



COVID-19 Workspace Safety Plan – Adaptive Microsystems Lab (AdaMist)

Standard hours of return: Phase I occupancy 7 AM to 6 PM Monday to Friday.

Consulted Resources (to be read and acknowledged by all users)

The following guidance documents and resources were used in the development of this plan:

- Brimacombe Phase I Safety plan - Common Areas-Safety Plan Brimacombe June 2.docx
- UBC Safety & Risk Services - “Preventing exposure to COVID-19 (<https://srs.ubc.ca/covid-19/health-safety-covid-19/prevention/>)
- WorkSafeBC - “Preventing exposure COVID-19 in the workplace: a guide for employers” (<https://www.worksafebc.com/en/resources/about-us/guides/preventing-exposure-to-covid-19-in-the-workplace?lang=en>)
- UBC Safety & Risk Services - “Personal Protective Equipment (PPE)” (<https://srs.ubc.ca/covid-19/health-safety-covid-19/working-safely/personal-protective-equipment/>)
- Government of Canada - “Personal protective equipment against COVID-19” (<https://www.canada.ca/en/health-canada/services/drugs-health-products/medical-devices/covid19-personal-protective-equipment.html>)
- UBC - “Physical distancing guidelines” (<https://riskmanagement.sites.olt.ubc.ca/files/2020/04/COVID-19-Physical-Distancing-Guidance-FINAL-.pdf>)
- UBC Safety & Risk Services - “Reporting COVID-19 exposure” (<https://srs.ubc.ca/covid-19/health-safety-covid-19/reporting-covid-19-exposure/>)
- UBC Research & Innovation: “COVID-19: curtailing research activities on UBC campuses” (<https://research.ubc.ca/covid-19-curtailing-research-activities-ubc-campuses>)
- WorkSafeBC - “COVID-19 and returning to safe operation - Phases 2&3” (<https://www.worksafebc.com/en/about-us/covid-19-updates/covid-19-returning-safe-operation>)
- AMPEL - “Brimacombe building emergency response plan” (<https://www.ampel.ubc.ca/about/brimacombe-building-emergency-response-plan-berp/>)
- UBC Safety & Risk Services - “Reporting COVID-19 Exposure” (<https://srs.ubc.ca/covid-19/health-safety-covid-19/reporting-covid-19-exposure/>)



- UBC Safety&Risk Services Covid-19 training (<https://wpl.ubc.ca/browse/srs/courses/wpl-srs-covid>)

Section #1: Lab information

Department	Electrical and Computer Engineering
Faculty	Applied Science
Building(s)	Brimacombe
Lab(s)/workspace(s)	443, 442/442a
Name of the PI	Edmond Cretu
Contact email	edmondc@ece.ubc.ca
Phone	*****

Introduction to the Adaptive Microsystems (AdaMist) Laboratory

Adaptive Microsystems Lab (AdaMist) is dedicated to advanced, green and rapid micromanufacturing technologies, the design and assembly of microsystems, and for the test and measurement of MEMS devices and microsystems. The associated lab space comprises the rooms AMPEL 443 and 442/442a, with relevant fabrication equipment (maskless lithography, laser micromachining, aerosol jet printer, etc.) and test and characterization equipment (atomic force microscopy, laser Doppler vibrometry, rotation table, etc.). Overall, it is a unique lab facility in Canada.

We have used to provide access to the equipment to other research groups before the COVID-19 shutdown, but presently this has been blocked, and *for the time being (Phase 1) the access will be limited to only a reduced number of AdaMist researchers*, whose projects are critical for maintaining alive both a large industrially sponsored project and NSERC level projects. The research team in AdaMist normally includes one or two postdoc fellows, about ten graduate students, one - two visiting researchers and several (2-4) volunteer undergraduate students. In standard operating modes, 5-8 researchers from outside AdaMist group were also accessing the available equipment, from various other research teams (e.g. from the groups of Dr. Takahata, Dr. Chrostowski, Dr. Madden, Dr. Stoeber, etc.). As a result, in normal operating mode, the number of users accessing the AdaMist lab space has been in the range of 25-28 people.



