areas and other common areas, including spaces where equipment where frequent maintenance is required, and ensure dispensers are serviced often and remain operational.

9. Post signage in prominent locations that contain information and instructions to educate and remind staff about proper procedures to maintain personal protection while cleaning, replacing filters and moving or using other equipment that maybe contaminated
10. Consider providing antimicrobial door mats at high traffic entrances to the building.
11. Institute additional cleaning procedures to ensure proper disinfection of bathrooms, kitchens and common areas. Educate cleaning and maintenance staff on proper personal protection and PPE use including following OSHA worker exposure guidelines.

Review Indoor and Outdoor Environment

- Maintain dry bulb temperatures within the comfort ranges indicated in ANSI/ASHRAE Standard 55-2017
- Maintain relative humidity between 40% and 60% through the use of the air conditioning systems.

In Cold Climates
i. HVAC systems with no humidification may not achieve the minimum humidity indicated, ii. Observe building assemblies and finishes frequently for condensation when indoor dew points rise above the surface temperatures of the assemblies and finishes, iii. Excessive humidity may lead to condensation, indoor mold growth, and degradation of indoor air quality.

Review the space types

Conference Rooms	Keep doors to be opened to promote good ventilation where possible. If doors must be closed, consider local air filtration and cleaning devices and appliances such as portable air filters, or provide local exhaust fans discharging directly to the outside to improve ventilation.
Pantries/Storage Rooms	Provide local exhaust, or portable air filtration and cleaning appliances, especially if refrigerators, or similar appliances, are presented.
Public/Large Assembly Spaces	Where there can be a large assembly of people, consider air treatment, e.g. upper-room UVGI lamps.

Operate and maintain the HVAC system

Building owners and service professionals should follow the requirements of ASHRAE Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial HVAC Systems which has tables to show the typical maintenance required for equipment that has been in operation. Consider PPE when maintaining ventilation materials including filters, condensate. Consult additional guidance before duct cleaning. Check specifically:

- Dampers, filter, and economizers seals and frames are intact and clean, are functional and are responding to control signals. MERV13 or higher filters are required for capture of airborne viruses; however, most existing equipment will not be able to support the associated pressure drop of these filters and equipment should be provided with only the highest MERV rating that does not affect the heating and cooling capacity of the units.
- Zone and air temperature are calibrated and accurately reporting environmental conditions to the BAS or local controllers.
- Exhaust fans are functional and venting to the outdoors.
- Check outside air intake regularly for any potential risk such as exhaust nearby and provide proper clearance if assessible by pedestrians, etc.

Operate and maintain the HVAC system – Air conditioning and ventilation systems

- Continued operation of all systems is recommended.
- For offices with fan coil units, open windows 2 hours before and after occupied periods.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: General information

- For central or floor-by-floor VAV systems that have the capacity to operate with 100% outside air, such as an economizer cycle, close return air dampers and open outdoor air dampers to 100% or to the maximum setting that the HVAC system can accommodate and still maintain acceptable indoor conditions.
- If there are heating and cooling coils to temper the air, it can provide comfort and eliminate recirculation (in the mild weather seasons this will have smaller impacts to energy consumption, thermal comfort, or humidity control, however, using 100% outside can be more difficult in extreme weather conditions).
- Considerations also should be given in areas with dry outside air that may lower the relative humidity to below 40%.
- Prioritize increasing outside air over humidity (see concerns about operating at indoor humidity outside the range of 40%-60%).

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Floor-by-floor

- In floor-by-floor VAV systems that have only minimum outside air damper positions or openings, open outside air damper to its maximum position (the same cautions and concerns stated above apply).
- If outside air is supplied centrally from outside air handling units (typically at mechanical levels) to all floors, and there are unoccupied tenant floors, divert the outside air to the occupied floors.

