University of Colorado Boulder

COVID-19 HVAC Operational Protocols

Background

Transmission of the SARS-CoV-2 virus is possible through multiple exposure pathways. Minimizing the potential of virus transmission requires use of Infection Control Layers and consistent application of the Hierarchy of Controls, (e.g., Administrative Controls, Engineering Controls and Personal Protective Equipment (PPE)). Successful application of the Hierarchy requires campus-wide coordination and individual responsibility by all campus personnel. The Campus is defining administrative controls and PPE requirements for the campus community to adhere to. Additional risk minimization efforts, including Engineering Controls and disinfection, are the responsibility of the multiple Facility Management groups across campus. This document is intended to provide a consistent framework for the operation of heating, ventilation and air conditioning (HVAC) systems in campus buildings, in order to minimize risk of transmission of the SARS-CoV-2 virus. This document was created based on public health recommendations from multiple agencies (e.g., ASHRAE, CDC, OSHA, USEPA. etc.) and input from Environmental Health and Safety (EH&S), Facilities Management, and faculty experts from multiple departments, including Chemistry, Mechanical Engineering and Integrative Physiology.

Purpose

According to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), "transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures."

The purpose of this document is to outline the recommendations for HVAC operations in campus facilities in order to reduce the potential for transmission of SARS-CoV-2 through airborne exposure. These guidelines and recommendations are intended to be the framework for the Campus response and can be used for messaging, training and implementation into a campus wide Pandemic Planning and Response document.

Strategies for Risk Minimization

According to ASHRAE's Epidemic Task Force, the underlying efforts should focus on increasing outside air to spaces, treating return air and using mechanical filtration for supply air. All retrofits and modifications must maintain indoor comfort and quality as defined by the design temperature and relative humidity and must not contradict ASHRAE 62.1 guidelines.

Due to the age of the Boulder Campus, there is a broad variation of complexity, resiliency, and age in HVAC equipment, systems, controls and Building Automation Systems (BAS) in campus facilities. Due to the variability in our building systems and the nature of the activities conducted in each building, the Campus is applying a layered approach to minimize risk of transmission. In addition to the primary exposure control strategies being applied on campus (e.g., remote work, social distancing and PPE

requirements), secondary exposure control strategies are being applied to further reduce the risk of transmission in campus facilities. To reduce the risk of transmission, various engineering controls (HVAC system modifications) and administrative controls (i.e., increased cleaning and disinfection) are being applied campus-wide. A combination of these controls will be implemented when feasible and as necessary based on risk and type of facility.

In addition to the minimum code requirements, the following sections outline risk management strategies that are being applied in campus buildings to reduce the risk of transmission. These recommendations follow CDC and ASHRAE guidance for building operations intended to slow the transmission of viruses via HVAC systems.

Maximizing amount of outdoor air ventilation

According to ASHRAE, ventilation and filtration provided by HVAC systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. Unconditioned spaces can cause thermal stress to people that may be directly life threatening and that may also lower resistance to infection. In general, disabling of heating, ventilating, and air-conditioning systems is not a recommended measure to reduce the transmission of the virus.

To minimize risk of transmission through the air, building HVAC system operations will be modified to provide the maximum amount of outdoor air while minimizing the percentage of recirculated air. Outdoor air and recirculated air ratios will be based on outdoor conditions and the capacity of each building's HVAC system. Building Systems will be run 24-hours per day and 7 days a week in order to ensure adequate flushing of the building's indoor environment, and demand-controlled ventilation systems and energy recovery systems with potential for cross contamination (e.g., heat recovery wheels) will be disabled.

Buildings that rely on natural ventilation or a blend of mechanical and natural ventilation will require additional control measures and risk minimization strategies based on type of use. Additional control strategies for naturally ventilated buildings are discussed in detail below.

Filtration

Buildings that do not have the ability to provide 100% outdoor air will be retrofitted with a minimum of MERV-13 filters as recommended by ASHRAE. MERV-13 filters (or greater) are efficient at capturing airborne viruses and will increase filtration efficiency in buildings with recirculated air, improving indoor air quality and slowing the transmission of the virus via the HVAC systems.

