

COVID-19 and Air Conditioning Systems

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 - Understanding Droplet Transmission and the HVAC System

Information Resources

CDC – Center for Disease Control, a collects research and provides guidance to the USA for controlling diseases.

WHO – World Health Organization, collects international research and provides international guidance and support for controlling infectious diseases.

ASHRAE – American Society of Heating Refrigerating and Air Conditioning Engineers, provides guidance on HVAC for all types of buildings for the purpose of comfort and health.

Key Terms

Corona Virus – A virus of the corona family which include the common cold, SARS-Cov-1 and SARS- CoV-2

COVID 19 – Name the WHO gave for the illness caused by SARS-CoV-2. **CO** is short for Corona, **VI-** is short for viral, **D** is short for disease and **19** stands for the year it was discovered.

Aerosol – A suspension of fine solid or liquid particles in gas.
Examples are fog, mist, dust

Droplet – a particle of moisture discharged from the mouth during coughing, sneezing, or speaking

Key Terms

HVAC — It stands for Heating, Ventilation, Air Conditioning, and is the system that filters, heats, chills and moves air in your home or facility.

Supply Duct— In the classroom, usually above the ceiling, a duct is pushing air that has been cooled or heated and filtered through a metal diffuser. It is SUPPLYING the room with nice temperature air.

Return Duct — In the classroom, there is a return vent is where the classroom air gets sucked back to the machine to be mixed with fresh air, filtered, and cooled or heated again. This machine is called an Air Handling Unit, or AHU.

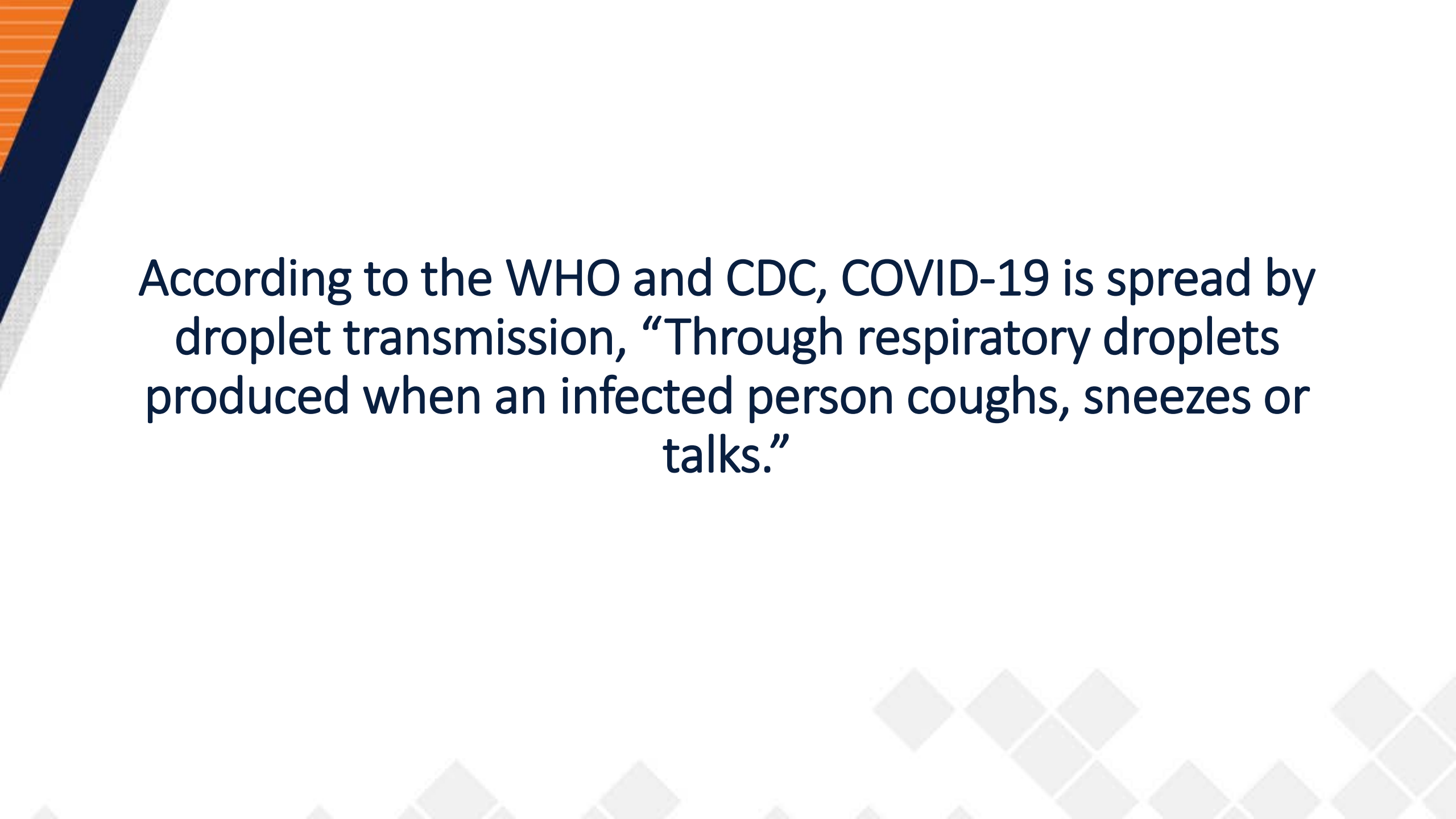
Filter— In the AHU, the air from outside and the air from the Return Duct is filtered before it is cooled or heated, and then filtered again after it is heated or cooled. The filters catch particulates (dust) from outside and the classrooms in their weave, making the supplied air cleaner.

