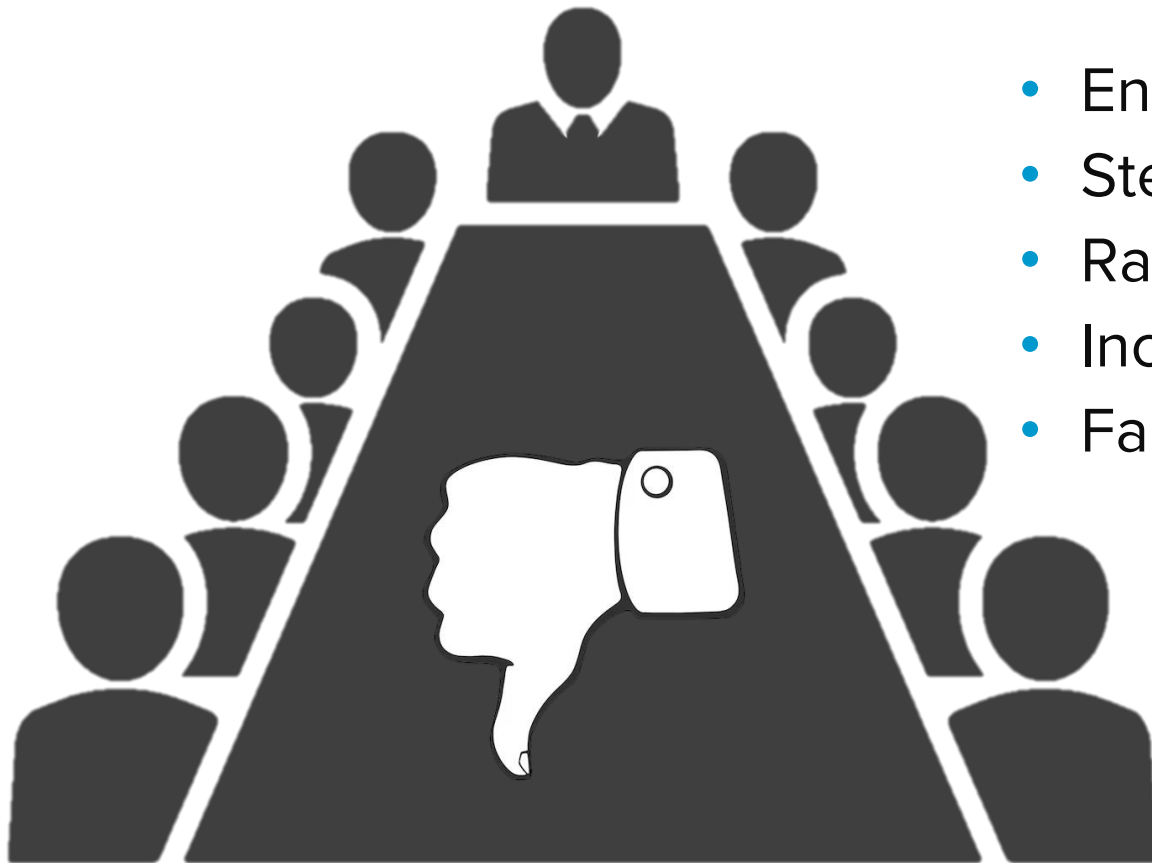




3 STEPS TO ELIMINATE OPERATING ROOM DESIGN FRUSTRATION

**Presented by
Joe Mezzetti
Precision Air Products**

SOLVING THE PROBLEMS BECOMES CHASING BAND-AIDS



- Enforcing temperature rules on surgeons
- Stealing airflow from other spaces
- Ramping airflow only to chase new noises
- Increasing reheat on adjacent spaces
- Facilities teams altering components themselves