- Consider changing the floor level VAV air handling units' discharge air temperature setpoint the maximum (typically no higher than 60º F).
- This will cause VAV terminal units (boxes) to open to try and satisfy space cooling loads which will increase the number of air changes in the space being served.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Cooling coils

- Cooling coils, heating coils and condensate drain pans inside air handling equipment can become contaminated.
- Therefore, consider adding UVGI for coil surface and drain pan disinfection are encouraged as it will reduce the needs and frequency for in-person coil surface disinfection.
- These devices and systems should be monitored often and regular and emergency maintenances should continue.
- Provide PPE protection for building operators, maintenance technicians and anyone else who must inspect or come in contact with the device or equipment.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Operable windows

- In buildings with operable windows, when outside air thermal and humidity conditions and outdoor air quality are acceptable, open windows where appropriate during occupied hours.
- Disabling the interlock between opening windows and air conditioning system lockout or shut down if this feature is provided for in the Building Automation System.
- Monitor indoor spaces for possible contaminants entering through the windows such as toilets exhaust located nearby or for windows accessible to public and high traffic on adjacent streets and walkways.
- Exposure to seasonal and other outdoor allergens (pollen and mold spores) may occur with windows opened.
- Special ductwork cleaning, or, changing filters more often than normal is not necessary.

Domestic Heating Water systems:

- Keep heating water systems circulating and maintain temperatures above 140°F to avoid microbial incursion. Do not let water temperature to drop below 120°F.

Operate and maintain the HVAC system - Exhaust systems

- Exhaust system for toilets should run 24/7. Do not open operable windows in toilets.
- Other exhaust systems should continue to run as normal. Run exhaust systems 2 hours before and after occupied periods.
- If there are exhaust outlets located in pedestrian areas outside, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.

Elevator Control

1. Turn on elevator cab (lift) ventilation fans, where possible

2. Encourage occupants to take stairs, where possible, especially when elevator lobbies are crowded.
3. Allow elevators to run at high speed to minimize time in elevator.
4. Close elevator lobby vestibule doors, if available.
5. Consider local air treatment devices in frequently used lifts.

Building Automation System and Access Control System Programming

Building Automation Systems:

- Automate the control sequences in this document as a "Epidemic Mode" operation that can be turned on, shut down or override, if needed, by manual selection of the operator.
- Provide remote access to staff and trusted service providers who are responsible for operating and maintain Building Automation Systems, security, access control, information technology, fire alarm and life safety systems. Have written procedures and test remote access and secure access levels and permissions for all individuals prior to an emergency, if possible.

Access Control Systems:

- Post signage and communicate to tenants, and post visitors' procedures for entering and leaving the building that will minimize the time spent in public spaces.
- Use touchless assess control system if available and where possible.
- Require and enforce social distancing within public and shared spaces using signage.
- Ensure that workspaces are situated to accommodate social distancing recommendations.

