

## Ventilation at Redeemer Lutheran Church

Ventilation is an important yet often overlooked component to every building. During the COVID-19 pandemic ventilation has slowly come into the spotlight as a very important mitigation tool. With a virus that is spread through respiratory droplets and to some extent through respiratory aerosols it is very important to pay attention to how those droplets and aerosols enter the air and leave the air.

In this document we will discuss how ventilation at Redeemer Lutheran Church has always helped to reduce the spread of pathogens and also the improvements that are now in place to care for this Family of Believers during this pandemic and into the future.

In the most basic sense ventilation is bringing fresh air into a building and exhausting the current air out of a building. For the purposes of this paper, we will look into more than just fresh air in, old air out. We will consider the many ways we can reduce the likelihood of sharing COVID-19.

It is good to start off by saying if no one has COVID-19 in a room no one can get it! We ask that if you feel ill in any way or have been exposed to someone with COVID-19 that you refrain from coming to church until proper quarantine recommendations are followed. We are well aware that people can have COVID-19 and not have symptoms and still spread the virus. The following ventilation precautions are to help greatly mitigate risk in the event an asymptomatic carrier does enter the building.

Everyone should know that we cannot remove 100% of risk. Each day we take thousands of calculated risks. Many we don't even think about. The Transition Team at Redeemer has and will continue to do all it can to bring the risk as low as possible. It is up to each individual and family to elect to own the remaining small risk and make the decision that is appropriate for them.

### Hope

Psalm 121 says, "I lift my eyes to the hills. From where does my help come? My help comes from the Lord, who made heaven and earth." Our help comes from the Lord. God has blessed us with the wisdom and the ability to care for our surroundings and those around us during this pandemic. But our help comes from the Lord. In the world's eyes the worst that can happen is if a person dies of COVID-19. As Christians we can say, "'Death is swallowed up in victory.' 'O Death, where is your victory? O death, where is your sting?'" 1 Corinthians 15:55. We will put our faith and trust in the Lord. We have used and will use Godly wisdom to do all we can to cherish the life God has given! Our Help comes from the Lord!

### Areas of Mitigation

As stated, we will look beyond "fresh air in and old air out" ventilation. You will see how we are waging a full-scale assault on COVID-19's potential presence at Redeemer. We will look at, Filtration, Space, Air Treatment, Time, and Air Movement.

1. **Filtration- The use of materials to capture COVID-19 from entering or staying in the air.**
  - a. **Masks-** Study after study has confirmed the vital importance of mask use. Masks are the very front-line filter in Redeemer's ventilation plan. All members are to wear a well-fitting mask that covers their nose and mouth while in the building or outside when

social distance is not possible. Masks have been proven to drastically reduce and defuse the droplets and aerosols that could potentially carry COVID-19. Additionally, studies show that masks impart some level of protection to the wearer. Wearing masks is the most important part of Redeemer's ventilation plan.

- b. **System Filters-** The air handling units (AHU) that Redeemer uses to move air through the building utilize filters. These filters are given a "MERV" (Minimum Efficiency Reporting Value) rating. The higher the MERV rating the smaller the particle the filter will capture. While it is not impossible for lower MERV rated filters to capture COVID-19 virus it has been demonstrated that a minimum MERV rating of 13 is needed to truly be consistent in capturing COVID-19. Filters with a higher MERV rating will do a better job. To keep proper air flow levels, it is not always possible to have MERV 13 filters in all AHUs. Redeemer does have several AHUs with MERV 13 filters.
  - c. **HEPA Filters-** HEPA is an acronym that has several uses one of which is High-Efficiency Particulate Air. HEPA filters are not rated on the MERV scale as they far surpass what the MERV scale measures. HEPA filters have a special testing and rating system. Currently Redeemer has purchases 12 portable HEPA filter machines. These can be moved into spaces that may need additional help to clean the air. Redeemer is placing HEPA filter units in Sunday school rooms, in the sanctuary for bigger services, and in the narthex when larger numbers of people are expected. They are especially helpful in cleaning the air after a group has left. The HEPA machine can be left running and will eventually pull 99.97% of air particles .3 microns in size or larger. That includes the vast majority of potential COVID-19 and any other type of particulate.
2. **Space- The use of distance to allow droplets, and aerosols that could potentially carry COVID-19 to drop out of the air or defuse, reducing the chance to receive an effective dose of the virus.**
- a. **Social Distancing-** The CDC has recommended that people stay 6 feet apart, as well as mask, to greatly reduce the spread of COVID- 19. The Mayo Clinic and others have found that this is an effective way to prevent transmission. It should be noted that other researchers have identified certain situations where a distance greater than 6 feet would be beneficial. As part of Redeemer's ventilation plan, we ask and encourage people of different households to maintain a social distance of 6 feet if at all possible. This distance allows larger, heavier droplets to fall to the ground rather than contact the face. It also allows aerosols to have room to spread out and defuse into the surrounding air. 6 feet is not magical. As mentioned, in some situations it should be more. If you happen to be closer, it does not automatically mean you will be infected. 6 feet is a good goal to shoot for to help reduce the spread of COVID-19.
  - b. **Size of rooms-** Size of room matters. Redeemer is assigning groups and activities to rooms that will be large enough for them. We are putting fewer people in larger rooms which allows for the diffusion of potentially infections droplets of aerosols. Some of the smallest rooms at Redeemer have gone unused while our bigger rooms will have more use than before. Redeemer's sanctuary also benefits from a high ceiling. In aerosol studies high ceilings have been shown to be beneficial to allow aerosols to move above the heads of those in the room making it less likely to breath in.