The slide features decorative geometric patterns. In the top-left corner, there are overlapping diagonal stripes in orange, dark blue, and light grey. In the bottom-right corner, there is a pattern of light grey diamonds arranged in a grid-like fashion.

Understanding Disease Transmission

What is Transmission? In infectious diseases, transmission is how the disease is spread from one infected person, to other healthy persons.

Name of Transmission	Method of Entry	Example of Disease	Method of Transfer
Cutaneous	Skin Membranes, Skin cuts, Skin lesions	Anthrax, Cold Sores	Direct Contact
Droplet	Eye, nose or mouth	COVID-19, SARS	Direct Contact with Infected person or Indirect Contact; Contact with Contaminated medium
Airborne	Particles of airborne virus	Tuberculosis, Chickenpox, Hanta Virus	Contaminated Air Currents
Fecal-Oral	Fecal contaminated food or water	Rotavirus, Hepatitis A, Clostridium Difficile	Indirect Contact through contaminated medium
Vector-borne	Animals –fleas, mosquitos, ticks, rats, dogs	Malaria, West Nile Virus, dengue fever	Direct through bites usually, although feces carried by a fly can transmit it indirectly



According to the WHO and CDC, COVID-19 is spread by droplet transmission, “Through respiratory droplets produced when an infected person coughs, sneezes or talks.”

Droplet Transmission

- **Droplet transmission**

- means big respiratory particles which are too heavy to ride normal air currents very far.
- Droplets can travel a short distances on a strong force, like a sneeze or a cough.

Aerosolized Droplets

- **Aerosolized droplets**

- is the brief suspension of droplet in the air.
- Aerosolized droplets are affected by gravity, trajectory, and distance

