LIFE BALANCE Technologies

Airborne Infection Prevention: Elements of Risk

Central Texas RIMS Chapter
March 3, 2022

Introductions

Corey Kilpack Co-Founder

Corey Kilpack is a co-founder of Life Balance Technologies, which is based in Austin, Texas. He also founded Kilpack Partners LLC, which provides airborne infection control services for hospitals and other public buildings. Using his analytical and auditing expertise, Corey developed a proprietary system which has become the basis of Life Balance Technologies software. Prior to forming Kilpack Partners, Corey worked was an investment banker, an equity and fixed income research analyst and eventually an investment manager in the energy sector. Corey was recognized by the Wall Street Journal as one of the top research analysts and was a ranked All Star Analyst in 2000. He earned a BSM in Accounting at Tulane University.

Steve Manz Co-Founder

Steve Manz is a co-founder of Life Balance Technologies. Prior to forming Life Balance, Steve was the Chief Financial Officer of public companies in the energy service sector where he led three IPO's and closed approximately 20 acquisitions. Corey and Steve met in 1997 and spent many hours visiting offshore drilling rigs and analyzing investment data. Corey promised that he never "shorted" Steve's company. Previously Steve was an auditor at PWC and an internal auditor for a global manufacturing company. He has a degree from the University of Texas Austin.

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!! Warning !!

It is going to get worse.

It is going to get a lot worse.

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Presentation Outline

- Introduction
- Objectives
- Infection prevention, ventilation systems and building standards
- Risks in a pandemic environment
- Capital and operating risks
- Challenges and solutions
- Conclusions

Objectives

By the end of the presentation, we hope you will understand:

- ❑ Existing HVAC design standards address infection control in every type of commercial and public building.
- ❑ There are trade-offs in designing buildings and systems; energy vs. infection control vs. comfort.
- ❑ Some trade-offs affect the level of airborne infection risk.
- ❑ Ignoring basic infection control standards is a greater capital risk today than it was prior to the pandemic.
- ❑ Cost effective solutions exist to mitigate the multiple risks.

Critical Parameters are Used to Measure the Conditions for Airborne Infections

All building designs must meet five established parameters:

1. **Minimum ACH:** (Minimum Air Changes per Hour): How many times is **ALL** the air changed each hour?

2. **Minimum OACH:** (Minimum Outside Air Changes per Hour): How many times is **fresh outside** air changed each hour?

3. **Balance:** Is there more air supplied to the room, or more air removed from the room?

4. **Balance Differential:** How much more air is supplied than exhausted, or how much more air is exhausted than supplied?

5. **Differential Pressure:** Is the air in the room being forced out, or is the adjacent air being forced in?

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3. **Bal[illegible]e:** Is [illegible]r mo[illegible]a[illegible] supplied t[illegible]oom, or more air removed from the roo[illegible]
4. **Balance Diff[illegible]ntial:** How much more air is supplied than exhausted, or how [illegible]more air is exhausted than supplied?
5. **Differential Pressure:** Is the air in the room being forced out, or is the adjacent air being forced in?

Infection Control Standards Apply to Every Building

- ❑ Commercial Office Buildings
- ❑ Government Buildings
- ❑ Schools
- ❑ Hospitals
- ❑ Assisted Living Centers
- ❑ Medical Office Buildings
- ❑ Entertainment Venues
- ❑ Restaurants

Infection Control Standards Apply to Every Room

Every room you enter has infection control requirements.

- ❑ EVERY room has established air volume parameters.
- ❑ EVERY room has a relationship to adjacent rooms which impacts the air balances.
- ❑ EVERY change to the air balance of a room affects other rooms.
- ❑ EVERY room and zone is part of the total distribution of a specific fan.
- ❑ EVERY commercial building owner must certify that the ventilation system has been properly designed and built within the established standards.

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- ❑ EVERY change
- ❑
- ❑ been

!! WARNING !!