**New projects can die in
the board room**

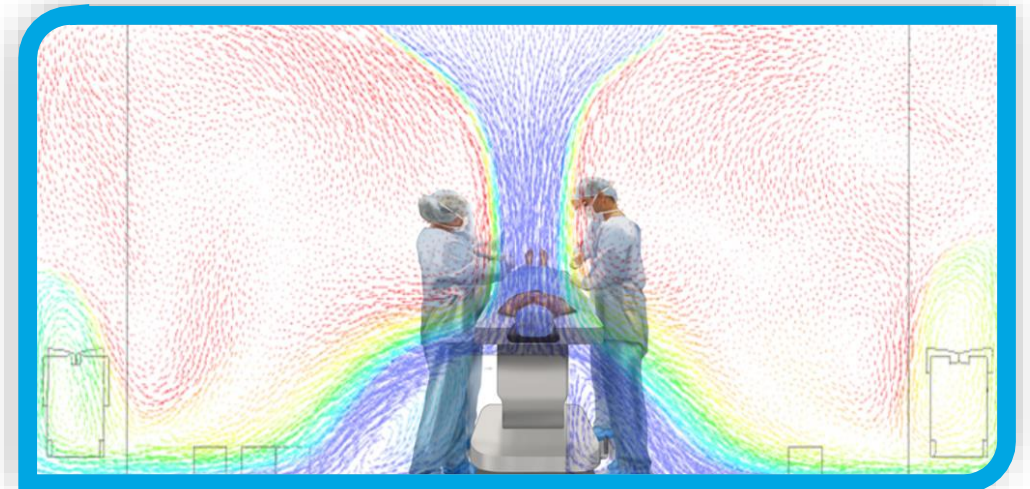
EMPIRICAL AND MODELED TEMPERATURE WITH BASIC LAMINAR AIRFLOW

Ceiling	Diffuser Array Area																				
10'	69.4	69.2	69.0	65.4	61.8	59.7	57.5	57.1	56.7	56.7	56.7	56.7	57.1	57.5	60.0	62.4	65.8	69.1	69.2	69.2	
	69.5	69.3	69.2	67.0	64.9	62.5	60.1	58.9	57.7	57.4	57.1	57.5	57.9	59.1	60.4	62.8	65.2	67.3	69.4	69.4	69.5
	69.5	69.5	69.4	68.7	68.0	65.4	62.7	60.7	58.7	58.1	57.5	58.2	59.0	61.1	63.3	65.6	68.0	68.8	69.6	69.7	69.8
	69.5	69.4	69.4	68.9	68.4	65.9	63.3	61.5	59.8	59.0	58.1	58.8	59.6	62.1	64.6	66.3	68.1	68.9	69.7	69.9	70.1
	69.5	69.4	69.3	69.1	68.9	66.4	63.9	62.4	60.9	59.8	58.8	59.5	60.1	63.0	66.0	67.1	68.2	69.0	69.8	70.1	70.4
	69.9	69.6	69.3	69.0	68.8	67.0	65.3	63.4	61.5	60.2	58.9	60.0	61.0	63.6	66.2	67.3	68.3	68.9	69.5	69.7	69.9
	70.2	69.8	69.3	69.0	68.7	67.7	66.8	64.4	62.1	60.6	59.0	60.5	61.9	64.2	66.4	67.5	68.5	68.9	69.2	69.3	69.3
	69.1	68.9	68.8	68.6	68.3	67.5	66.7	64.5	62.3	60.8	59.3	60.9	62.5	64.6	66.7	67.6	68.5	68.7	68.8	68.9	68.9
	68.0	68.1	68.2	68.1	68.0	67.4	66.7	64.6	62.4	61.0	59.5	61.3	63.1	65.1	67.0	67.8	68.5	68.5	68.5	68.5	68.6
	68.0	67.8	67.6	67.5	67.4	66.8	66.2	64.8	63.3	61.6	59.9	61.6	63.3	65.0	66.7	67.4	68.1	68.0	67.9	67.9	67.9
	68.1	67.6	67.1	66.9	66.8	66.3	65.7	64.9	64.1	62.3	60.4	61.9	63.4	64.9	66.3	67.0	67.7	67.5	67.3	67.3	67.3
	67.2	66.9	66.7	66.6	66.4	65.9	65.3	64.1	63.0	61.8	60.7	61.9	63.1	64.5	66.0	66.5	67.0	66.9	66.8	66.8	66.7
	66.3	66.3	66.3	66.2	66.1	65.5	64.9	63.3	61.8	61.4	61.0	61.9	62.7	64.2	65.7	66.0	66.3	66.4	66.4	66.2	66.0
	65.9	66.0	66.2	66.0	65.9	65.3	64.7	62.9	61.5	60.1	58.7	59.5	60.3	61.1	62.0	62.5	62.5	62.5	62.5	62.5	62.5
	65.7	65.9	66.1	65.9	65.8	65.2	64.6	62.7	61.3	60.0	58.6	59.4	60.2	61.0	61.9	62.4	62.4	62.4	62.4	62.4	62.4
	65.5	65.8	66.0	65.9	65.7	65.1	64.5	62.6	61.2	60.0	58.6	59.4	60.2	61.0	61.9	62.4	62.4	62.4	62.4	62.4	62.4
	65.5	65.7	66.0	65.9	65.7	65.1	64.5	62.6	61.2	60.0	58.6	59.4	60.2	61.0	61.9	62.4	62.4	62.4	62.4	62.4	62.4
Floor																					

Surgical Table

Air at Ceiling 59°F ➡ 56°F ➡ 54°F
 Air at Patient 63°F ➡ 60°F ➡ 57°F
 Air at Surgeon 68°F ➡ 67°F ➡ 65°F
 Room Temp (set) 68°F ➡ 65°F ➡ 62°F

Cold airflow is focused exclusively on patient, missing surgeons



**STEP
#1**

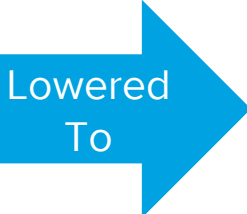
PROVIDE LESS AIR AND COOLING FROM THE AHU