Buildings that do not have mechanical ventilation or the ability to be retrofitted with MERV-13 filters should not be used for large gatherings (e.g., classroom) and strict social distancing must be followed (e.g., older homes on Grandview Avenue which have been converted to campus buildings). Naturally ventilated spaces, with six or more occupants, will be provided with recirculated HEPA filtration units (see Portable HEPA Air Purifiers below) sized appropriately for the volume of the space. It is important to note that Social distancing and masks are still required in all spaces on campus.

Relative Humidity

Studies have shown that percent relative humidity (RH) can modulate the risk of infections. RH below 40% can increase risk by allowing infectious aerosols to shrink rapidly and become droplet nuclei, possibly remaining suspended in air and traveling great distances. RH above 60% is also another risk factor, as it can increase the risk for surface contamination. Some viruses also show increased viability in low RH conditions and immunobiologists have determined that RH below 40% can impair mucus membrane barriers and other steps in immune system protection. To address this concern the task force recommends that individuals stay well hydrated. A recommendation for other task force members is to consider water bottles and electrolytes to address this concern.

Colorado is a naturally dry climate. Increasing humidity and employing humidity control is not a common practice due to the potential for mold growth and diminished indoor air quality (IAQ). Where humidity control is employed, the outside air ventilation is often decreased to maintain the %RH set points. This practice can compete with the recommendation of maximizing outdoor air ventilation. Building operations will focus on maximizing outdoor air ventilation and providing a percentage of relative humidity to a feasible extent based on the building infrastructure.

Operations and Maintenance

Ensuring proper operation and function of the HVAC systems is an integral part of the risk minimization strategy. Building HVAC systems will be inspected at an increased frequency to ensure proper operation and functionality of each system. Inspections will focus on the requirements outlined by ASHRAE, which include proper testing and cleaning of dampers, condensate drains and pans, outside air intakes, control valve actuation and ensuring filters are in good operating condition. The higher frequency of maintenance on air handlers will be ongoing throughout the COVID-19 pandemic response. Furthermore, validation of design airflows and testing will be completed for spaces for six or more people which are used to accommodate in-person classes or study spaces (prior to the beginning of the fall semester) or any spaces used for higher risk activities. Additionally, carbon dioxide (CO_2) monitoring can be conducted on a case-by-case basis by EH&S in targeted higher density areas to ensure adequate fresh air ventilation is being supplied and CO_2 concentrations remain below 800-1000 parts per million.

The following sections outline additional risk management strategies that can be applied to further reduce the risk of transmission in campus facilities. Each section outlines the pros, cons, associated costs and feasibility of implementation.

Ultraviolet Germicidal Irradiation

The CDC considers Ultraviolet Germicidal Irradiation (UVGI) an effective tool for reducing the transmission of airborne bacterial and viral infections. UVGI is considered a supplemental air-cleaning measure and is not recommended as a substitute for other risk minimization strategies (e.g., increased filtration, local exhaust of air to the outside, or negative pressure). Various types of UVGI systems are available and include In-Duct Air Disinfection, Upper–Air Disinfection, In-Duct Surface Disinfection and portable Room Decontamination. Although an effective tool for reducing the transmission risk, UVGI can be challenging to implement due to infrastructure limitations and

timing related to supply chain issues and design requirements. In spaces where the bundled approach doesn't sufficiently minimize risk, due to infrastructure limitations, the inability to maintain social distancing or the nature of the activities conducted within the spaces; the campus may consider additional UVGI in the future.

Physical Barriers

Physical barriers (I.e., fixed in place plexiglass shields) are not recommended in all situations due to the potential to negatively impact airflow and ultimately reduce the effective ventilation in a room. Physical barriers can be a useful tool in certain situations when social distancing or PPE is not feasible and close contact is required. For example, transactional windows (e.g., Buff One Card Office) or cashier activities that require close personal contact. However, physical barriers are not recommended in classrooms due to a variety of challenges and drawbacks. For example, increased surfaces to clean, faculty must remain behind an immobile barrier during lectures, the feasibility of installing barriers in each classroom across campus, and the potential for creating air turbulence which can decrease the effectiveness of house HVAC systems. The Facilities Task Force is currently reviewing appropriate use of barriers, including plexiglass and face shields, to mitigate risk while supporting the unique needs of programs such as Music and Linguistics.