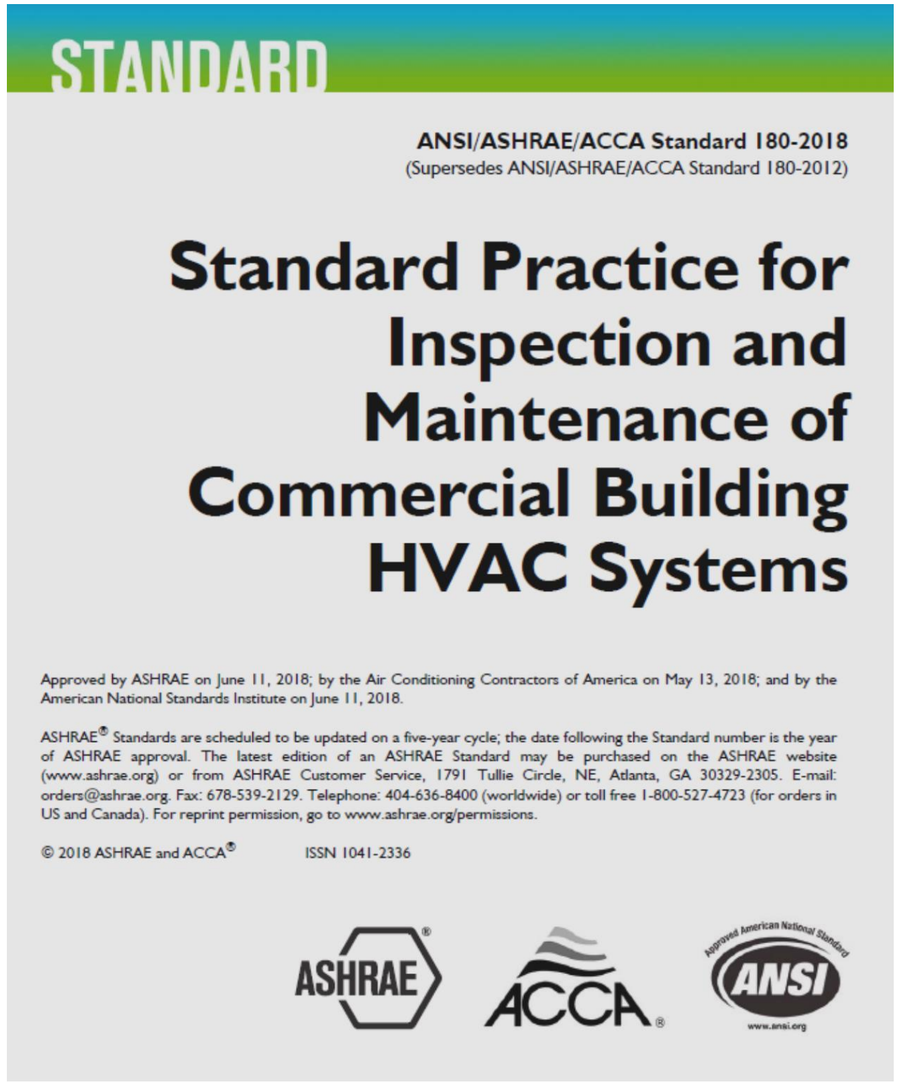
COMPLETE INFECTION CONTROL STANDARDS OF MOST BUILDINGS, INCLUDING HOSPITALS, ARE NOT VERIFIED AFTER THE BUILDING IS OCCUPIED.

Risk Components of Airborne Infection Control: Infrastructure

What does your building have?

- ❑ Fans, fans, fans, fans. Supply fans, return fans, exhaust fans.
- ❑ Filters.
- ❑ Ducts and dampers.
- ❑ Registers.
- ❑ Temperature controls.
- ❑ Steam, chilled water, heating coils.
- ❑ Size, shape and use of the building.
- ❑ Building Management System (BMS)

Risk Components of Airborne Infection Control: Standards



STANDARD

ANSI/ASHRAE/ACCA Standard 180-2018
(Supersedes ANSI/ASHRAE/ACCA Standard 180-2012)

Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems

Approved by ASHRAE on June 11, 2018; by the Air Conditioning Contractors of America on May 13, 2018; and by the American National Standards Institute on June 11, 2018.