AMPEL442 operates as a low-cost yellow room, with air filters and fumehood; AMPEL442a is a small measurement space for the AFM, laser Doppler vibrometry equipment and a probe station, while AMPEL443, the larger room, has the East half dedicated to assembly, test and measurement, with various electronic equipment, and the West half dedicated to manufacturing by direct deposition (aerosol jet printer and microplotter). There is a small office space in AMPEL443, which will be dedicated to circuit assembly in the present context.

Section #2 - Risk Assessment

1. Lab/workspace Occupancy (under proposed COVID-19 operations)

The operating mode of the available equipment in the 442/443 space relies on creating safe areas for the people doing activities there. The presence of the people in the lab is justified only by the need of using a certain specialized equipment, essential for their research work.

Room 442 (the yellow room) has two central equipment pieces, placed relatively closed to each other, a laser micromachining tool and a maskless lithography equipment. Their size and weight prevents us from doing any repositioning of the equipment at this time in order to increase the physical distance between operators, and consequently a single person at a time will be allowed in 442.

Room 442a has two main instruments, an AFM analyzer and a Microsystem Analyzer (MSA-500) with laser Doppler vibrometry capabilities. They are placed on opposite sides in the room, more than 2m apart, and therefore they can be concurrently used by two students. In consequence, the occupancy limit for 442a is of two students. As a remark, students accessing 442a need to pass through the corridor set in 442, but this is not a real issue, as the user at the time in 442 (for the laser micromachining or maskless lithography) can keep more than 2m physically apart, and separated by existing curtains from the corridor (curtains have the role to maintain a proper air filtering of the operating environment in the space dedicated to the maskless lithography and laser micromachining).

Room 443 has a larger space. The half dedicated to assembly, test and measurement easily allows more students, physically separated by more than 2m, but for now we will limit this to maximum three students at the same time (two in the main area and one in 443a, the office space transformed into an assembly space). The fabrication-dedicated half has two central pieces of equipment, an aerosol jet printer and a microplotter. As the microfabrication and the cleaning procedures afterwards can be more intense, maximum 2 people at a time are allowed in this half.



Room	Occupancy limit (Phase 1)	Comments
442	1	Restricted yellow room operating space
442a	2	Measurement instrumentation
443a	1	Space transformed into a circuit assembly space
443	2+2	2 people in the assembly, test and measurement section, 2 people in the fabrication section

The proposed maximum occupancy limit

I have had, as a supervisor and PI, individual discussions with all the team members who have expressed their agreement and own desire to return to work in the lab. They are aware of the general WorkSafeBC and UBC specific principles and rules for a safe working environment in the context of the COVID-19 pandemic, and have studied the associated document related to the Safety Plan implementation for the common areas in the Brimacombe building.

A list of the users to be accepted at this time in the lab space (442/442a/443) is provided below.

All users of lab space will take the mandatory UBC Safety&Risk Services Covid-19 training (<https://wpl.ubc.ca/browse/srs/courses/wpl-srs-covid>) within 2 weeks of returning to work. The selection was made so that we can cover the distinct critical projects at present - there are other students who need access, but we will cover for now the minimum needs and the other students in the research team will be helped by the allowed students for the experimental aspects of their work. It is worth mentioning that, at the AdaMist team level, only one PhD student out of the present team has a more theoretical project that do not require AMPEL access, while all the remaining students have projects where the experimental fabrication and testing is an essential component of their research. The PI (Dr. Cretu) will have access for the regular inspection and management aspects related to the AdaMist workspace.

The labs will be open only during the standard operating time, 7am to 6pm, Monday to Friday



The HQR on the above list will cover the critical activities related to various ongoing projects - more students are involved in these projects, and we have chosen a representative student for each of these projects, to be able to restart the work.