Portable HEPA Air Purifiers

Although ASHRAE states that minimal data are available on the health consequences of using packaged air cleaners employing multiple technologies, multiple studies have shown a reduction in airborne particulate concentrations, which may be beneficial in reducing risk of virus transmission. If MERV-13 filters cannot be installed in a building, ASHRAE recommends providing portable HEPA filtration units to filter and recirculate air within each space. Portable HEPA filtration units are also beneficial for naturally ventilated buildings as they can filter the air after a class has finished, minimizing the amount of time necessary between classes. Portable HEPA filtered air purifiers are recommended for naturally ventilated spaces that will accommodate greater than six people. Portable air purifiers deployed on campus must be placed strategically to ensure the air in the room is circulated effectively and "dead zones", where air becomes stagnant, are minimized. Portable units must be sized appropriately for each room they are used in, and at times multiple units will be required per room. The units must remain operational while the room is occupied and continue running after the occupants have left.

Voluntary Purchase

Portable Air Purifiers will not be provided campus-wide and will be placed strategically where warranted. If departments or campus personnel wish to purchase a portable HEPA air purifier for their office of other spaces the following is recommended: a unit that has been certified by the Association of Home Appliance Manufacturers (AHAM) and has a minimum Clean Air Delivery Rate (CADR) of 200 or higher, which will include a recommended room size for optimal performance. Higher CADR ratings are encouraged.

Risk Characterization

The campus characterized the potential risk of virus transmission in campus buildings based on multiple variables. The purpose of the exercise was to understand the potential risk of transmission based on

building infrastructure and the nature of the activities conducted within. The goal of the risk characterization was to develop recommendations and operational guidelines necessary to minimize risk of transmission. The comparison was not intended to compare the level of safety between buildings and was only intended to provide a consistent approach to the decision-making process based on various risk factors. This strategy was developed based on the campus-wide risk management guidelines and responsibilities (Social distancing, PPE, etc.) for all personnel to follow. The management of ventilation systems on campus is considered a supplementary control measure used to further minimize risk of transmission.

HVAC System Operational Guidelines

The campus used a control banding approach to characterize the risk of virus transmission in campus facilities. The campus's buildings were classified into five categories based on the type of HVAC system and any known limitations (e.g., filtration capacity). HVAC systems were broken down into five different types based on ability to effectively manage risk (e.g., increased outdoor air, increased filtration, operable windows, etc.) and subsequent recommendations for operation. The following tables outline the different types of HVAC systems and the recommendations for operations based on current CDC and ASHRAE guidelines.

The principles of the HVAC Operational Guidelines are based on the climate and infrastructure that are available for CU Boulder. Due to the local climate, Boulder can take advantage of mild outside air temperatures, providing once through non-recirculated air to condition the buildings. When non-recirculated air cannot be employed, MERV-13 filters will be installed. For spaces where outside air is supplied via operable windows or natural ventilation, recirculated HEPA filtration will be deployed for occupancies greater than six people. The campus has a diverse portfolio of buildings. The following tables outline the different types of HVAC systems and the recommended operational guidelines for each.

TYPE 1: Recirculated Mechanical Ventilation with Minimum Outside Air Ventilation
Description: Recirculated Mechanical Ventilation systems heat and cool the building with minimal outside air under extreme weather conditions. The infrastructure is sized to provide dedicated outside air based on building occupant capacity to ensure sufficient ventilation. In the Colorado climate, the infrastructure has been designed to use 100% outside air between low and high extreme temperatures. Once through air can be employed approximately 80% of the year. For the times when minimal outside air is being supplied to the buildings MERV-13 filtration will be utilized. As previously mentioned, MERV-13 filters are efficient at capturing airborne viruses. Based on reduced campus densities, available outside air per person is two to three times more when compared to full occupancy. Outside air is typically turned over four times in a one-hour time period.
Recommendations: • Occupant densities are based on an 8-foot hexagonal model that ensures 6-foot social distancing for traditional lecture/conversational activities and increased social distancing for higher risk activities (e.g., music, dance, theatre, athletic type activities). Until further research or recommendations are available, the Task Force recommends 12-foot distancing for higher risk activities and limiting the duration of high-risk indoor classes to 30 minutes.

- Time between re-occupancy: Recommend time between occupancy to be 15 minutes between classes, allowing the air to be purged between different occupants.
- HVAC System Filtration: MERV-13 filtration installation
- HVAC Operations:
  - Operate Air Handling units continuously, or two hours minimum pre and post occupancy
  - Operate direct evaporative cooling where available
  - Raise Discharge Air Temperatures of Air Handling unit to increase air volumes in spaces
  - Increase outside Air Economizer, allowing drift up to 70 degrees F or higher
  - Increased frequency of maintenance inspections

Recommendations for additional Risk Reduction:

- No further actions necessary, ASHRAE has shown that by installing MERV-13 filters it achieves the effectiveness of a 100% O.A.