ASHRAE® Standards are scheduled to be updated on a five-year cycle; the date following the Standard number is the year of ASHRAE approval. The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

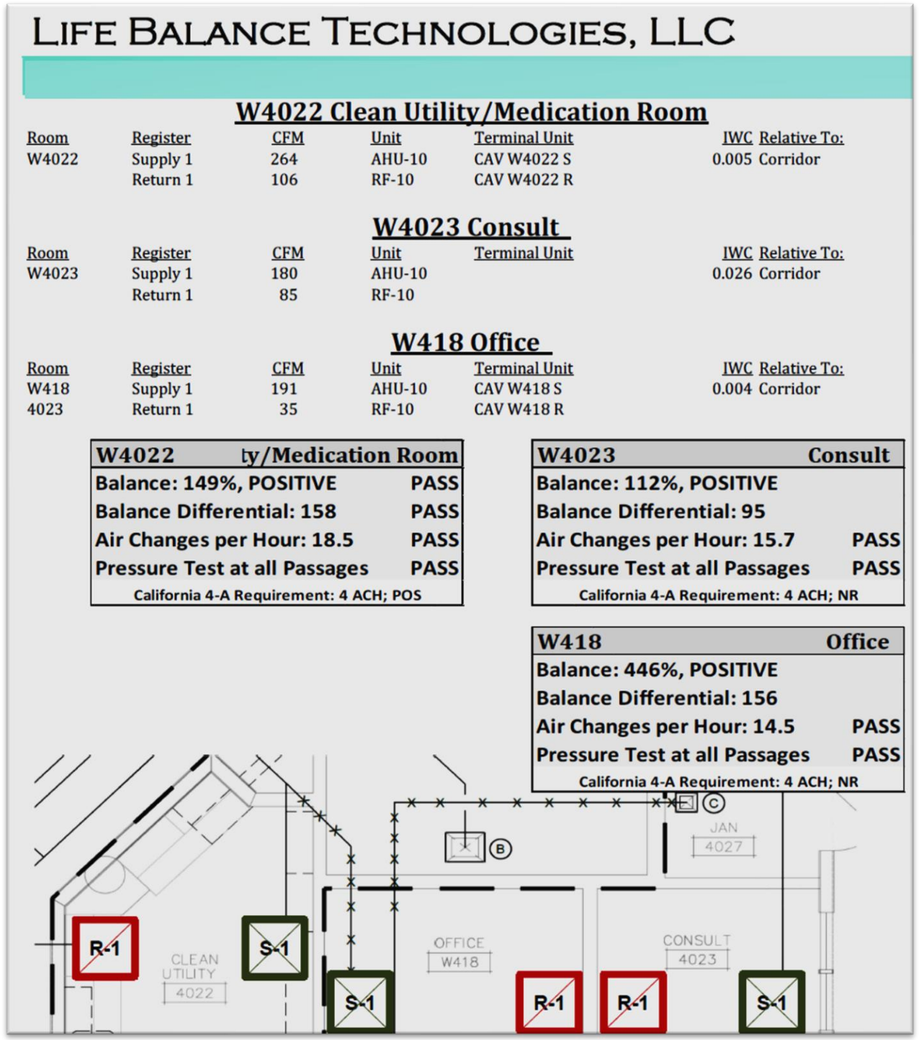
 ISSN 1041-2336

ASHRAE ACCA Approved American National Standard ANSI www.ansi.org

Sources for building standards. What must your building do?

- ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers
- AABC: Associated Air Balance Council
- State and Local Mechanical Codes: Ventilation Standards
- ANSI: American National Standards Institute
- BMS Vendors: Siemens, Leidos, Johnson Controls, etc.
- Life Safety Plans (Room Application)
- As-built Mechanical Plans

Risk Components of Airborne Infection Control: Conditions



LIFE BALANCE TECHNOLOGIES, LLC

W4022 Clean Utility/Medication Room

Room	Register	CFM	Unit	Terminal Unit	IWC	Relative To:
W4022	Supply 1	264	AHU-10	CAV W4022 S	0.005	Corridor
	Return 1	106	RF-10	CAV W4022 R		

W4023 Consult

Room	Register	CFM	Unit	Terminal Unit	IWC	Relative To:
W4023	Supply 1	180	AHU-10		0.026	Corridor
	Return 1	85	RF-10			

W418 Office

Room	Register	CFM	Unit	Terminal Unit	IWC	Relative To:
W418	Supply 1	191	AHU-10	CAV W418 S	0.004	Corridor
4023	Return 1	35	RF-10	CAV W418 R		

