

INDOOR AIR QUALITY

MAKING SENSE OF THE RETURN TO THE WORKPLACE



OUR TEAM FOR TODAY'S PRESENTATION



TODD ALLSHOUSE, CIH, CSP

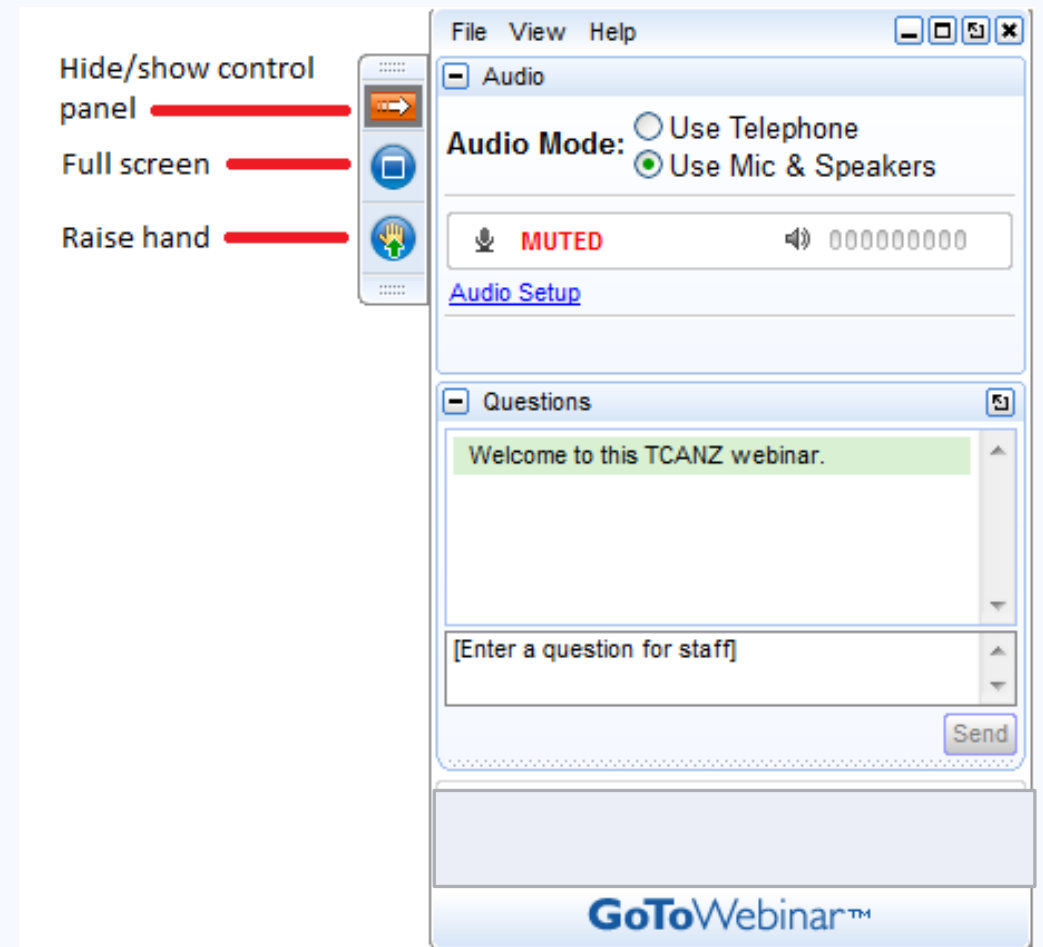
DIRECTOR, INDUSTRIAL HYGIENE SERVICES

ERIN RYMSA

DIRECTOR, TRAINING SERVICES

HOUSEKEEPING

- This presentation is being recorded and will be shared.
- Everyone will be muted to prevent background noise.
- Use the question button to log your question.