QUALITIES OF AEROSOLIZED DROPLETS

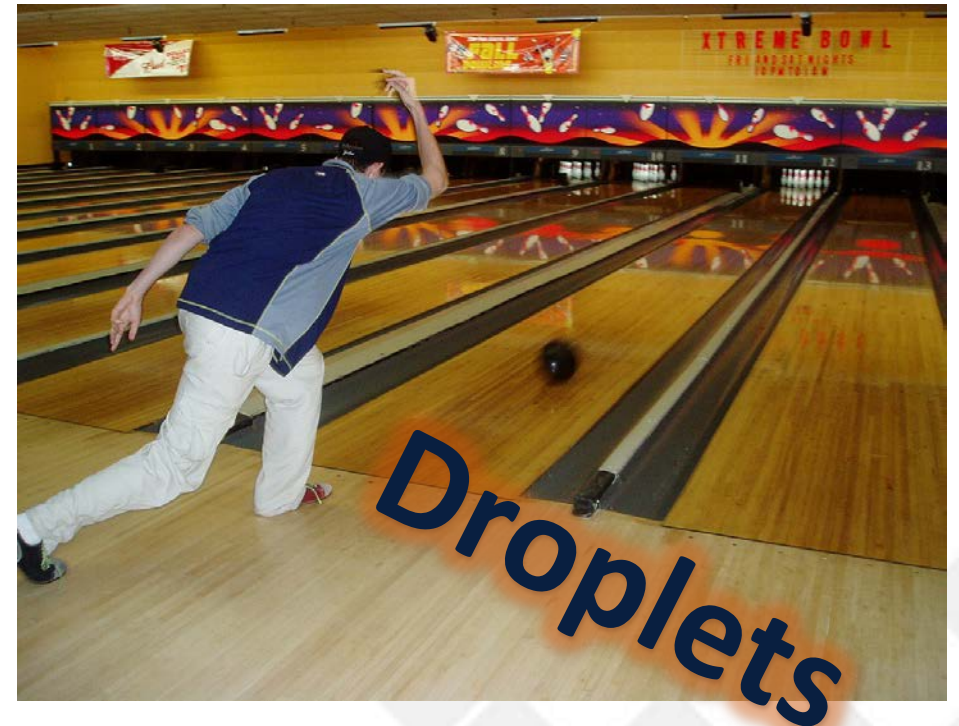
- **TRAJECTORY** – The force of the projection determines how far droplets such as from a perfume can reach. The closer the perfume spray is to the object it is spraying, the more droplets of perfume are deposited on that object.
- **DISTANCE** – Most droplets fall quickly, so a person four feet away from a perfume spray bottle would get very lightly covered if at all, because much of the perfume droplets fall to the ground before reaching the person.
- **AIR CURRENT** – If you spray perfume outside into the wind, it may blow back into your mouth. Yuck!

TRAJECTORY

Light or no force, rides currents, easily changes direction with the current, not very affected by gravity



Ballistic, forceful, large, heavy, stops with impact, direction is not as affected by air currents, direction is affected by gravity



Air Currents

Air currents carry or propel things through the air. Air currents can be light, like a soft breeze, or strong, like the winds of a tornado. As an air current loses strength, gravity pulls whatever is riding them out of the current and to the ground.



DISTANCE

Light and small particles are less affected by gravity and travel farther, but air currents affect direction and distance.



Droplets

Heavy and large particles depend on force of expulsion to overcome gravity in order to achieve any sort of distance



Gravity

Droplet Transmission – What gets wet is what is ...

Heavier **droplets** fall more quickly and are less affected by air movement.

Whatever is close and below.

How far droplets travel before falling depends on the force of the sneeze or cough.

This picture is not a normal sneeze or cough, it is an exaggeration. However if this man was six feet away from the stream, he would not be as wet, if at all.