W4022 ty/Medication Room	
Balance: 149%, POSITIVE	PASS
Balance Differential: 158	PASS
Air Changes per Hour: 18.5	PASS
Pressure Test at all Passages	PASS
California 4-A Requirement: 4 ACH; POS	

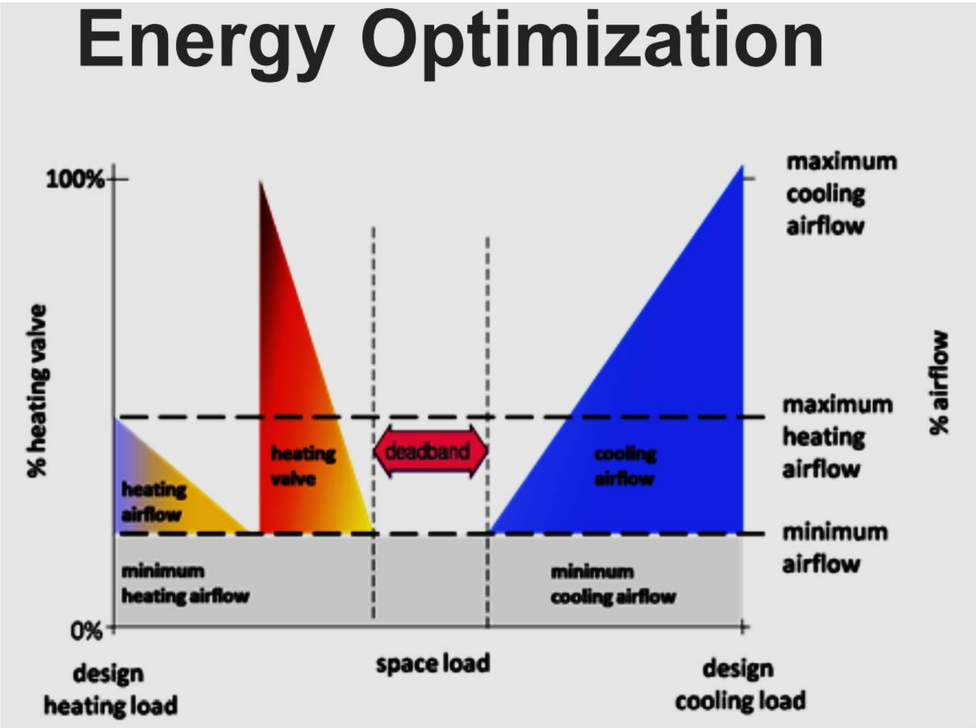
W4023 Consult	
Balance: 112%, POSITIVE	
Balance Differential: 95	
Air Changes per Hour: 15.7	PASS
Pressure Test at all Passages	PASS
California 4-A Requirement: 4 ACH; NR	

W418 Office	
Balance: 446%, POSITIVE	
Balance Differential: 156	
Air Changes per Hour: 14.5	PASS
Pressure Test at all Passages	PASS
California 4-A Requirement: 4 ACH; NR	

Are you subject to risky conditions?

- ❑ KNOW YOUR INFRASTRUCTURE
- ❑ KNOW THE STANDARDS
- ❑ Test and Balance Critical Areas
- ❑ Test and Balance Entire Facilities
- ❑ Apply all the Infection Control and Balance Parameters
- ❑ Maintain Infrastructure
- ❑ Continued Education of Staff

#1 Statistical Indicator of Failing Infection Control Conditions is Energy Optimization



Actual Diagram from a Hospital's Presentation "Energy Star Achievements"

Key features in Energy Star program include:

- ❑ "Optimizing the HVAC system to provide optimal occupant comfort while optimizing energy consumption…"
- ❑ "Procedure room optimization should include reducing operating and procedure room ventilation rates…"
- ❑ ***Energy Star programs and technologies do not incorporate comprehensive airborne infection control parameters which keep the building safe!***