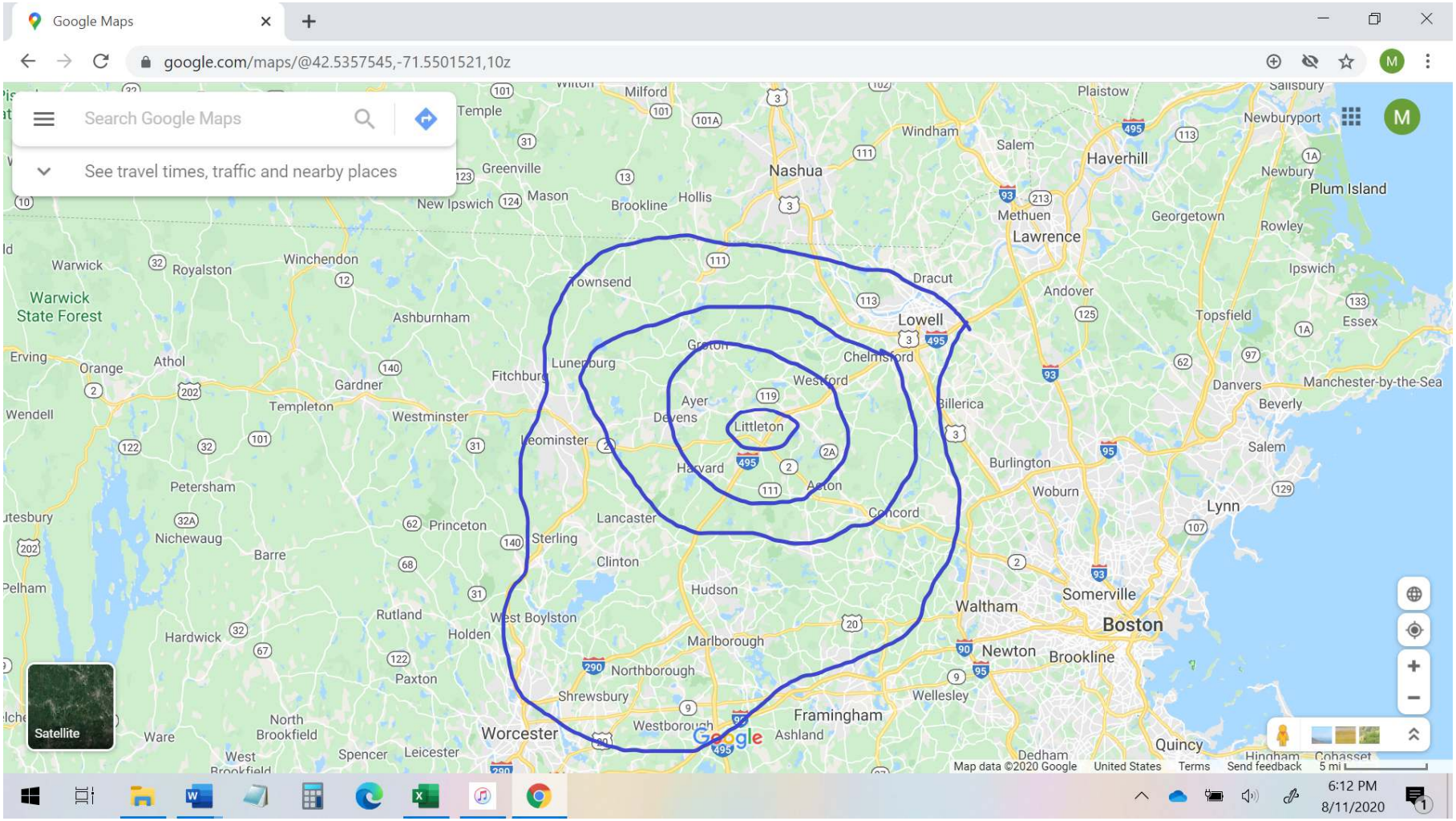
Covid-19
Heath Metrics

Littleton and Surrounding Communities

Town Groupings Evaluated

- **Littleton**
- **Border Communities**
  - Littleton, plus Acton, Ayer, Boxborough, Groton, Harvard, and Westford
- **Contiguous Communities**
  - Border Communities, plus Bolton, Carlisle, Chelmsford, Concord, Dunstable, Lancaster, Lunenburg, Maynard, Pepperell, Shirley, Stow
- **495 Belt**
  - Contiguous Communities, plus Ashby, Bedford, Berlin, Boylston, Clinton, Hudson, Leominster, Lincoln, Lowell, Marlborough, Northborough, Shrewsbury, Southborough, Sterling, Sudbury, Townsend, Tyngsboro, Wayland, West Boylston, Westborough, Weston
- **Middlesex County**
- **Commonwealth of Massachusetts**

Town Groupings Evaluated



Thresholds

DESE Thresholds Average Cases Per Day per 100,000

- <4 Cases Per Day: GREEN
- Between 4 and 8 Cases Per Day: YELLOW
- >8 Cases Per Day: RED