- Carlos *** - he is coordinating the activities related to the polyCMUT biomedical imaging projects, while in the same time he acts as a lab manager for AdaMist, for both the microfabrication and test/measurement procedures
- Chang **** - he is the PhD student nominated to represent the industrial project collaboration with B&C, China, dedicated to developing wearable sensors through polymer micromachining
- Joel E. **** - will deal with green printed sensors, within the context of the NSERC National Research Network "GreEN", focused on smart food packaging
- Amir *** **** - he is the representative student in a collaboration project with Dr. Antony Hodgson and Dr. Robert Rohling, for manufacturing flexible sensor arrays to monitor the position and dynamics of bones.
- Jonas **** is a representative student for our collaboration project with DLR (German Aerospace Institute). He will fabricate dedicated transducer arrays for nondestructive testing in aerospace industry
- Gabriel **** is the PhD student responsible for the circuit design and manufacturing, to ensure the electronic interface of polyCMUT transducers for actuation and sensing, as well as building dedicated microsystems
- Ruolan *** **** - she designs transducer arrays for manipulation through Lamb waves of particles and droplets.

As only the students present on this list will have access to the AdaMist space, the requests from other researchers will be handled as a test and fabrication service by one of the allowed students (usually Chang *** or Carlos ***).

2. Hazard Identification

The microfabrication processes running in the lab are purposely maintained as green as possible, avoiding the use of toxic/dangerous chemicals. As a consequence, there are no acids nor bases in 442 and 443 workspace. The heavy equipment like the laser micromachining or the maskless lithography equipment are anchored to the ground and immovable. The laser cutting operation is performed in a safe manner, with a protecting enclosure separating the user from the active laser. There are no plans at this moment to execute measurements or fabrication steps that will



require two persons to closely interact for either operating an equipment or for doing device testing or system assembly. The identified critical issue was the closeness between the laser micromachining and the maskless lithography setups in AMPEL442, and the measure taken is to not allow more than one student at a time in that space. The system assembly, test and measurement section of 443 is large, and easily allows physical separation (>2m) between students. Moreover, most of the instrumentation equipment, like PXI measurement units, is portable, so distinct measurement setups can be established in two opposite corners of the space. The fabrication section of 443 has a single fumehood, and it will be used mostly for the aerosol jet printing. The microplotter equipment is smaller and portable, placed at distance, and does not require the same complex cleaning after usage as the aerosol jet printer.

3. Employee (HQP, research staff, other) Input/Involvement

Group discussions have taken place with the team members, in order to identify potential risks and set up a proper and safe protocol. We have decided for a hierarchical control structure, in order to minimize the risks and enforce the protocols, pivoting on a couple of central points:

- Our Post-doctoral fellow, Carlos ***, will act as a lab manager, with a complementary help from Chang *** PhD student. Together with Prof. Edmond Cretu (the PI), they will ensure that the HQP will align with the safety measures and protocols.
- We have aligned with the safety strategy and associated protocols with the general safety measures for the Brimacombe building, as presented in the common-area safety plan document. Before making specific plans for 442/442a/443, the team has analyzed the protection measures set up at building level.
- The list with the allowed people in the lab space and the maximum occupancy limits will be posted on the doors of 442 and 443, together with a separate list with key contacts (building manager, floor warden). Hard copies of this workspace safety document and of the Brimacombe common-area safety plan will be as well present at the entrance of 442 and 443.
- As the final plans will be posted on UBC's COVID-19 Safety Plan website, all students will be notified by email of the official web link.
- At the end of each week, Edmond, Carlos and Chang will analyze the proper usage of the workspace, the feedback from the HQP and the full conformity with the protocols, as well as check the need to renew the supplies of paper towels, hand sanitizers and spray disinfectant or wipes.