Type 2: 100% O.A. Air Handling Units
Description: 100% outside air is supplied to the building via mechanical means and does not allow for recirculation within the building spaces. Air is exhausted from the building via exhaust fans and is typically exchanged between 4-16 times per hour.

Recommendations:
• Occupant densities are based on an 8-foot hexagonal model that ensures 6-foot social distancing for traditional lecture/conversational activities and increased social distancing for higher risk activities (e.g., music, dance, theatre, athletic type activities). Until further research or recommendations are available, the Task Force recommends 12-foot distancing for higher risk activities and limiting the duration of high-risk indoor classes to 30 minutes.
• Time between re-occupancy: Recommend time between occupancy to be 15 minutes between classes, allowing the air to be purged between different occupants
• HVAC System Filtration: No change needed; the filters are typically MERV-13 or higher
• HVAC Operations: No change necessary
  ○ Allow 15 mins. between occupancy changes to purge spaces
  ○ Operate Direct Evaporative Cooling
  ○ Increase discharge air temperatures to increase airflows in spaces

Recommendations for additional Risk Reduction: • No further actions necessary, building is being supplied with 100% outdoor air

Type 3: Natural Ventilation
Description: Naturally ventilated spaces rely on operable windows to provide outside air ventilation. ASHRAE and CDC recommend windows be opened for two hours pre- and post-occupancy to adequately ventilate each space. A Window Steward is required to ensure naturally ventilated buildings have the windows opened and closed prior to and after occupancy to ensure the building infrastructure is not damaged (i.e. frozen pipes).
Recommendations: • Occupant densities are based on an 8-foot hexagonal model that ensures 6-foot social distancing for traditional lecture/conversational activities and increased social distancing for

higher risk activities (e.g., music, dance, theatre, athletic type activities). Until further research or recommendations are available, the Task Force recommends 12-foot distancing for higher risk activities and limiting the duration of high-risk indoor classes to 30 minutes.
    - Recommend five people or less for naturally ventilated spaces. Additional control measures (i.e., Portable HEPA filtration units) are required for greater than six occupants
- Time between re-occupancy: Without supplemental control measures, such as portable HEPA filtration units, two hours recommended pre and post occupancy
- HVAC System Filtration: Not applicable
- Building Operation:
    - Open windows and purge space two hours pre and post occupancy

Recommendations for Additional Risk Reduction:

- Portable HEPA Air Purifiers will be installed in all naturally ventilated spaces with greater than six occupants. Recirculated HEPA filters decrease the time between re-occupancy to 20 minutes. Guidelines will be developed to ensure room occupants understand the proper use and limitations of the portable air purifiers.

Type 4: Natural and Mechanical Ventilation VAV

Description:

These buildings utilize a combination of operable windows and HVAC systems to provide outside air ventilation. The building is designed to recirculate air based on outside air conditions. The systems are a combination of HVAC Types 1 and 3 detailed above.

Recommendations:

- Occupant densities are based on an 8-foot hexagonal model that ensures 6-foot social distancing for traditional lecture/conversational activities and increased social distancing for higher risk activities (e.g., music, dance, theatre, athletic type activities). Until further research or recommendations are available, the Task Force recommends 12-foot distancing for higher risk activities and limiting the duration of high-risk indoor classes to 30 minutes.
    - Recommend five people or less for naturally ventilated spaces. Additional control measures (i.e., Portable HEPA filtration units) are required for greater than six occupants
- Time between re-occupancy:
    - Naturally ventilated spaces: Without supplemental control measures two hours recommended pre and post occupancy
    - Mechanically ventilated spaces: Recommend time between occupancy to be 15 minutes between classes, allowing the air to be purged between different occupants
- HVAC System Filtration:
    - Mechanically ventilated spaces: MERV 13 filtration installation
    - Naturally ventilated spaces: Not applicable
- Building Operation:
    - Mechanically ventilated spaces:
        i. Operate Air Handling units continuously, or a minimum of two hours pre- and post-occupancy
        ii. Operate direct evaporative cooling where available

iii. Raise Discharge Air Temperatures of Air Handling unit to increase air volumes in spaces
iv. Increase outside Air Economizer, allowing drift up to 70 degrees F or higher
v. Increased frequency of maintenance inspections