65°F Room

60% RH

2,200 CFM

20 ACH



62°F Room

60% RH

2,200 CFM

20 ACH




~~**15,800 BTU
additional
capacity per room**~~

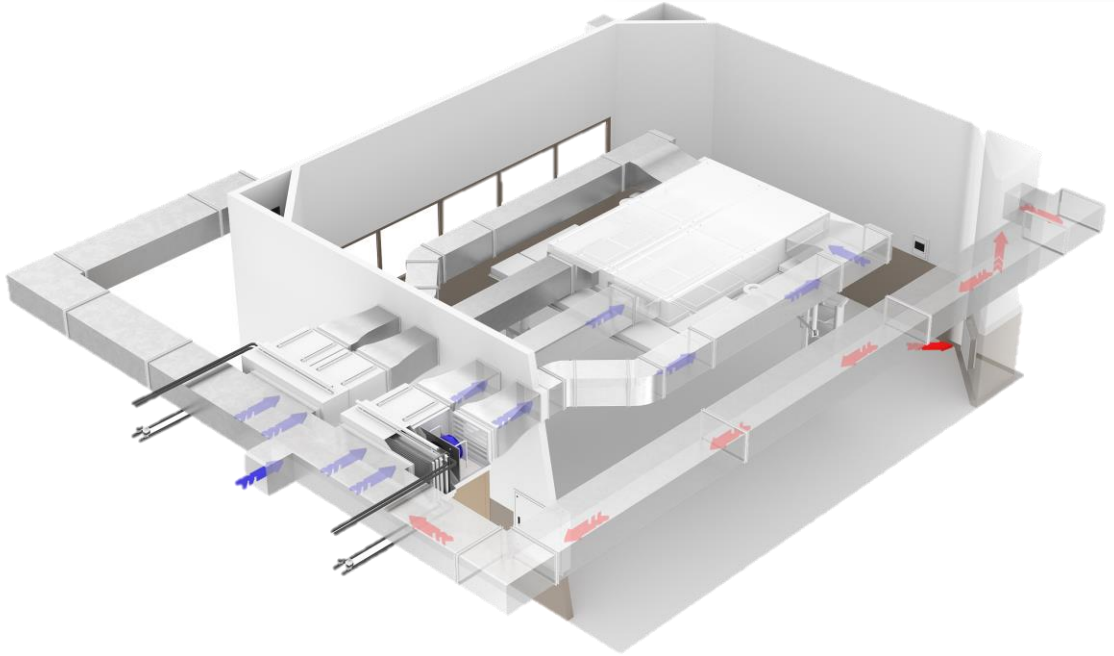
**STEP
#2**

LOCALLY INCREASE AIR CHANGES AND TEMPERATURE

55°F AHU Supply
73% RH
4-10 ACH

HVLR
61°F Delivery
58% RH
40-60 ACH

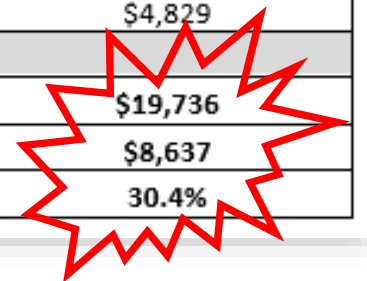