Section #3 – Hazard Elimination or Physical Distancing

The following general practices shall be applied for all UBC buildings and workspaces:



- *Where possible, workers (HQP, research staff, others) are instructed to work from home.*
- *Anybody who has travelled internationally, been in contact with a clinically confirmed case of COVID-19 or is experiencing “flu like” symptoms must stay at home.*
- *All employees are aware that they must maintain a physical distance of at least 2 meters from each other at all times*
- *Do not touch your eyes/nose/mouth with unwashed hands*
- *When you sneeze or cough, cover your mouth and nose with a disposable tissue or the crease of your elbow, and then wash your hands*
- *All employees are aware of proper handwashing and sanitizing procedures for their workspace*
- *Supervisors must ensure large events/gatherings (> 50 people in a single space) are avoided*
- *Supervisors must ensure that all workers have access to dedicated onsite supervision at all times; via their own presence, members of safety committees, campus security or other. When working alone, HQP and staff must be aware of working alone procedures and how these have been adapted for COVID-19.*
- *All staff wearing non-medical masks are aware of the risks and limitations of the face covering they have chosen to wear or have been provided to protect against the transmission of COVID-19. See [SRS website](#) for further information.*
- *Note transportation/vehicle guidelines if applicable: 1 Person per vehicle, unless the vehicle is large enough to maintain 2m between occupants.*

3. Scheduling

The work scheduling will be supervised by the PI (Edmond), with the help of Carlos (Post-doc) and Chang (PhD). As an online Google Calendar will maintain the planned scheduling, they will ensure that, when the workspace is being used, one of them could inspect in that day the labs. We do not plan at this time to allow researchers to access the lab space after the normal hours, 7am to 6pm, Monday to Friday.

- A record log sheet for each lab space (443,442,442a) will be displayed at the entrance in the respective spaces. The users need to sign in when they enter the lab, and sign out at the exit time. A parallel online Google Calendar (in the AdaMist account) will be maintained, in order to analyze in advance potential scheduling conflicts and maintain the maximum occupancy restrictions

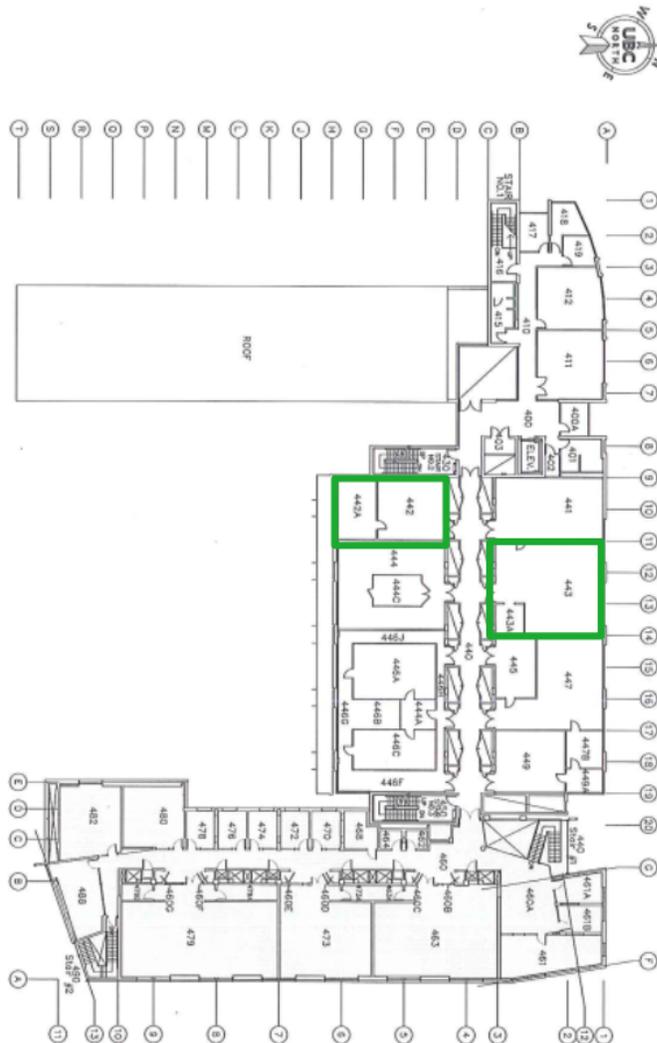
- A remote/virtual “buddy” system will be implemented - when a researcher enters a lab space for a scheduled activity, one of the three coordinators (Edmond, Carlos or Chang) will act as a “buddy” - he will be notified by a text message that the researcher is in the lab (unless one of them is already in the workspace), and update the related event box on Google Calendar, so everyone can be aware. When a user exits the lab, there will be as well a text confirmation to



the same “buddy” and a corresponding update on Google Calendar. In case of a lost of contact, Edmond, Carlos or Chang will either check personally or ask the floor warden to check. If this is not an immediate solution, then a call to 2-2222 will be issued to ask for a verification of the HQP status.