- Naturally ventilated spaces:
  i. Open windows and purge space two hours pre and post occupancy

Recommendations for Additional Risk Reduction:

- Mechanically ventilated spaces:
  - No further actions necessary, ASHRAE has shown that by installing MERV-13 filters it achieves the effectiveness of a 100% O.A. further actions necessary
- Naturally ventilated spaces:
  - Portable HEPA Air Purifiers will be installed in all naturally ventilated spaces with greater than six occupants. Recirculated HEPA filters decrease the time between re-occupancy to 20 minutes. Guidelines will be developed to ensure room occupants understand the proper use and limitations of the portable air purifiers

Type 5: Natural, Mechanical, 100% Outside Air Ventilation

Description:

These buildings are the most diverse in terms of system complexity, employing the use of HVAC system types 1, 2 and 3 listed above. These buildings utilize a combination of operable windows and HVAC systems to provide outside air ventilation. A portion of the building is designed to recirculate air based on outside air conditions.

Recommendations:

- Occupant densities are based on an 8-foot hexagonal model that ensures 6-foot social distancing for traditional lecture/conversational activities and increased social distancing for higher risk activities (e.g., music, dance, theatre, athletic type activities). Until further research or recommendations are available, the Task Force recommends 12-foot distancing for higher risk activities and limiting the duration of high-risk indoor classes to 30 minutes.
  - Recommend five people or less for naturally ventilated spaces. Additional control measures (i.e., Portable HEPA filtration units) are required for greater than six occupants
- <u>Time between re-occupancy:</u>
  - Naturally ventilated spaces: Without supplemental control measures two hours recommended pre and post occupancy.
  - Mechanically ventilated spaces: Recommend time between occupancy to be 15 minutes between classes, allowing the air to be purged between different occupants
- <u>HVAC System Filtration:</u>
  - Mechanically ventilated spaces: MERV-13 filtration installation.
  - Naturally ventilated spaces: Not applicable
- <u>Building Operation:</u>
  - Mechanically ventilated spaces:
    i. Operate Air Handling units continuously, or a minimum of two hours pre- and post-occupancy
    ii. Operate direct evaporative cooling where available
    iii. Raise Discharge Air Temperatures of Air Handling unit to increase air volumes in spaces

iv. Increase outside Air Economizer, allowing drift up to 70 degrees F or higher
v. Increased frequency of maintenance inspections

- Naturally ventilated spaces:
  i. Open windows and purge space two hours pre- and post-occupancy

Recommendations for Additional Risk Reduction:

- Mechanically ventilated spaces:
  - No further actions necessary, ASHRAE has shown that by installing MERV-13 filters it achieves the effectiveness of a 100% O.A. further actions necessary
- Naturally ventilated spaces:
  - Portable HEPA Air Purifiers will be installed in all naturally ventilated spaces with greater than six occupants. Recirculated HEPA filters decrease the time between re-occupancy to 20 minutes. Guidelines will be developed to ensure room occupants understand the proper use and limitations of the portable air purifiers
- 100% O.A. Air Handling Units
  - No further actions necessary, building is being supplied with 100% outdoor air

Special Considerations for Building Operations

Forced-Air Hand Dryers

Electric hand dryers are commonly used in restrooms for drying hands post washing. A review conducted by faculty, Environmental Health and Safety, Facilities Engineering and Operations concluded that air-dryers in restrooms could pose an increased risk of transmission by causing unnecessary turbulence and disrupting exhaust air streams. Due to this potential increase of risk, the Task Force recommends that forced-air hand dryers are avoided when possible, and paper towels are supplied as an alternative. In situations where forced-air hand dryers are unavoidable, appropriate signage should be installed to indicate the potential increase of risk.

Unventilated Bathrooms

Unventilated bathrooms are not common on campus however they do exist. The Task Force recommends these bathrooms are made single occupancy and appropriate signage is installed to clearly communicate the restriction.

Propping Doors open

Propping doors is not recommended nor allowed as this practice can negatively impact the air pressurization within a building. Propped doors increase the likelihood of causing uncontrolled air migration and the potential for indoor air quality issues for occupants.