Harvard Global Health Institute
Testing Positivity Threshold
<3%

City/Town	Population	Total Cases (Last 14 Days)	Average Cases per Day (Last 14 Days)	Rate of Average Daily Cases per 100,000 Residents (Last 14 Days)	Average Cases Per Day Compared to 4 Cases Per 100,00 (DESE Green Threshold)	Total Tested (Last 14 days)	Total Positive Tests (Last 14 days)	Percent Positivity (Last 14 Days)
Littleton	10,227	4	0.29	2.79	-30.16%	605	5	0.83%
Acton	23,662	3	0.21	0.91	-77.36%	1,332	3	0.23%
Ayer	8,196	2	0.14	1.74	-56.42%	521	2	0.38%
Boxborough	5,793	0	0.00	0.00	-100.00%	251	0	0.00%
Groton	11,325	2	0.14	1.26	-68.46%	1,192	2	0.17%
Harvard	6,620	1	0.07	1.08	-73.03%	339	2	0.59%
Westford	24,817	20	1.43	5.76	43.91%	1,271	21	1.65%
Contiguous Communities Total	**90,640**	**32**	**2.29**	**2.52**	**-36.96%**	**5,511**	**35**	**0.64%**
Bolton	5,426	1	0.07	1.32	-67.09%	326	1	0.31%
Carlisle	5,252	1	0.07	1.36	-66.00%	265	1	0.38%
Chelmsford	35,391	27	1.93	5.45	36.23%	1,735	30	1.73%
Concord	18,918	3	0.21	1.13	-71.68%	1,572	3	0.19%
Dunstable	3,403	0	0.00	0.00	-100.00%	146	0	0.00%
Lancaster	8,082	3	0.21	2.65	-33.72%	411	3	0.73%
Lunenburg	11,736	3	0.21	1.83	-54.35%	469	3	0.64%
Maynard	11,336	4	0.29	2.52	-36.99%	591	4	0.68%
Pepperrell	12,114	6	0.43	3.54	-11.55%	480	6	1.25%
Shirley	7,636	4	0.29	3.74	-6.46%	330	4	1.21%
Stow	7,234	0	0.00	0.00	-100.00%	439	0	0.00%
Contiguous Communities+ Total	**217,168**	**84**	**6.00**	**2.76**	**-30.93%**	**12,275**	**90**	**0.73%**
Route 495 Belt Totals	**642,573**	**371**	**26.50**	**4.12**	**3.10%**	**38,067**	**449**	**1.18%**
Middlesex County	**1,634,150**	**1041**	**74.36**	**4.55**	**13.76%**	**172,693**	**1,235**	**0.72%**
Commonwealth of MA Totals	**6,894,522**	**4,823**	**344.50**	**5.00**	**24.92%**	**693,958**	**5,950**	**0.85%**