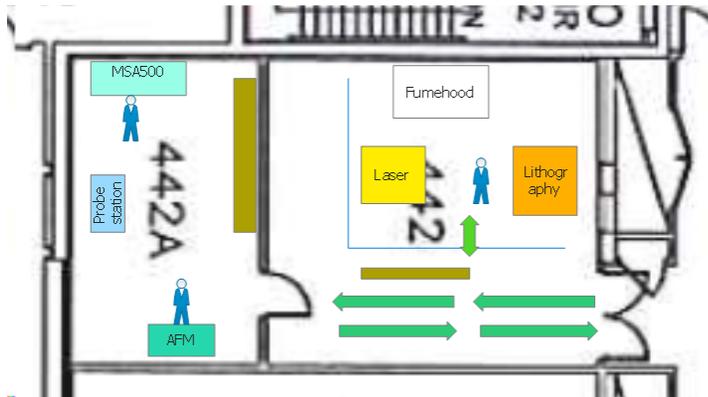
5. Occupancy limits, floor space, and traffic flows

The general floor plan of the 4th floor in Brimacombe is shown below, with marked lab spaces belonging to AdaMist (the rooms 442/442a and 443/443a):



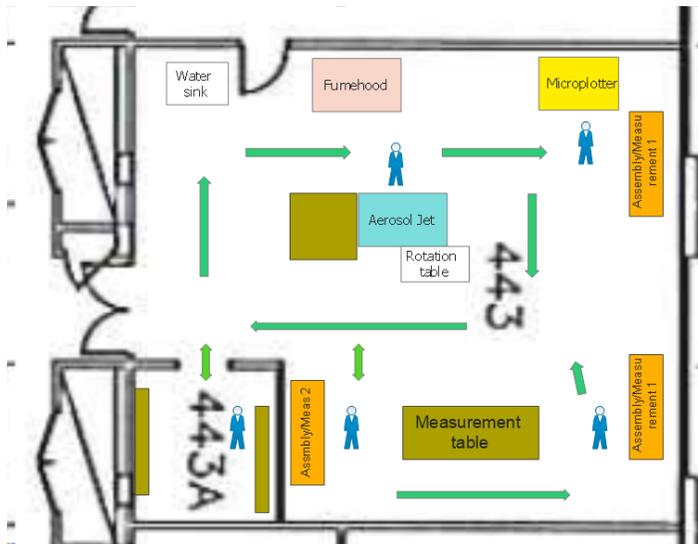


The floor plans for the rooms 442 and 442a, together with the placement of the essential equipment to be used and the location of the users, are illustrated below:



The traffic flow is indicated by the green arrows, and they will be marked as well on the floor of the lab space. As shown in the figure, the maximum occupancy for room 442 (yellow-room) is of one person, so that the physical distance is ensured, and the maximum occupancy for room 442a is of two persons. 442a is a room dedicated to measurements and characterization of devices, and the users do not need to share any fume hood for fabrication processes. The potential conflict in respecting the distancing rules may appear in 442a, when a user of either the probe station or the laser Doppler vibrometer might want to enter or leave while another user will operate the AFM. In this case the two users will firstly communicate from a safe distance, and the AFM user will temporarily move further away towards the corner, to allow the other user to pass safely.

The floor plan and equipment location for the room 443 is presented below. Again, the green arrows indicate the directional movements of the people using the lab space:



The assembly, test and measurement section of the room (East side) is set for a maximum occupancy limit of two people, well distanced from each other, as indicated. Similarly, the fabrication section (West side) of the lab space has a maximum occupancy limit of two, as graphically indicated. 443a is set as a local circuit assembly space, with a maximum of one person occupancy.