65°F Room
60% RH
OR 1



ENERGY SAVINGS WITH HIGH VOLUME LOCAL RECIRCULATION

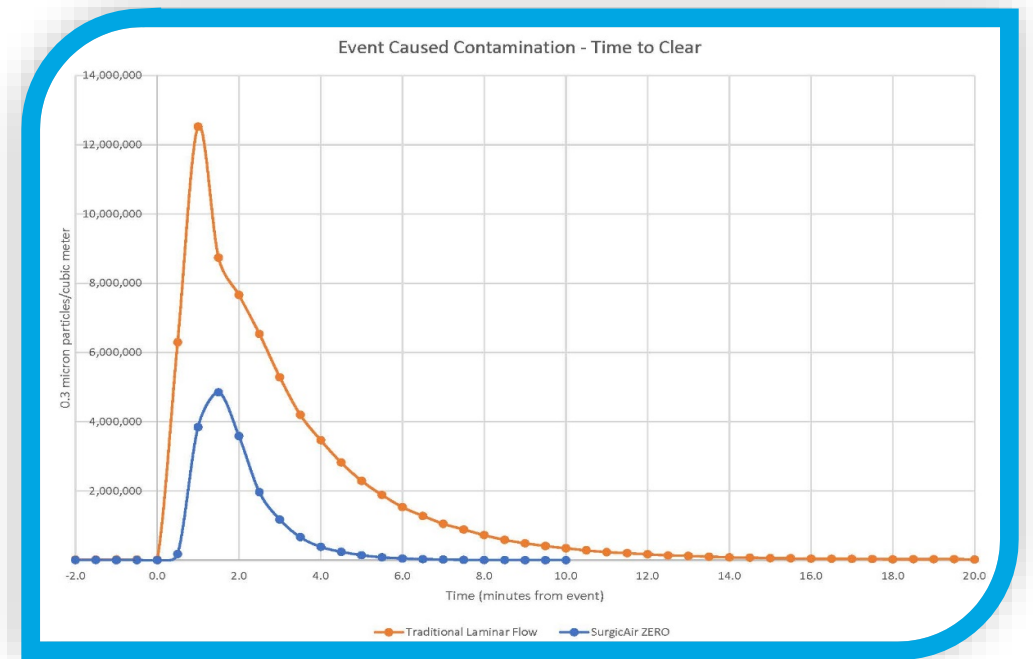
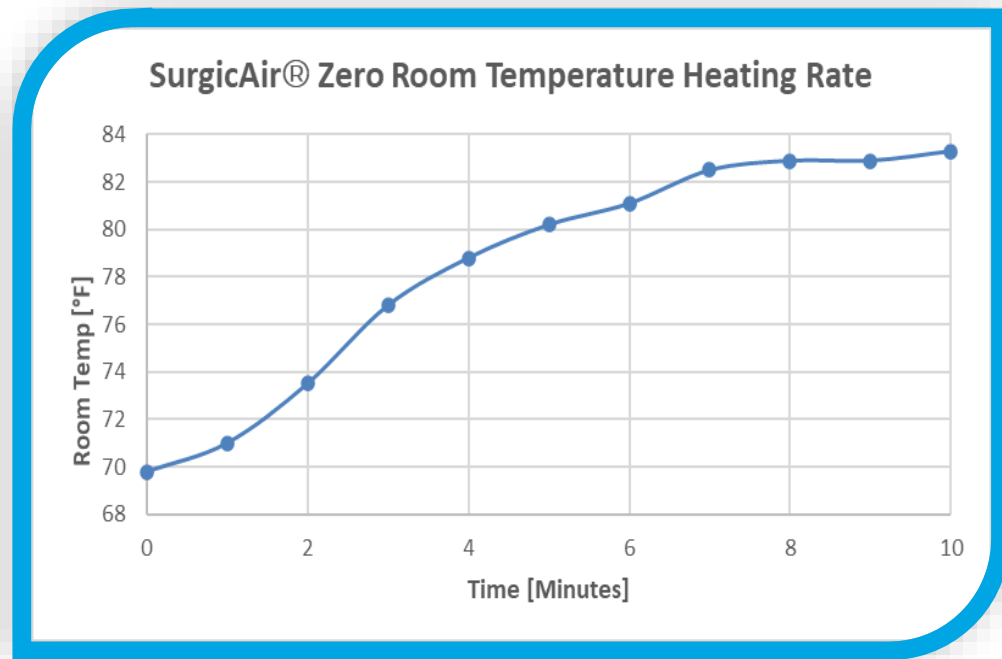
- IES Virtual Environment serving:
 - **4 ORs**
 - **Sterile corridor**
 - **Surrounding corridor**
- Standard VAV system at **25 ACH**
- HVLR system at **62 ACH**
- **30% energy savings**