KEY TERMS

IAQ: Indoor Air Quality (also Indoor Environmental Quality, IEQ)

HVAC: Heating, Ventilation and Air Conditioning





RETURN TO WORK IAQ ISSUES

- COVID is still a concern
- Many workplaces are moving back to traditional arrangements
- Heightened sense of IAQ awareness



TODAYS TOPICS

- IAQ considerations and practices for reducing COVID risk
- Understanding IAQ issues during the return to work
- Practices for stakeholder communication and engagement
- Best IAQ practices under EPA “Clean Air in Buildings Challenge”



IAQ PRACTICES AND CONSIDERATIONS FOR REDUCING COVID RISK

- ASHRAE 62.1, “Ventilation for Acceptable Air Quality”
- Various consensus organizations agree on the following:
 - HVAC is a factor in reducing or increasing the spread of the virus
 - HVAC alone is not capable of addressing all aspects of infection control
 - Avoidance, testing, screening and physical distancing are most effective methods



CONSENSUS IAQ STRATEGIES FOR REDUCING COVID RISK

- Ventilation and airflow
- Air filtration
- Ultraviolet germicidal irradiation (UVGI)
- Temperature and relative humidity control

MORE EFFECTIVE



LESS EFFECTIVE

VENTILATION/AIRFLOW

- Increase fresh outside air
- Extend HVAC operational times
- Control airflow patterns



VENTILATION/AIRFLOW: SUPPLYING OUTDOOR AIR TO INDOOR SPACES

NATURAL VENTILATION

Pros:

- Direct pathway to large amounts of outside air
- Significant dilution of indoor contaminants

Cons:

- Air is unfiltered and unconditioned
- Airflow can be unpredictable
- Open doors/windows can interrupt HVAC
- Not all areas have access to windows
- Outdoor air quality may be poor

MECHANICAL VENTILATION

Pros:

- Provides filtered, conditioned air with temp/RH control
- Able to control direction/delivery of airflow

Cons:

- HVAC system must be properly designed, operated and maintained
- If HVAC is not properly sized or configured, can be difficult maintain acceptable IAQ conditions
- Changes to system can impact performance

VENTILATION/AIRFLOW: MINIMUM OUTDOOR AIR

- 10,000 square foot office with 40 people
- HVAC unit handles 8,000 cubic feet of air per minute (cfm)
- ASHRAE minimum fresh air recommendations:
 - 5 cfm per person: $40 \times 5 \text{ cfm} = 200 \text{ cfm}$
 - 0.06 cfm per square foot: $10,000 \times 0.06 \text{ cfm} = 600 \text{ cfm}$
 - Minimum of 800 cfm fresh air (10% of air handled by HVAC)

Adequate outdoor air ventilation provides continuous control over indoor contaminant concentrations

VENTILATION/AIRFLOW: AIR CHANGES PER HOUR (ACH)

- Air change is a complete turnover of air in a space
 - 4.5 ACH can be equivalent to an N95 mask
 - Higher risk locations should strive for 6 to 12 ACH
- 10,000 sq. ft. office with 9 foot ceilings (90,000 cubic feet):
 - HVAC unit handles 8,000 cfm (10% fresh air)
 - Air change occurs every 11 minutes, or 5 ACH
 - At 10% fresh air, the fresh air exchange is 0.5 ACH

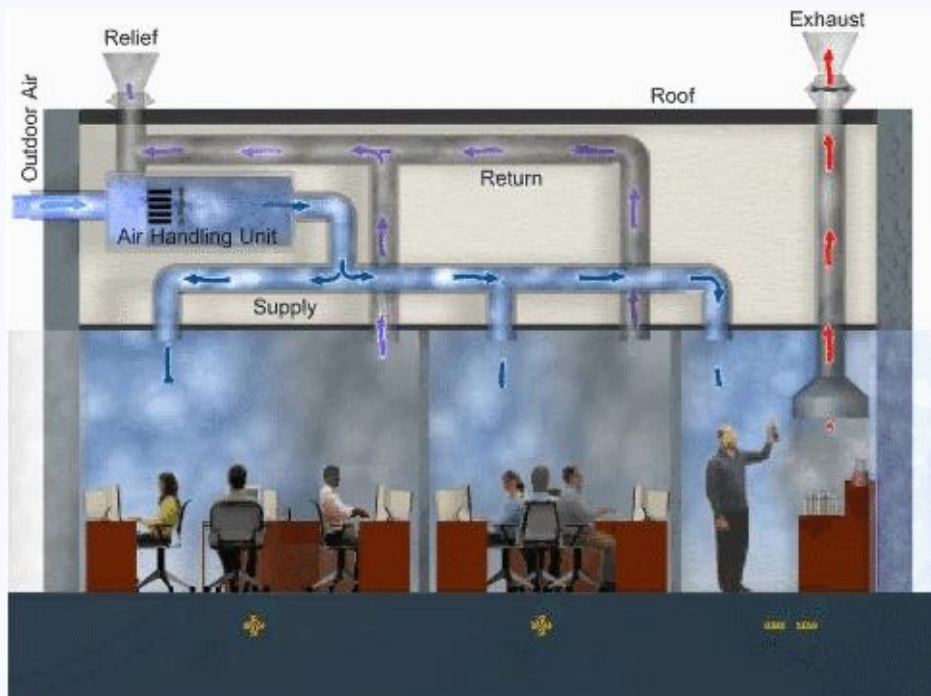
Air changes indicate how quickly indoor contaminant levels will decrease