Section 4 – Engineering Controls

Cleaning and Hygiene

All users will be allowed to enter only if they assess themselves and do not show any illness symptoms (dry cough, higher than normal temperature, signs of chronic fatigue, etc.). Moreover, the international students who might have returned from a travel will have firstly a mandatory isolation period before having the possibility of entering the lab space.

Every person who will enter 443/442a/443/443a needs to have his own gown and a hand sanitizer. At the entrance in the rooms there will be a table with hand sanitizers, disposable gloves, disinfectant spray and wipes. Face masks are recommended, but not mandatory in the lab space - a small supply of face masks will be as well present in the lab. A disposable bin close to the exit will collect the gloves, face masks, wipes and other disposed items .

The touched area of every piece of equipment and every tool needs to be cleaned with either disinfectant wipes of paper towels and disinfectant spray before and after usage. The tools in use will be placed in a marked “in-use” zone on the desk. Other sensitive surfaces like drawer knobs need to to be cleaned as well with isopropyl alcohol (70%) or anti-bacterial wipes. Each



working place will have its **checklist** with items that need to be sanitized at the beginning, when a user enters the area, and at the end, when the user exits the area.

Once the hands are sanitized at the entrance of the lab space, it is recommended for the researchers to wear nitrile gloves and individual safety glasses. Each PPE equipment will be used by a single user and separately stored, to avoid any potential contamination perils.

Section 5 – Administrative Controls

Communication

All the users must acknowledge reading additional resources available online, related to COVID-19 prevention:

- UBC Safety & Risk Services - “Preventing exposure to COVID-19 (<https://srs.ubc.ca/covid-19/health-safety-covid-19/prevention/>)
- WorkSafeBC - Preventing exposure to COVID-19 in the workplace: a guide for employees (<https://www.worksafebc.com/en/resources/about-us/guides/preventing-exposure-to-covid-19-in-the-workplace?lang=en>)
- COVID-19 Physical distancing guidance (<https://riskmanagement.sites.olt.ubc.ca/files/2020/04/COVID-19-Physical-Distancing-Guidance-FINAL-.pdf>)
- UBC Safety & Risk Services - Personal Protective equipment (<https://srs.ubc.ca/covid-19/health-safety-covid-19/working-safely/personal-protective-equipment/>)
- Government of Canada - Personal protective equipment against COVID-19 (<https://www.canada.ca/en/health-canada/services/drugs-health-products/medical-devices/covid19-personal-protective-equipment.html>)

The protection rules indicate clearly that any person showing symptoms of illness **MUST** stay home, or otherwise go to a hospital and get checked.

As we have previously mentioned, all the presence in the lab will be logged - the researchers need to mark it in the online Google calendar and note the start and exit time on the log sheet at the entrance of each lab space. Every entrance and exit from the lab will be also communicated by a text message to the virtual buddy and marked on Google Calendar. At the end of every week, Edmond (PI), Carlos (Postdoc) and Chang (PhD) will analyze the activity, the feedback from users and the compliance with the safety plan, as well as possible improvements. When



additional training videos will be available at UBC, the links will be emailed to the users. Regular lab meetings (Zoom meetings) will discuss and analyze the existing procedures (e.g. sanitization procedures) and identify potential uncertainties or possible improvements.

Signage

The rules of the safety plans, the list of occupancy limits for each space, the allowed people and contact information related to the building manager and the floor warden will be clearly displayed on the doors. Maps of the rooms with the indication of the direction of motion will be also posted at the entrance in the labs. Tape indicating the direction of movement will be set on the floor of the lab space, so that there is no misunderstanding. “In-use” areas on the desk will be marked, for placing tools that are still being used and are not cleaned yet.

Emergency procedures and reporting

A printed copy of the Brimacombe Building Emergency Response Plan (BERP) will be placed at the entry of AMPEL442 and 443 rooms. The users have already received by email the BERP document for analysis and compliance. Future updates of BERP, as present on the website (<https://www.ampel.ubc.ca/about/brimacombe-building-emergency-response-plan-berp/>), will be communicated to the team.