Data from September 23, 2020 MA weekly DPH report

City/Town	Population	Total Cases (Last 14 Days)	Average Cases per Day (Last 14 Days)	Rate of Average Daily Cases per 100,000 Residents (Last 14 Days)	Average Cases Per Day Compared to 4 Cases Per 100,00 (DESE Green Threshold)	Total Tested (Last 14 days)	Total Positive Tests (Last 14 days)	Percent Positivity (Last 14 Days)
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Acton	23,662	3	0.21	0.91	-77.36%	1,332	3	0.23%
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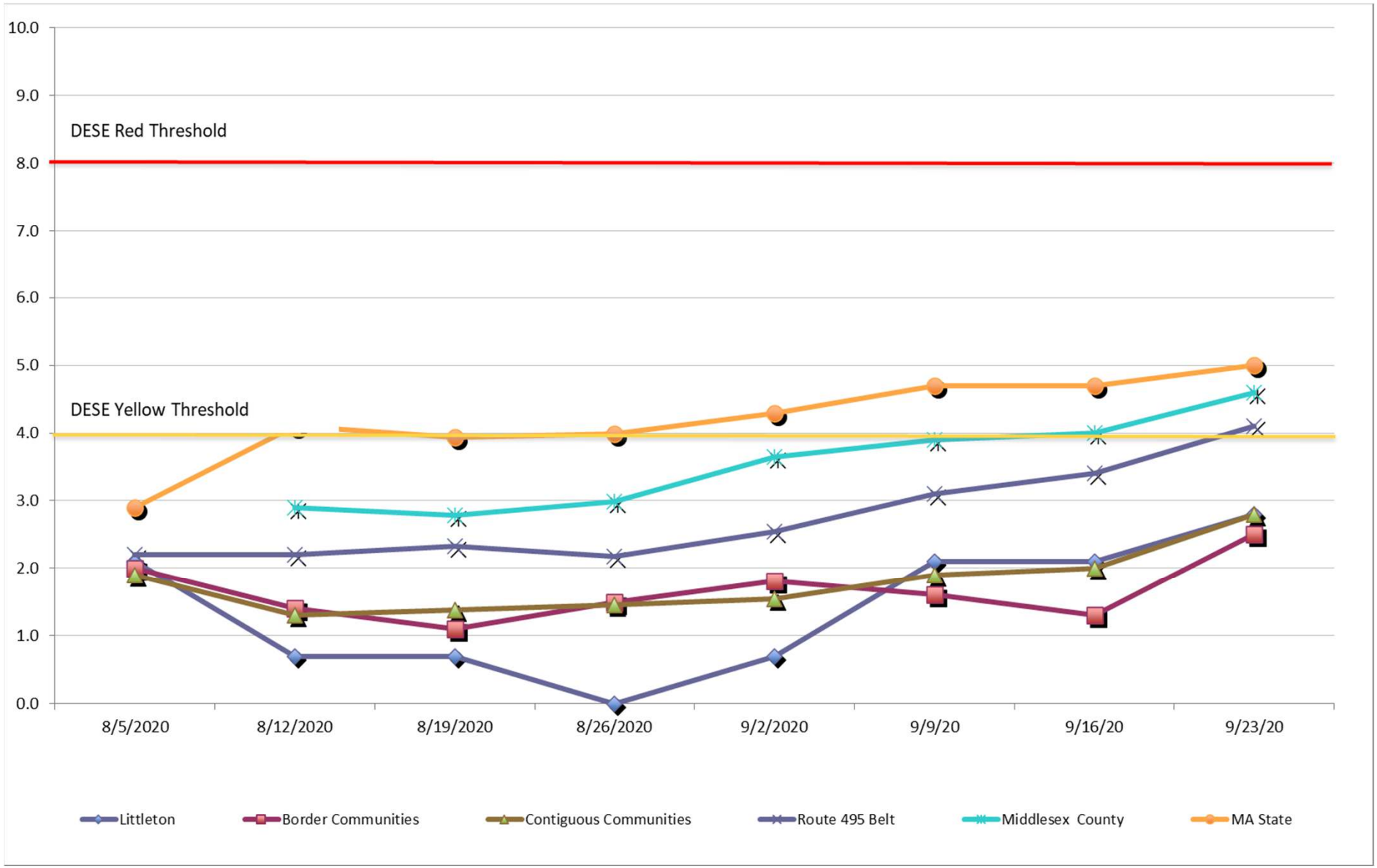
Lunenburg	11,736	3	0.21	1.83	-54.35%	469	3	0.64%
Maynard	11,336	4	0.29	2.52	-36.99%	591	4	0.68%
Pepperrell	12,114	6	0.43	3.54	-11.55%	480	6	1.25%
Shirley	7,636	4	0.29	3.74	-6.46%	330	4	1.21%
Stow	7,234	0	0.00	0.00	-100.00%	439	0	0.00%
Contiguous Communities+ Total	**217,168**	**84**	**6.00**	**2.76**	**-30.93%**	**12,275**	**90**	**0.73%**
Ashby	3,219	0	0.00	0.00	-100.00%	125	1	0.80%
Bedford	14,123	7	0.50	3.54	-11.49%	1,080	7	0.65%
Berlin	3,240	1	0.07	2.20	-44.89%	198	1	0.51%
Boylston	4,712	2	0.14	3.03	-24.21%	304	2	0.66%
Clinton	14,000	13	0.93	6.63	65.82%	711	13	1.83%