HVAC Options: Philadelphia PA	Standard VAV	HVLR System
Space Heating Boilers (therms)	6,560.0	4,734.1
Boiler Pumps (kWh)	278.2	170.2
Space Cooling Chillers (kWh)	44,795.1	35,561.0
Primary Pumps (kWh)	2,035.6	2,075.8
Secondary Pumps (kWh)	7,475.8	5,783.7
Heat Rejection – Condenser Pumps (kWh)	12,235.2	12,138.2
Heat Rejection – Towers (kWh)	1,419.5	850.2
Interior Central Fans (kWh)	172,669.3	78,131.4
Interior Local Fans (kWh)	-	30,922.1
Total Electrical Energy (kWh)	240,908.6	165,632.7
Total Heating Energy (therms)	6,560.0	4,734.1
Total Electrical Energy Cost (\$0.11/kWh)	\$21,682	\$14,907
Total Heating Energy Cost (\$0.72/therm)	\$6,691	\$4,829
Total Cost (\$)	\$28,373	\$19,736
	Cost Difference	\$8,637
	Percent Savings	30.4%



RAPID ROOM HEATING AND COOLING

75% LESS STAFF EXPOSURE TO SURGICAL SMOKE



Cool 10°F in 10 Minutes ● Heat 10°F in 5 Minutes

**STEP
#3**

DON'T TOUCH THE REST OF THE BUILDING



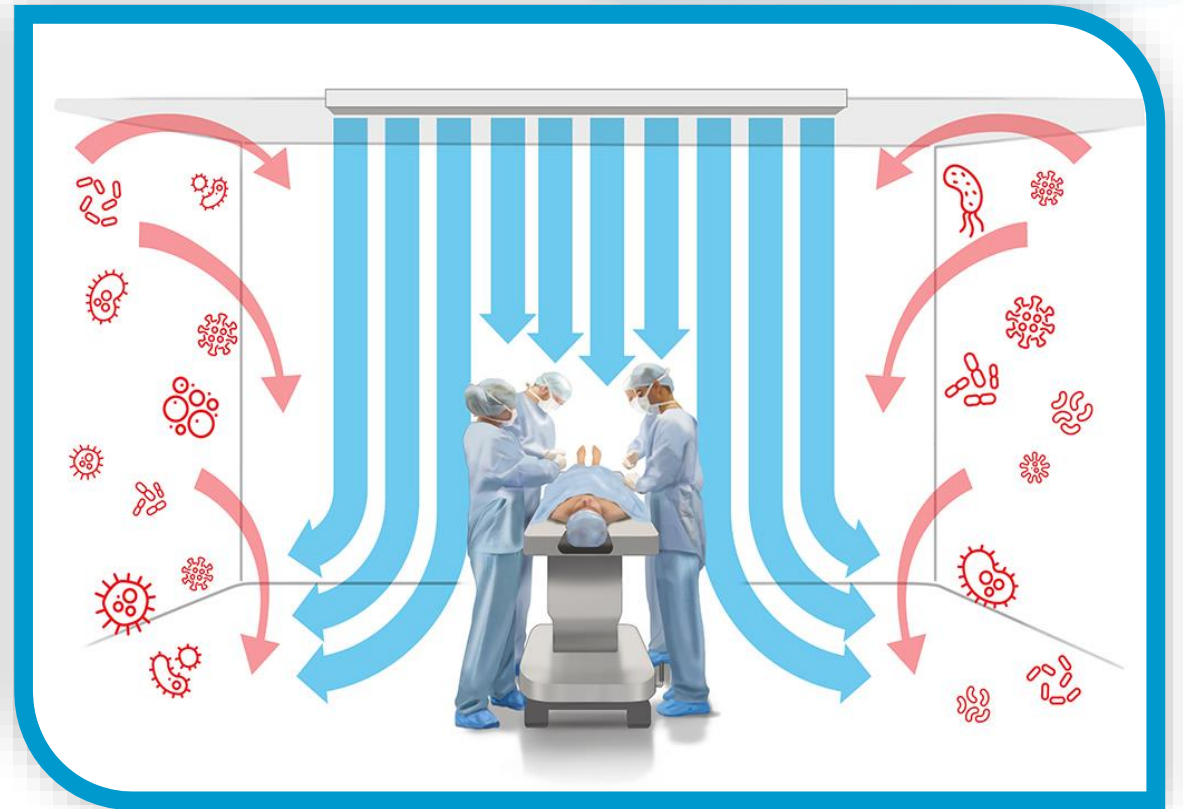
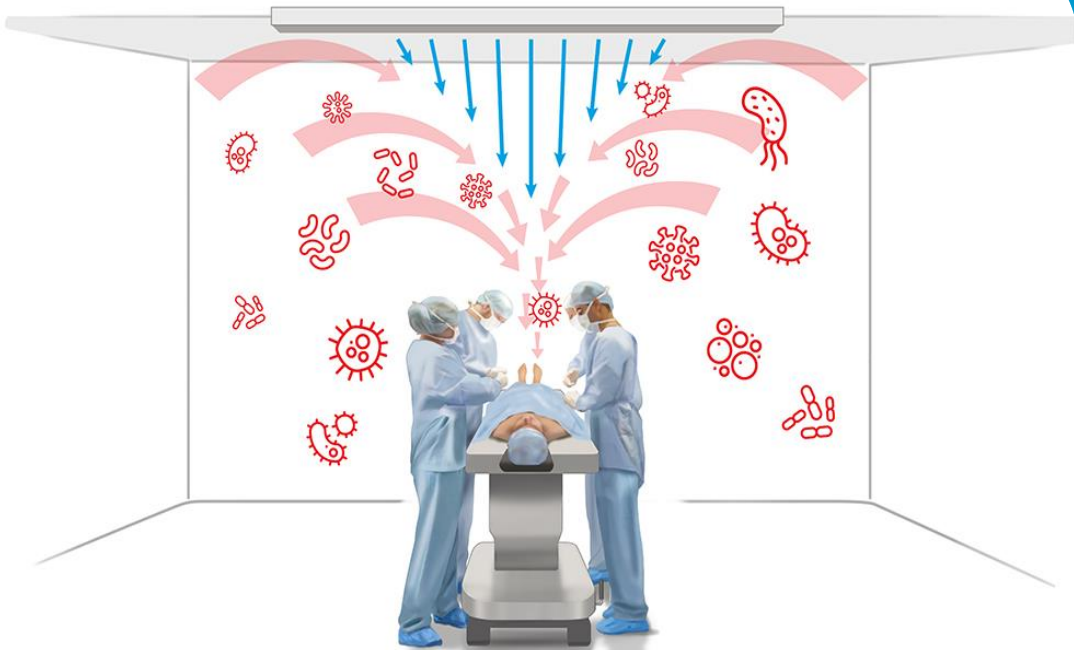
Updating an OR with higher heat load equipment?

Making an OR bigger and need more air?