As part of the mandatory access pre-requisites, the HQP have read and acknowledged the information presented on UBC Safety & Risk Services - “Reporting COVID-19 exposure” (<https://srs.ubc.ca/covid-19/health-safety-covid-19/reporting-covid-19-exposure/>). The contact information for the Safety & Risk Services (604-822-2029 or email ready.ubc@ubc.ca) will be included on the printed sheet with relevant contact data on the doors of 442 and 443 labs.

Monitoring

A hierarchical structure was set in place for daily monitoring of the activity in the lab, and for a weekly summary and analysis. One of the managing team members (Edmond (PI), Carlos (Post-doc) or Chang (PhD)) will check the labs in a day when there are scheduled lab activities, to verify the compliance. All the start and finish events in a specific lab space will be acknowledged by text messages sent to the PI. We have encouraged the HQP to provide as well their feedback regarding possible improvements and challenges they have encountered.

Section #6 – Personal Protective Equipment (PPE)

13. Personal Protective Equipment



UBC has a [central process for purchasing PPE](#). Describe what PPE you will require for your lab.

- *If applicable list any other protective controls such as access to showers/laundry facilities*
- *Discuss how you will safely dispose of soiled PPE*

Note that UBC does not require the use of non-medical masks, but will allow them to be worn. Non-medical masks are not considered PPE. N95 masks (Medical and Non-medical) are not recommended by UBC unless needed because of the type of work you are doing. Please refer to UBC guidelines found on the SRS website linked above and in the Brimacombe Safety Plan.

#	Type of PPE	Activity and PPE Use Rationale
10	Hand sanitizer bottles (750ml)	To be used all personal entering and exiting the lab space
10	Spray sanitizer bottles	For the sanitization of the tables, equipment and of the tools in the lab
20	Paper tissues boxes	To be used for cleaning and sanitization of the tables, equipment, and the tools in the lab
5	Disposable face mask boxes (50x)	Recommended usage for the users accessing the lab space
15	Nitrile glove boxes	Recommended usage when operating in the lab
10	Safety glasses	Individual safety glasses, recommended when operating in the lab
10	Laboratory gowns	Individual gowns, to be personalized with name tags
20	Cleanroom style plastic boxes	Storage containers for the PPE equipment of the users (individualized gowns, safety glasses, etc., must be stored by each user in his own plastic container, placed at the entrance in the lab)



Researcher Agreement

SAFE-RETURN-TO-WORK AGREEMENT THE BRIMACOMBE BUILDING

Signature line for researcher (faculty, student, research staff, post-doc etc.) and administrative staff acknowledgment

I Edmond Cretu _____ have read and understand the additional precautions being taken during this time, as outlined in the Brimacombe Phase I Safety Plan, my lab's Workspace Safety Plan. I have read and agree to abide by the safety plans, and to undergo training that will be required by UBC once it is put in effect (we anticipate video training that all those entering the building will be required to complete):

RESEARCHER/ SIGNATURE *Signed*

or STAFF

DATE July 26, 2020 _____



SUPERVISOR/ SIGNATURE _____ *Signed* _____
or DIRECTOR in case of PIs

DATE 29 July 2020

Supervisor is to keep a copy of this document in the lab and/or accessible electronically from the lab, in case of Local Safety Committee, SRS or WorkSafe BC audit.



Acknowledgement

I confirm that this Safety Plan has been shared with all workers (HQP, research personnel, etc.) who will be accessing this space both through email and will be made available as a shared document. For shared labs, please add the number of signature lines needed to cover all PIs who intend to have researchers use the space, e.g. including for students who will visit for a short period of time to use an instrument.

Date July 26, 2020

Name (Manager or Supervisor) Edmond Cretu

Title Professor

Signature: *Signed*

AMPEL Approval

John D Madden, AMPEL Director

Name, Title

29 July 2020

Date

Signature ***Signed***

X

Departmental Approval

Steve Wilton, ECE Head

Name, Title

Date

Signature