Understanding Droplet Transmission and the HVAC System

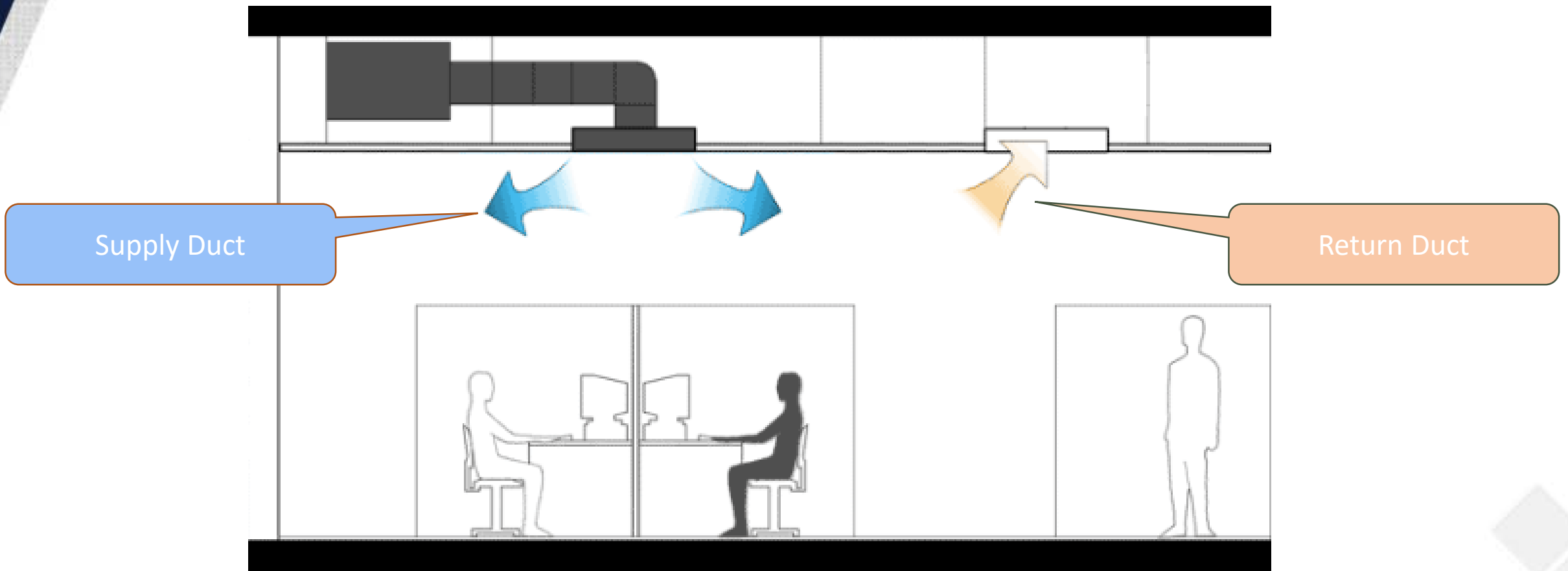


Figure 1. Conventional overhead air distribution system

Supply Duct

Supply ducts are located in the ceiling and are too high for the heavy droplets to reach. In addition the air coming from the supply is projecting an air current away from them and **towards the ground**.



Droplets are pulled down by gravity, their direction is **downward**.

This is why wiping down surfaces is so critical to prevent disease transmission.



Does the CDC recommend special air conditioner filters or changing them more often?

No, for the HVAC the CDC recommends normal routine maintenance. The CDC has not made any special recommendations for AC filters regarding COVID 19 in businesses that are not healthcare facilities at this time.



How does SCSD Maintain the HVAC System

- Routine Quarterly and Annual Preventive Maintenance work orders are scheduled for HVAC equipment per Manufactures recommendations.
- Filters are changed routinely.

Best Practices Learned from the Facts

- Air Conditioning vents are designed to direct air down, So **keep windows closed** so the flow of air is not changed.
- Educational facilities are required to have large amounts of pre-conditioned **fresh air continuously introduced** into the buildings. Let the system direct it in a downward direction.
- **Covid19 droplets** are large enough to be affected by gravity and will **fall downward**. So give room between yourself and others.
- **Sanitize surfaces** where droplets could have fallen.
- **Don't Panic**- Be mindful of where you place yourself when with others, Practice your personally preferred protection.

References

- <https://www.cdc.gov/coronavirus/2019-ncov/community/general-business-faq.html>
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