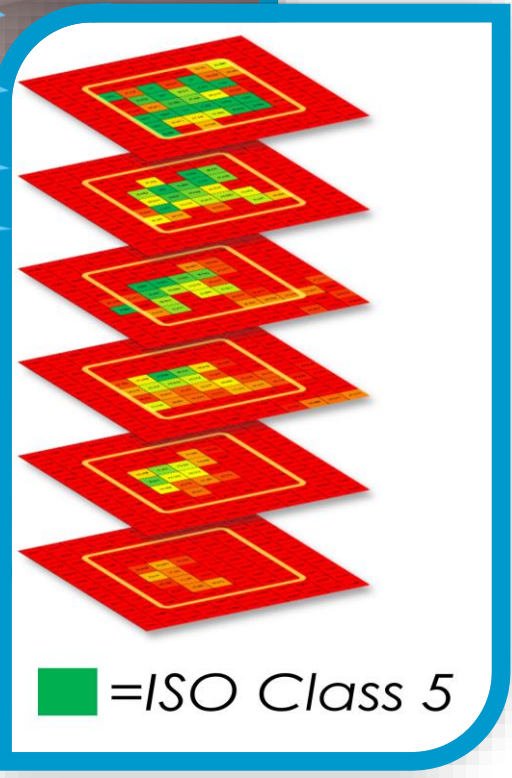
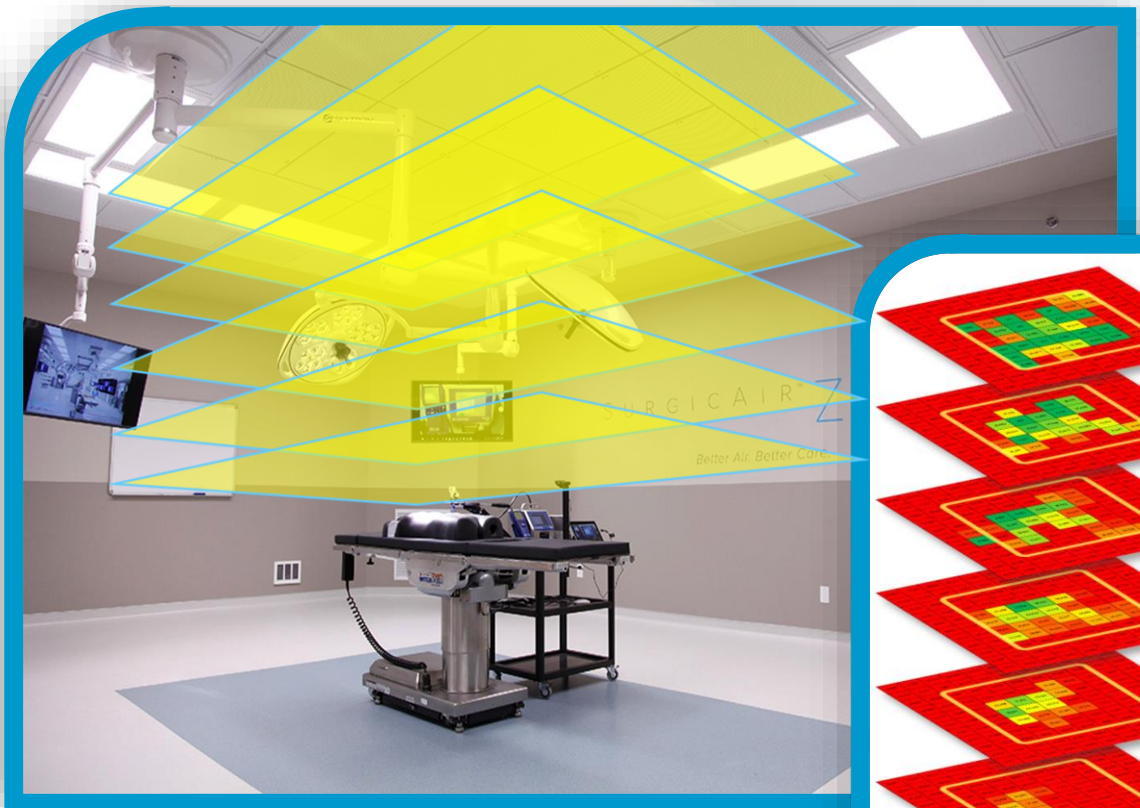
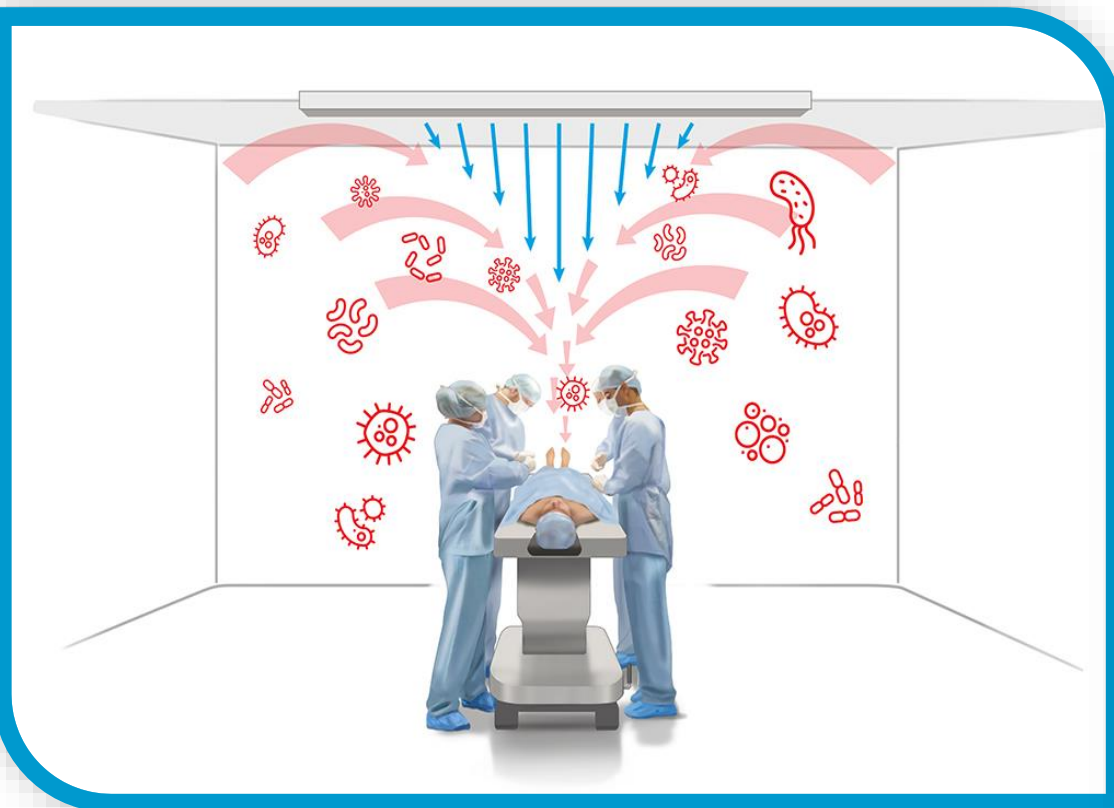
Want to future-proof your cooling, heating, and air volume capacity?