Hudson	19,864	9	0.64	3.24	-19.09%	966	10	1.04%
Leominster	41,716	10	0.71	1.71	-57.19%	2,063	21	1.02%
Lincoln	7,052	0	0.00	0.00	-100.00%	429	0	0.00%
Lowell	110,997	123	8.79	7.92	97.88%	6,785	152	2.24%
Marlborough	39,597	46	3.29	8.30	107.45%	2,317	64	2.76%
Northborough	15,109	12	0.86	5.67	41.83%	829	11	1.33%
Shrewsbury	38,526	13	0.93	2.41	-39.74%	2,621	14	0.53%
Southborough	10,208	0	0.00	0.00	-100.00%	753	2	0.27%
Sterling	8,174	2	0.14	1.75	-56.31%	707	4	0.57%
Sudbury	19,655	4	0.29	1.45	-63.66%	1,081	4	0.37%
Townsend	9,506	1	0.07	0.75	-81.21%	392	2	0.51%
Tyngsboro	12,527	15	1.07	8.55	113.82%	632	17	2.69%
Wayland	13,835	4	0.29	2.07	-48.37%	947	4	0.42%
West Boylston	8,077	1	0.07	0.88	-77.89%	410	1	0.24%
Westborough	19,144	16	1.14	5.97	49.24%	1,378	20	1.45%
Weston	12,124	8	0.57	4.71	17.83%	1,064	9	0.85%
Route 495 Belt Totals	**642,573**	**371**	**26.50**	**4.12**	**3.10%**	**38,067**	**449**	**1.18%**
Middlesex County	**1,634,150**	**1041**	**74.36**	**4.55**	**13.76%**	**172,693**	**1,235**	**0.72%**
Commonwealth of MA Totals	**6,894,522**	**4,823**	**344.50**	**5.00**	**24.92%**	**693,958**	**5,950**	**0.85%**