- c. **Distance of Air Movement-** Redeemer is a larger building and the ductwork runs a good distance. We have no situations where old air is picked up and immediately blown at other people. Situations like this have been attributed to cause some super spreader events. At Redeemer the air that is moved is taken into ducts that run it through system filters. In the case of the office and sanctuary/chapel the air also goes through bipolar ionization all the while diluting any possible contamination. This process cannot at this time guarantee that no COVID-19 will survive the trip, but it will greatly reduce the likelihood.

**3. Air Treatment- The use of technology to kill virus while it is in the air.**

- a. **Bipolar Ionization:** Bipolar Ionization is a technology that has been around for many years. It is compliant with standards that ensure it does not produce Ozone. Bipolar ionization units are placed in the duct work that sends air into a room. The unit adds energy to the oxygen molecules that pass through the duct work. This causes a shifting of electrons causing an increase in positively and negatively charged oxygen. These ions leave the duct work and enter the room. As they enter the room, they will do a few things. The charged ions will attract smaller particles in the air forming a larger particle that can drop out of the air quicker or be trapped in a filter easier. These charged particles will also attach to viruses and rob them of hydrogen killing the virus. Bipolar Ionization has been installed in the sanctuary and chapel air handlers and has been conditioning those spaces. This is still listed as an emerging technology even though it has been around for more than a decade. Bipolar Ionization has been installed in the sanctuary, chapel and office air handlers and has been conditioning those spaces. This is still listed as an emerging technology for removing virus from the air but has been used successfully for more than a decade to remove bacteria, mold, and allergens from the air. **UV Light-** UV light is proven to kill COVID-19. UV light from the sun helps make outdoor events safer. Redeemer has not intentionally added UV light to our ventilation plan, but we do utilize several UV plant lights in the sanctuary that will make an impact on COVID-19 in that space. *(I am following up on this section to confirm that the plant lights do emit UV spectrum and if so, which type(s) of UV light)*

**4. Time- How time allows ventilation to work.**

- a. **Resting rooms-** Redeemer schedules the use of rooms and spaces with breaks for the room to “rest”. When we use our lungs to breath, talk, cough, sing, shout, etc.. droplets and aerosols are released, and both have the potential to carry the COVID-19 virus if an infected person is in the room. It is important to let a room “rest” and give time to let the moisture produced to fall out of the air, get filtered, be treated and dilute. In short, give the ventilation time to do its job.
- b. **Shorter time frames-** Redeemer also is shortening the time some events take place. In-person worship is shorter to limit the buildup of droplets and aerosols. When less of this builds up in a room the ventilation can take care of it quicker.

**5. Air Movement – The use of air movement to dilute potentially virus concentration.**

- a. **Damper**- One of the Redeemer's sanctuary's weaknesses is a fresh air intake and exhaust system that is not as robust as we may want in a pandemic. Steps were taken to see what it would cost to upgrade our fresh air intake and exhaust ability and the cost was seen as prohibitive. As a way to help with this issue in the sanctuary, a handle was installed that allows us to manually open up a damper or "door" in the duct work that will allow us to flood the sanctuary with outside air. In Minnesota this is great in the spring, summer and fall but in winter it is ill advised to bring too much sub-zero air in. We did add glycol to the air handling system to give us more ability to open the damper and bring in fresh air even in colder temperatures. In the sections of the building serviced by the newer air handlers a certain percentage of fresh air is constantly being brought in.  
Adding fresh air into the system allows better dilution of possibly contaminated air.
- b. **Exhaust Fans**- Exhaust fans allow air to leave the building. We have always had exhaust fans in the main bathrooms of the church and in the kitchen. We have added an additional fan in the Choir room. This fan will help move potential aerosols out of that room as well as serving to exhaust air out of the building in general. You will also notice that more doors will be open. When the weather permits doors will be open allowing fresh air in and old air out.
- c. **Air Handling Unit Constantly Moving Air**- For a long time the Air Handling Units (AHU) for the sanctuary and chapel have constantly run. This was originally to maintain a consistent temperature and humidity level for the organ. In the COVID-19 pandemic this is helpful. As the AHU moves air 24 hours a day the bipolar ionization never has to catch up. Air is constantly being diluted and moved through filters.
- d. **6.5 Air Exchanges an Hour**- You may have heard that term "air exchanges". One air exchange is when theoretically all the air in a room is moved out and replaced by fresh air. This is a calculation involving the size of the room and the amount of cubic feet per minute (CFMs) of air the air handlers can move. Mayo Clinic seeks to have 12 air exchanges an hour in newer rooms and in older rooms (rooms older than 2005) they want 6 air exchanges an hour. The Redeemer sanctuary is far larger than patient rooms at Mayo and far older than 2005 but still manages 6.5 air exchanges per hour. Air exchanges allow for droplets and aerosols to dilute, fall out of the air, be filtered or neutralized by bipolar ionization.

### **Conclusion:**

We have laid out the many layers of our fight against COVID-19 in the air of the church. It starts with people staying home when they feel sick or are exposed to COVID-19 or sickness in general. When in the building as we mask, we greatly reduce the droplets and aerosols that could potentially contain COVID-19 from an infected person. Strategies like filtering, giving space, treating the air, allowing time, and moving the air all help us reduce the risk of passing COVID-19 a great deal. We cannot reduce the risk to 0%. Together we can keep that risk incredibly low and continue to worship together, receive the Lord's Supper as a Family of Believers and care for one another and those that we share the love of Jesus with each day. Our Help comes from the LORD!