- No need to ICRA off half the building
- No chasing and upsizing duct lines
- No air handler replacements

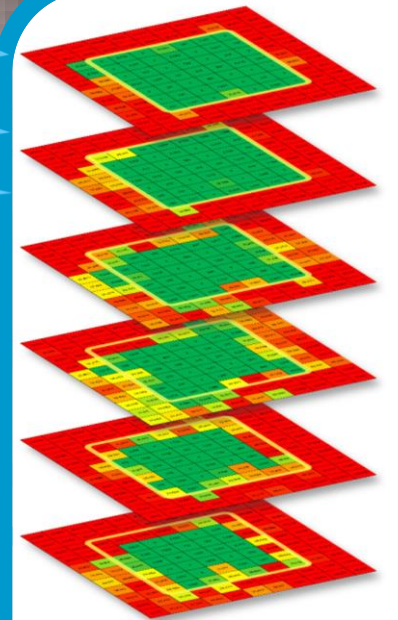
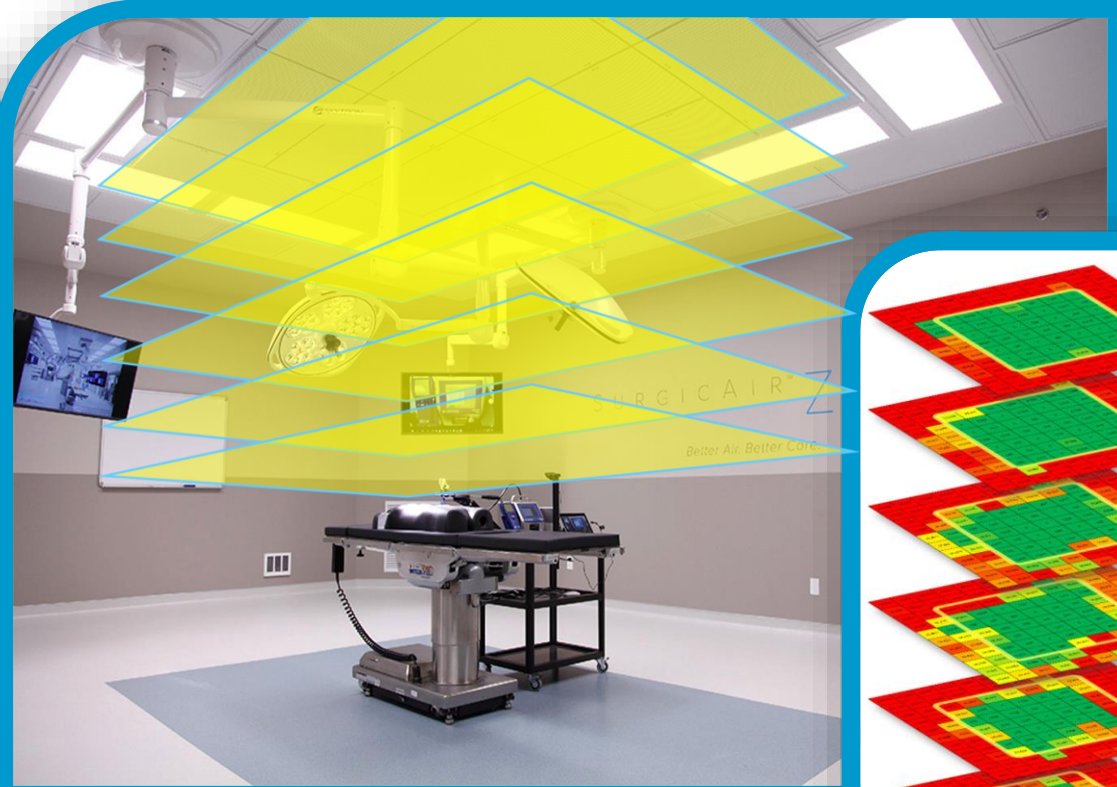
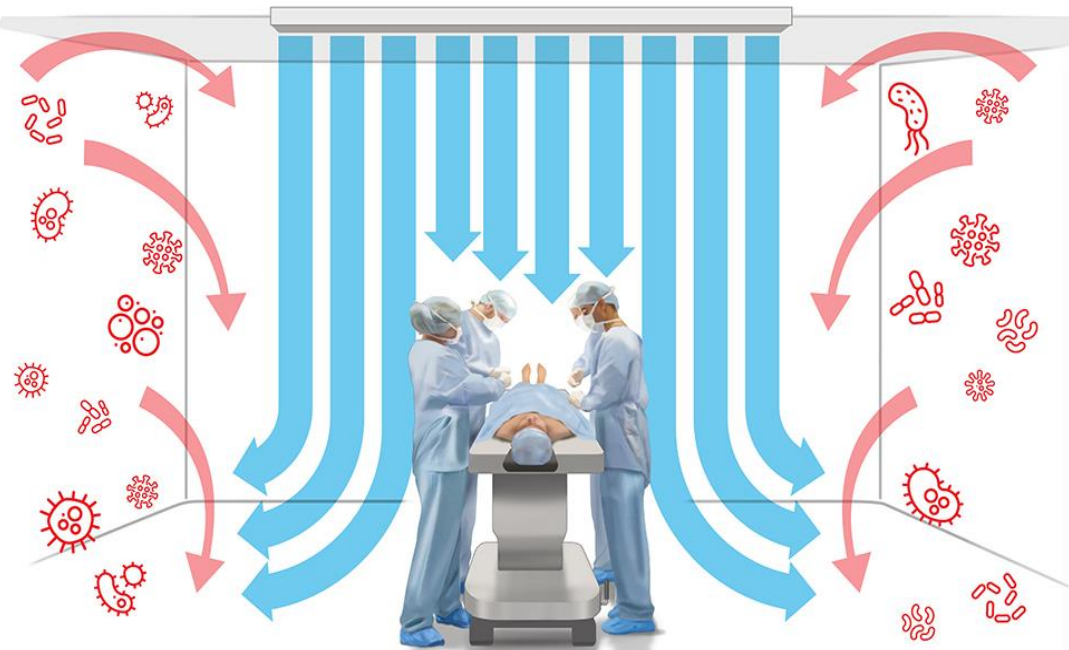
AIRBORNE CONTAMINANT CONTROL: BASIC LAMINAR FLOW V. HIGH VOLUME LOCAL RECIRCULATION