Fogging Disinfectants

Multiple departments will utilize fogging disinfection systems in a variety of buildings. Departments that will deploy fogging disinfection systems must give special consideration to building pressurization and chemicals and odors from migrating out of the space being treated, possibly creating indoor air quality issues. Additionally, adequate measures must be taken to protect HVAC filters from premature degradation or negative impact from disinfecting chemicals.

The fogging systems should be operated in low mode. Please reference cleaning and disinfecting guidelines for additional information.

Special Considerations for Space allocation and Planning

The purpose of the HVAC management strategy outlined above is to provide a consistent framework for the Campus to use when determining optimal building operations. The strategy also informs campus constituents about the layered approach to minimizing risk and the application of both primary and secondary control measures. However, it is important to note that certain spaces on campus are likely to have an increased risk of virus transmission where the physical layout provides difficulty to comply with physical distancing (e.g., art studios, teaching labs, theatre/dance), infrastructure limitations (e.g., unventilated spaces or closets that were converted to offices), use of the space, or the nature of the activities conducted within (e.g., exercise activities). For example, spaces where social distancing is challenging (e.g., art studios) or where there is a higher generation rate of respiratory aerosols (e.g., fitness centers or music studios) are believed to have an increased potential of virus transmission. Due to the increased risk in these types of spaces, additional control measures should be considered as results and recommendations from the scientific research community become available. The following sections outline activities and types of spaces on campus which are higher risk and may require additional measures to minimize risk to the extent feasible.

Deferred Maintenance

Proper and efficient operation of building HVAC systems can play a critical role in minimizing risk of virus transmission. Ensuring buildings are operating as designed and providing adequate amounts of fresh air ventilation and appropriate filtration is paramount. To ensure buildings with known infrastructure limitations (which could negatively impact indoor environmental quality or ventilation) were considered, the Ventilation Task Force examined the campus facilities in order to highlight items which could compromise the control strategies outlined above. Recommendations for HVAC operations based on the findings from the deferred maintenance review are included with the HVAC guidelines outlined above and summarized as building specific HVAC operations.

Higher Risk Activities

In addition to the variability between HVAC systems, each building could also have a variety of different activities that have the potential to increase the risk of virus transmission. Consideration must be given to these risk factors during the decision-making process to ensure additional control measures can be implemented. Activities that have a higher rate of aerosol generation should be considered higher risk and may require additive control measures to effectively mitigate the risk. For example, music (wind instruments and choir), fitness/exercise areas, athletics or spaces where louder speech or projection of your voice is required (e.g., theater). Additionally, spaces where social distancing is challenging (i.e., in person labs) or where the use of face masks is not feasible (i.e., playing wind instruments, eating/dining) may require additional considerations to effectively manage the associated risk.

Ventilation is only one piece of the overarching control strategy being applied on campus. Activities identified as higher risk may require supplementary control measures such as:

- Administrative Controls: decreased density, increased social distancing, increased cleaning frequency, decreased contact time to 30 mins or less, staggered occupancy, etc.

- Engineering controls: Portable Air Purifiers, Plexiglass barriers strategically placed, or bell covers for wind instruments.
- Personal Protective Equipment: increased respiratory protection (i.e., N95), face shields, etc.

As outlined above in the Operations and Maintenance Section, spaces that are used for higher risk activities must have the HVAC system evaluated to ensure proper use and function of the mechanical equipment and to verify adequate supply of ventilation air. Building systems will be evaluated based on the building's HVAC Type (as outlined above), and the design criteria for the specific HVAC system being evaluated.
Examples of spaces that may require additional risk control strategies and HVAC evaluation are

Unventilated Restrooms	Dance	Rec Center	Art Studios
Theater	Music	Fitness Rooms	Maker Spaces
Lounges	Teaching Labs	Elevators	Waiting rooms

Isolation Spaces

Isolation spaces are required on the Boulder Campus for student residents who test positive for COVID-19. The CDC defines isolation as the separation of sick people with a contagious disease from people who are not sick. The goal of isolation is to minimize interactions with people who are confirmed to be sick and prevent contact with people who are not sick. Many of the guiding principles and requirements for infection control stem from healthcare settings, and although helpful, are not always appropriate for a university setting. To help provide guidance during a pandemic which requires isolation and quarantine outside of a healthcare facility, the CDC has developed Community Containment Measures for Non-Hospital Isolation and Quarantine and provides Guidelines for Evaluating Homes and Facilities for Isolation and Quarantine. The guidelines outline basic infrastructure requirements (e.g., electricity, HVAC, potable water, etc.) which all of CU Boulder's buildings currently meet. The guidelines also highlight that considerations for ventilation capacity should provide the following:

- ***Preferably, rooms with individual ventilation systems (e.g., room or window fan coil units that do not recirculate to other parts of the building)***
- ***Alternatively, facility with a non-recirculating ventilation system that permits redirection of the air flow from corridors and staff areas into patient rooms.***

The guidelines also provide a bulleted list to help determine priorities when selecting isolation spaces. Many of the priorities related to selection of a space deal with logistics and operating the space as an isolation room. However, the first and second bullets in the guidelines recommend:

- *Separate rooms for patients or areas amenable to isolation of patients with minimal construction*
- *Single pass (non-recirculating) ventilation for each room or isolation area*

The CDC has also developed supplemental guidance for Infection Control in Healthcare, Home and Community Settings which outlines Infection Control for Care of SARS Patients in Community Isolation Facilities. The supplemental guidance states the following:

> *If a surge in patients overwhelms existing healthcare capacity or if home isolation is not feasible for individual patients, jurisdictions might need to use alternative facilities in the community for*

the isolation of SARS patient. In most situations, community isolation facilities will house and care for patients with milder cases of SARS-CoV disease. These patients can be expected to care for themselves and are not expected to have significant healthcare needs. The specific precautions that will be required will depend in part of the type of facility designated for community isolation (e.g., motel, hotel, hospital). The same infection control principles that apply to home isolation apply to community isolation facilities. However, in community settings, personnel who are in the facility should be trained and fit-tested for an N-95 respirator.

- *Community isolation facilities should have rooms with private bathrooms.*

When planning for campus facilities to be used as isolation spaces, the Task Force recommends following the guidelines outlined above, and when feasible, prioritizing:

- Single Occupancy isolation spaces
  - If double occupancy isolation rooms are necessary, portable HEPA air purification units are recommended.
- Naturally ventilated spaces with en-suite bathrooms
  - Isolation rooms in buildings which have shared bathrooms must have a functional mechanically driven exhaust system.
- Spaces with mechanical ventilations systems which avoid recirculating any air from the isolation room into other parts of the building.

However, due to the dynamic nature of a pandemic and the potential need to increase isolation spaces due to a rapid increase in positive cases, the Task Force recognizes that additional spaces may be required which do not meet the guidelines outlined above. In situations where the guidelines cannot be met, the Task Force recommends continual collaboration with the Boulder County Public Health Department to develop acceptable controls strategies for isolation spaces

Alternative Use Spaces

To meet the Campus needs for academic and teaching purposes, various non-traditional spaces are being considered. For example, tents, portable structures, athletic facilities and off campus buildings (e.g., hotels, commercial buildings). These type spaces should be evaluated to ensure a consistent application of our risk minimization strategy, as outlined above. Evaluation of these type spaces should include the HVAC system and the activities conducted within.

Supporting Documents

ASHRAE Position Document on Infectious Aerosols
https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf

ASHRAE Position Document on Filtration and Air Cleaning
https://www.ashrae.org/file%20library/about/position%20documents/filtration-and-air-cleaning-pd.pdf

ASHRAE Epidemic Task Force, Filtration and Disinfection
https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-filtration_disinfection-c19-guidance.pdf

ASHRAE Epidemic Task Force, Schools and Universities
https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-reopening-schools.pdf

CDC Reopening Guidance for Cleaning and Disinfecting Public Spaces, Workplaces, Businesses, Schools, and Homes
https://www.cdc.gov/coronavirus/2019-ncov/community/reopen-guidance.html

US EPA List N: Disinfectants for Use Against SARS-CoV-2
https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2

AIHA Back to Work Safely Guidelines
https://www.backtoworksafely.org/

Taylor Engineering COVID-19 White Paper June 2, 2020
https://taylorengineers.com/wp-content/uploads/2020/05/TE-COVID19-White-Paper.pdf

Illuminating Engineering Society Committee Report: Germicidal Ultraviolet (GUV) – Frequently Asked Questions
https://media.ies.org/docs/standards/IES%20CR-2-20-V1a-20200507.pdf

CDC Severe Acute Respiratory Syndrome (SARS) Guidelines for Evaluating Homes and Facilities for Isolation Quarantine

https://www.cdc.gov/sars/guidance/d-quarantine/app3.html