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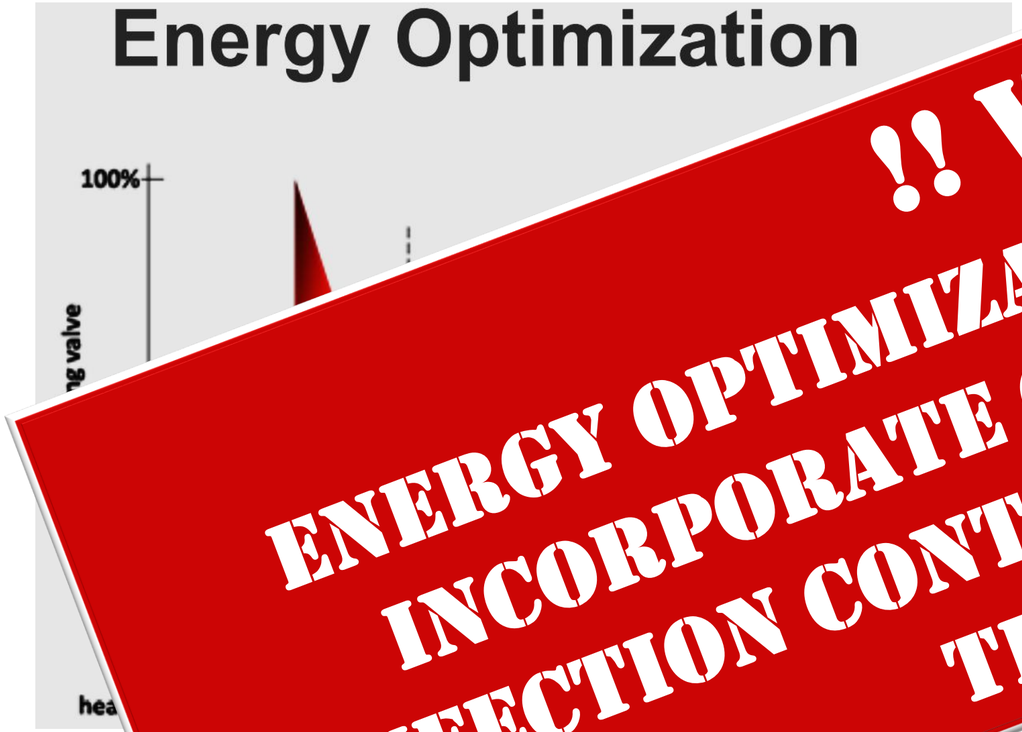


Key features in E… include:

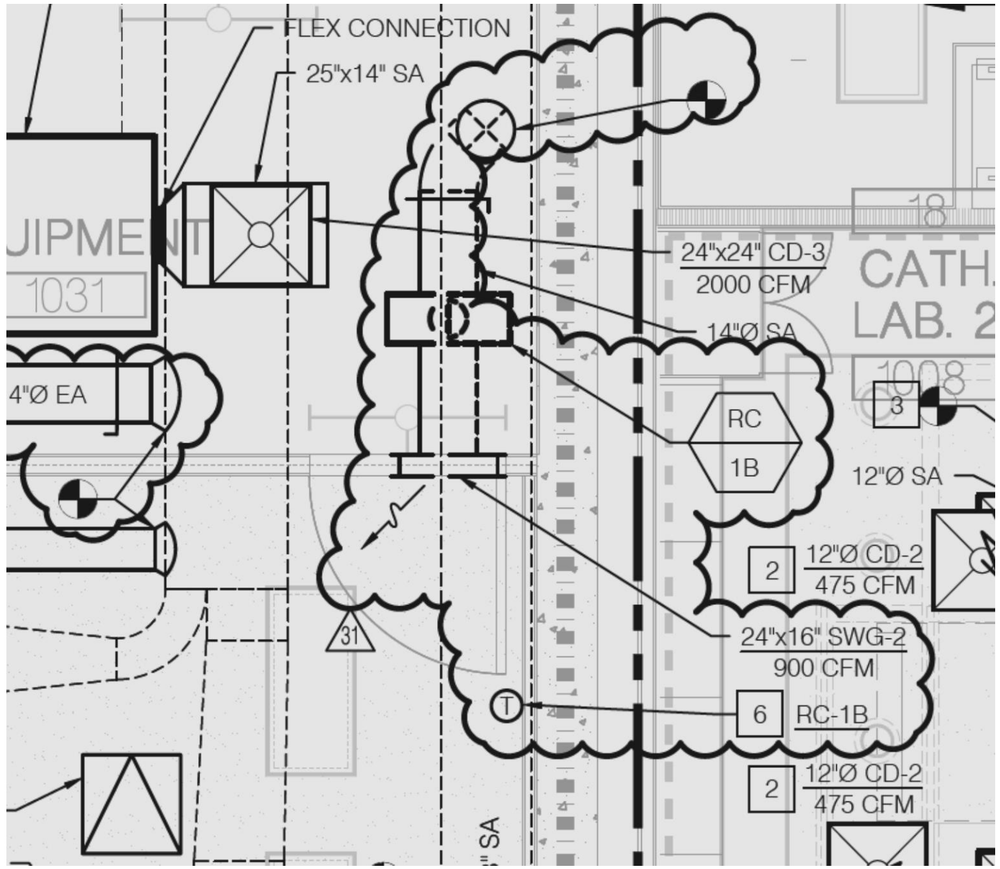
- ❑ "Opti…
- …ventilation

…and technologies do …comprehensive airborne …control parameters which keep …e building safe!

!! WARNING !!

ENERGY OPTIMIZATION TECHNOLOGIES DO NOT INCORPORATE COMPREHENSIVE AIRBORNE INFECTION CONTROL PARAMETERS WHICH KEEP THE BUILDING SAFE.

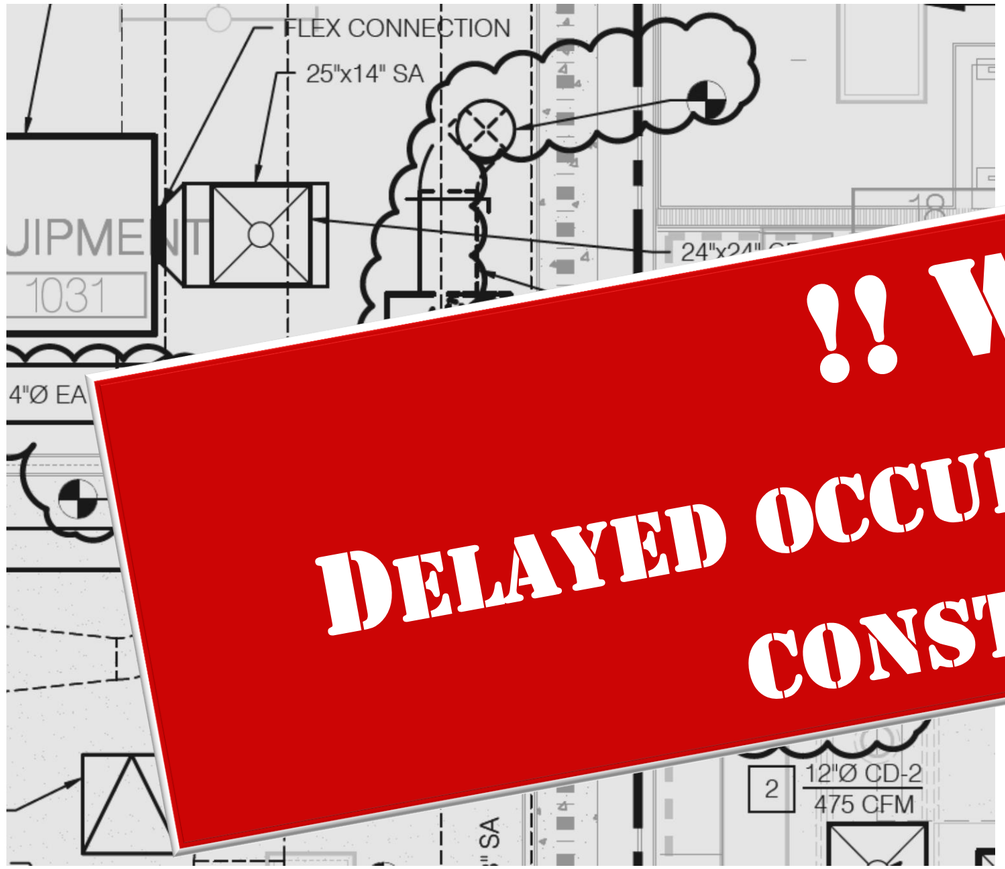
Construction and Capital Risks



What risks are taken with insufficient air balance planning?