VENTILATION/AIRFLOW: EXTEND HVAC OPERATIONAL TIMES

- Disable demand-controlled systems
- Continuous operation for contaminant control
- Run systems before/after occupancy



VENTILATION/AIRFLOW: CONTROLLING AIRFLOW PATTERNS



- Airflow distribution can either reduce or increase risk
- Strive for airflow from cleaner to dirtier areas
- Direct exhaust to outside for higher risk areas
- Be aware of fans blowing contaminants

AIR FILTRATION

- **MERV:** Minimum Efficiency Reporting Value
- Indicator of the efficiency of trapping particles
- The higher the MERV, the more efficient the filter



MERV-8	MERV-13	MERV-17 (HEPA)
>85% (Large Particles) <20% (Small Particles)	>90% (Large Particles) >80% (Small Particles)	≥99.97% (All Particle Sizes)
Good general filtration	Preferred for COVID	Excellent air cleaning, but system must be specially designed

AIR FILTRATION: MERV COMPARISON

- MERV-8 is a standard pleated filter used pre-COVID
- MERV-13 is becoming the COVID standard
- Is a higher MERV rating always better?



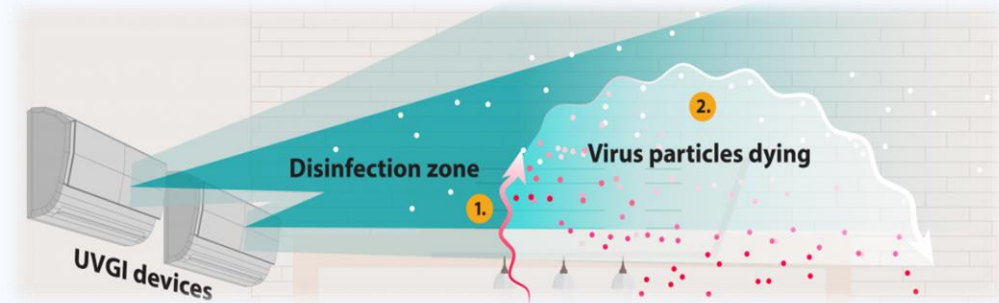
AIR FILTRATION: FILTERED AIR CHANGES

- 12' x 12' office with 9 foot ceiling (1,296 cubic feet):
 - Room HEPA unit handles 200 cfm
 - Air change occurs every 6.5 minutes, or 9 ACH
- Portable HEPA units are an inexpensive and efficient way to provide localized air cleaning
- Outdoor air changes are best, but MERV-13 filtered air should be considered as a minimum



UPPER ROOM ULTRAVIOLET GERMICIDAL IRRADIATION (UVGI)

- Kills organisms using UV radiation
- Select and size for space and airflow
- Used in higher occupancy/higher risk areas
 - Lobbies
 - Lunchrooms
 - Gyms
- Not a primary control method



SUMMARY OF CONSENSUS RECOMMENDATIONS

- Maximize fresh outdoor air
- Maximize filter efficiency
- Enhance cleaning and disinfection in shared spaces



Sounds simple, right?

IAQ ISSUES DURING THE RETURN TO WORK

FOR EVERY ACTION,
THERE IS AN EQUAL
AND OPPOSITE
REACTION.