Average Daily Cases

	Average Daily Cases per 100,000 (past 14 days)	DESE Threshold
Littleton	2.8	Green
Border Communities	2.5	Green
Continuous Communities	2.8	Green
Route 495 Community Belt	3.4	Green
Middlesex County	4.1	Yellow
MA State	4.6	Yellow

Data from September 23, 2020 MA weekly DPH report

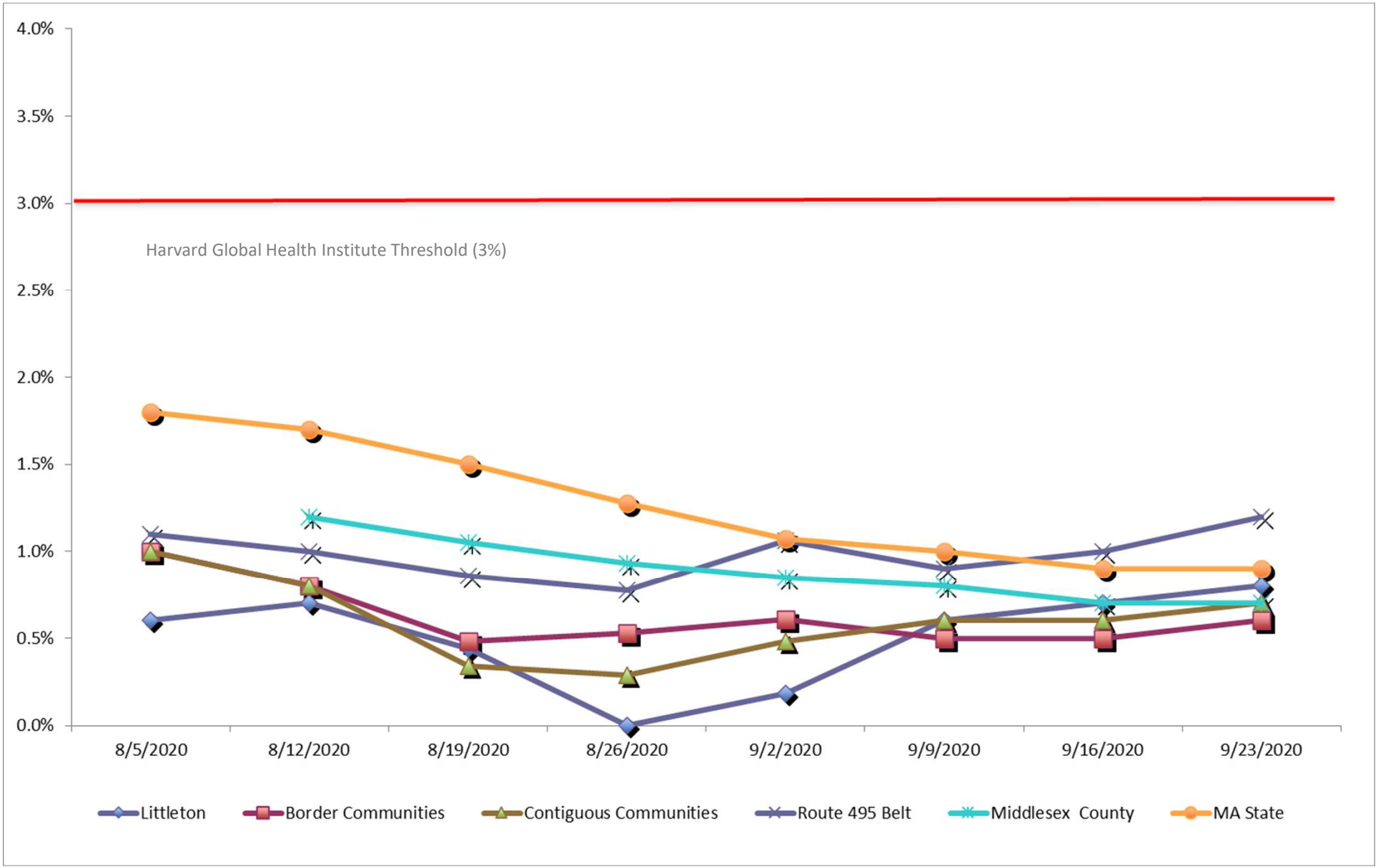
Trend: Average Daily Cases per 100,000



Percent Positivity

	Total Molecular Tests (last 14 days)	Percent Positivity	3% Positivity Threshold
Littleton	524	0.8%	<3%
Border Communities	5,264	0.6%	<3%
Continuous Communities	11,039	0.7%	<3%
Route 495 Community Belt	33,771	1.2%	<3%
Middlesex County	137,114	0.7%	<3%
MA State	567,709	0.9%	<3%

Data from September 23, 2020 MA weekly DPH report


4.0%
3.5%
3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
Harvard Global Health Institute Threshold (3%)
8/5/2020
8/12/2020
8/19/2020
8/26/2020
9/2/2020
9/9/2020
9/16/2020
9/23/2020
Littleton
Border Communities
Contiguous Communities
Route 495 Belt
Middlesex County
MA State

Heath Metrics Summary

- Data as of September 23, 2020 report
- Littleton is Green
  - 4 cases in the last 14 days
  - Average daily cases per 100k population = 2.9
  - Percent positivity in last 14 days = 0.8%
  - A slight increase from last week, but Rates and Testing Positivity remain well below thresholds
- Border and Surrounding Communities are Green
  - Average Daily Cases have risen and some communities are Yellow but overall, the region remains Green
  - Testing Positivity has also risen but remain below 1.0%, well below 3.0% threshold
- Middlesex County is Yellow
  - Rates are slightly higher, but testing positivity is stable
- MA State is Yellow
  - Rates are slightly higher, but test positivity is stable