- ❑ Compromised Infection Control Conditions
- ❑ Failing Accreditation
- ❑ Emergency Repairs and Restoration
- ❑ Construction Change Orders
- ❑ Delayed Occupancy
- ❑ Rebalancing Post Occupancy

Construction and Capital Risks



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- ❑ Co s
- ❑ yed Occupancy
- ❑ Rebalancing Post Occupancy

!! Warning !!

Delayed occupancy costs can exceed construction costs.

Most Buildings are Never Completely Retested After Initial Occupancy

Retesting and rebalancing are limited to extraordinary events, including:

- ❑ Tenant Improvement.
- ❑ Change in the functional use of the building.
- ❑ Catastrophic damage.
- ❑ Major renovations to the building infrastructure.
- ❑ Litigation or investigation of existing conditions.
- ❑ Upgrades or replacements of the building management system.

When was the ventilation system in your office or your child's school last tested and balanced?

Healthcare Facility Accreditation Requires Annual Air Balance Testing

The Joint Commission, the largest healthcare accreditation organization in the U.S., requires annual testing for tri-annual accreditation.

Healthcare facilities are required to test critical care areas which are a small (10-15%) portion of the building.

Pre-COVID: Hospitals Managed Risk With Insurance and Minimum Compliance

What we heard from risk managers and infection control officers.

"What you are developing is unique and interesting, but we do not see the value in the reports because the chance of having a major airborne related event is very remote."

"I would never consider a system like this; nobody wants see data that shows we have a dirty hospital."

"I rely on the air balance contractor's liability coverage for the first tier and buy a big umbrella policy to cover any major claims."

"Texas tort laws help our hospitals limit any damages."

Pre-COVID: Hospitals Managed Risk With Insurance and Minimum Compliance

What we heard from risk managers

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Longer term, the COVID pandemic could impact insurance in unforeseen ways

According to the *Insurance Journal*, the pandemic has been a truly unique "black swan" event that has affected the industry in ways that will change the way business for years to come

- On January 13, 2022, global life insurers adapted pandemic risk models after unexpected jump in claims from $3.5 billion to >$6 billion
- Increase in business interruption lawsuits have increased and carriers are expected to see new COVID related products liability claims
- Increase in litigation claims by unvaccinated employees and businesses:
  - "The Texas state Senate committee advanced legislation that would make any entity, including hospitals, vulnerable to discrimination lawsuits if they mandated vaccinations for all employees."
- Texas Senate passed Bill 22, which allows claims for benefits, compensation or assistance by certain public safety employees who contracted COVID

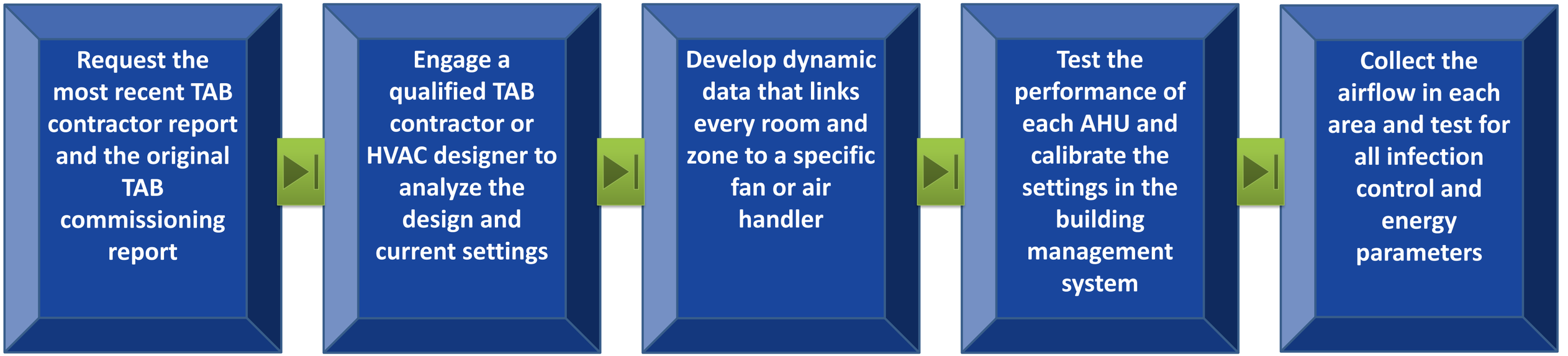
Improperly Maintained HVAC Systems Increase the Risk of Spreading Infections