ISAAC NEWTON

- HVAC operational practices under COVID can impact IAQ in other ways
- Return-to-work IAQ factors include:
 - Mold and moisture issues
 - Reoccupation of closed or dormant work spaces
 - HVAC operational practices under COVID may impact comfort and perception of air quality
 - New cleaners/sanitizing agents introduce new contaminants into the environment
 - Heightened occupant awareness of odors and IAQ

RETURN TO WORK: MOLD AND MOISTURE ISSUES

- Outdoor ventilation is very effective in reducing indoor contaminants
 - Estimated 60% of all IAQ complaints are due to inadequate fresh air
- During the transition to warm weather months, HVAC systems can have trouble controlling humidity
 - Widespread mold growth can occur with chronic high humidity (>60% RH)



RETURN TO WORK: MOLD AND MOISTURE ISSUES



- High indoor RH is worsened by:
 - High outdoor humidity conditions
 - Incorrectly sized HVAC systems
 - Lower-than-designed building occupancy
- Short cycling of HVAC can lead to chronic humidity buildup and widespread mold growth



RETURN TO WORK: MOLD AND MOISTURE ISSUES

Preventive/corrective actions:

- Understand how your HVAC systems are designed and operated
- Prevent short-cycling of HVAC
 - Adjust setpoints to maximize dehumidification
 - Adjust operating cycles to prevent humidity spikes
 - Force systems to cool longer
 - Add additional heat load
- Plan for seasonal changes
- Monitor relative humidity
- When necessary, use dehumidifiers
- Perform visual inspections to confirm no mold growth is present

RETURN TO WORK: UNDER-OCCUPIED SPACES

- IAQ issues in buildings that have been unoccupied or underused
- Building and HVAC systems may not have been maintained
 - HVAC maintenance and modifications
 - General housekeeping and cleaning
 - Physical damage, water intrusion
 - Water systems (*Legionella*, metals)
 - Drain traps
 - Landscaping, drainage and pest issues



RETURN TO WORK: UNDER-OCCUPIED SPACES

Preventive/corrective actions:

- Routine HVAC maintenance and cleaning
- Reinstate cleaning/housekeeping
 - Detailed cleaning
- Remove food sources for mold
 - Moisture damaged materials
 - Dead plants
- Building inspection and maintenance to prepare for return
 - Ensure building systems are fully functional
 - Identify signs of staining or moisture intrusion
 - Identify building envelope damage
 - Address drainage issues
 - Evaluate pest/rodent activity

RETURN TO WORK: HVAC OPERATIONAL CHANGES



- Enhanced filtration can reduce HVAC efficiency
- New/modified ducting can change HVAC operation and airflow/distribution
- Modified HVAC operating schedules can impact comfort and airflow

RETURN TO WORK: HVAC OPERATIONAL CHANGES

Preventive/corrective actions:

- Understand the HVAC changes and their impacts
- If necessary, rebalance airflows
- Monitor temperature and relative humidity conditions



RETURN TO WORK: CHEMICAL AGENTS

- New cleaners and disinfectants can introduce new airborne contaminants into the indoor environment
- Chemical usage can lead to discomfort and irritation complaints





RETURN TO WORK: CHEMICAL AGENTS

Preventive/corrective actions:



- Evaluate new chemicals brought onsite and select low hazard/low odor products
- Maintain safety data sheets (SDSs)
- Ensure personnel are trained on proper use
- Ensure HVAC is operating when chemicals are used

STAKEHOLDER COMMUNICATION AND ENGAGEMENT

- Heightened awareness and concern about IAQ had made ongoing communication critical
 - 72% of employees feel that IAQ is a critical factor in the safety and comfort of returning to work
 - 90% of building occupants want updates on IAQ issues, but only 13% receive frequent communication
 - 60% of employees said poor IAQ would be a factor in changing jobs



STAKEHOLDER COMMUNICATION AND ENGAGEMENT



IAQ Management Plan to define roles/ responsibilities and IAQ actions

- Maintain HVAC design and operational information
- Establish operational practices
- HVAC maintenance and testing
- Housekeeping and inspections
- Planning/management of change when changes or modifications are considered
- Response, investigation and communication procedures

STAKEHOLDER COMMUNICATION AND ENGAGEMENT

Ongoing communication with employees and building occupants

- Communication of the IAQ plan and IAQ activities
- Train affected personnel on their roles in the plan
- Establish IAQ contacts for reporting IAQ issues
- Maintain an IAQ log
- Investigate significant IAQ events and follow-up with affected occupants
- Proactive communications of planned changes that could impact air quality



PUTTING IT TOGETHER: EPA “CLEAN AIR IN BUILDING CHALLENGE”

EPA call to action with best practices for reducing risks from airborne viruses and other indoor contaminants

1. Develop a Clean Indoor Air Action Plan
2. Optimize Fresh Air Ventilation
3. Enhance Air Filtration and Cleaning
4. Get Your Community Engaged in Your Action Plan

 EPA
Clean Air in Buildings Challenge

1. DEVELOP A CLEAN INDOOR AIR ACTION PLAN

- Understand your system and make sure it is functioning
- Evaluate clean air needs for each space
- Evaluate airflow in high risk areas
- Develop maintenance and testing schedules
- Develop plans when HVAC systems are taken out of service
- Training and education for HVAC and facility maintenance staff



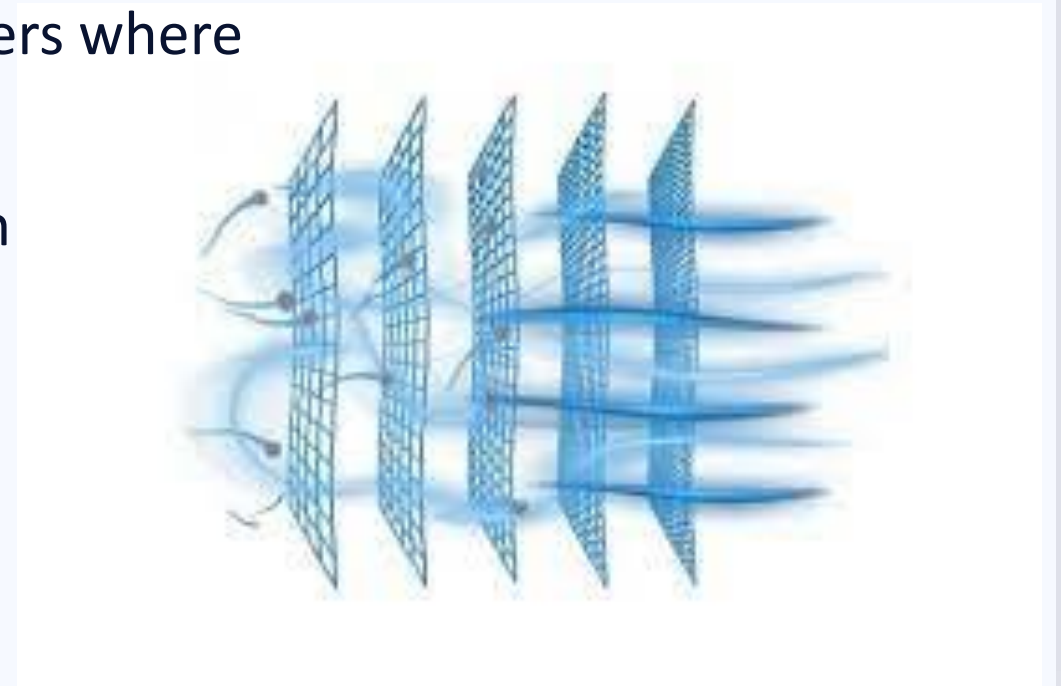
2. OPTIMIZE FRESH AIR VENTILATION



- Maximize fresh air ventilation while maintaining IAQ comfort
- Run HVAC systems during occupied hours to ensure distribution
- Ensure restroom exhaust fans are operated continuously during occupied hours
- Run the HVAC systems before and after occupied hours to remove remaining contaminants
- Where possible use natural ventilation

3. ENHANCE AIR FILTRATION AND CLEANING

- When possible, use MERV-13 or highest rated filters compatible with your systems
- Use portable air cleaners with HEPA filters where airflow is not sufficient
- Enhance ventilation in areas where high particulate emissions could occur
 - Increase outdoor air
 - Use portable air cleaners
 - Provide exhaust to outdoors
 - Consider upper-room UVGI



4. GET YOUR COMMUNITY ENGAGED IN YOUR ACTION PLAN



- Communicate your IAQ plan to employees and other building occupants
- Communicate the importance of actions to optimize HVAC effectiveness
- Implement feedback mechanisms for addressing IAQ concerns or other building issues
- Continue to use COVID prevention and elimination strategies for reducing transmission

Connect with us for a 15 minute
consultation.

GET IN TOUCH:

WWW.COMPLIANCEPLACE.COM

TODD ALLSHOUSE

TALLSHOUSE@COMPLIANCEPLACE.COM



Questions?

Thank you for joining us.