Over the past two years, experts acknowledged the link between the ventilation systems and airborne infections

- "Authorities have come to accept what many researchers have argued for over a year: The coronavirus can spread through the air.
- That new acceptance, by the World Health Organization and the U.S. Centers for Disease Control and Prevention, comes with concrete implications: Scientists are calling for ventilation systems to be overhauled like public water supplies were in the 1800s after fetid pipes were found to harbor cholera.
- Cleaner indoor air won't just fight the pandemic, it will minimize the risk of catching flu and other respiratory infections that cost the U.S. more than $50 billion a year, researchers said in a study in the journal Science on Friday. Avoiding these germs and their associated sickness and productivity losses would, therefore, offset the cost of upgrading ventilation and filtration in buildings."

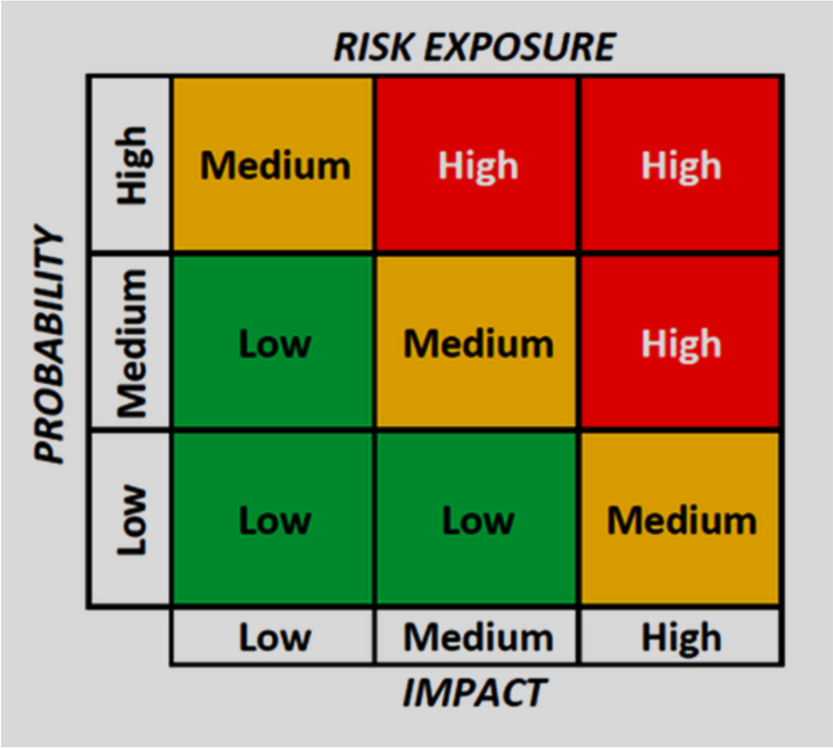
Bloomberg – May 2021

Infection Control Risk Management Includes Data and Process Organization



Complete TAB reporting reduces the maintenance costs and construction and operating risks for the building owners and tenants.

Risk Management Considerations



What are the infection control risks in your building?

High Risk = High Probability + High Impact

- ❑ Who are the people in your classrooms or offices?
- ❑ What's your worse case scenario?
- ❑ What is the cost of compliance vs. not complying?
- ❑ What are your options to mitigate the risk?

Conclusion: Infection Control and HVAC Maintenance Requires Risk Management

- It is critical to understand the relationships between airborne infection prevention, building designs, building management and HVAC infrastructure.
- Many energy efficient buildings and systems neglect basic infection control standards.
- The risks of ignoring comprehensive infection control and air balancing standards are getting higher, and the cost of procrastinating the problem will increase.
- Risk managers who proactively address air balancing and infection control now will have the luxury of planning vs. reacting.

About Life Balance Technologies

Life Balance Technologies is committed to help hospitals and building owners identify airborne infection risks by delivering accurate, reliable, and verifiable information.

Our system allows hospitals and other facilities to analyze air quality conditions to effectively manage HVAC systems. By streamlining the process for compliance, auditing, and reporting, we help reduce costs and save lives.

https://www.lifebalancetech.com/