BASIC LAMINAR FLOW CONTAMINANT CONTROL

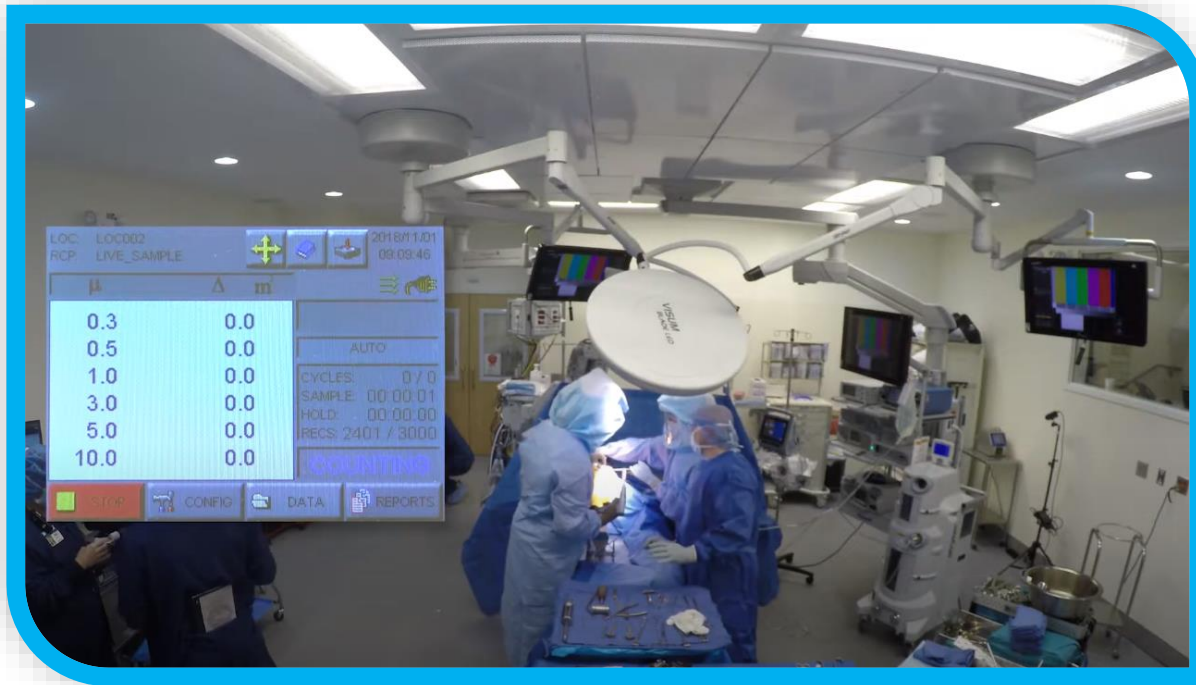


HIGH VOLUME LOCAL RECIRCULATION AIRBORNE CONTAMINANT CONTROL



■ = ISO Class 5

HIGH VOLUME LOCAL RECIRCULATION AIRBORNE CONTAMINANT CONTROL – DURING SURGERY



	Viable Particles at Patient/m ³
OR #1 High Volume Local Recirculation	128
OR #2 Traditional Laminar Flow	974
Total Reduction	87%

- **Single hip replacement in each room**
- **Sampling from open to close**
- **Heavy irrigation and activity at wound**

HIGH VOLUME LOCAL RECIRCULATION AN UNDERUTILIZED WAY OF ADDRESSING OR PROBLEMS TODAY AND TOMORROW

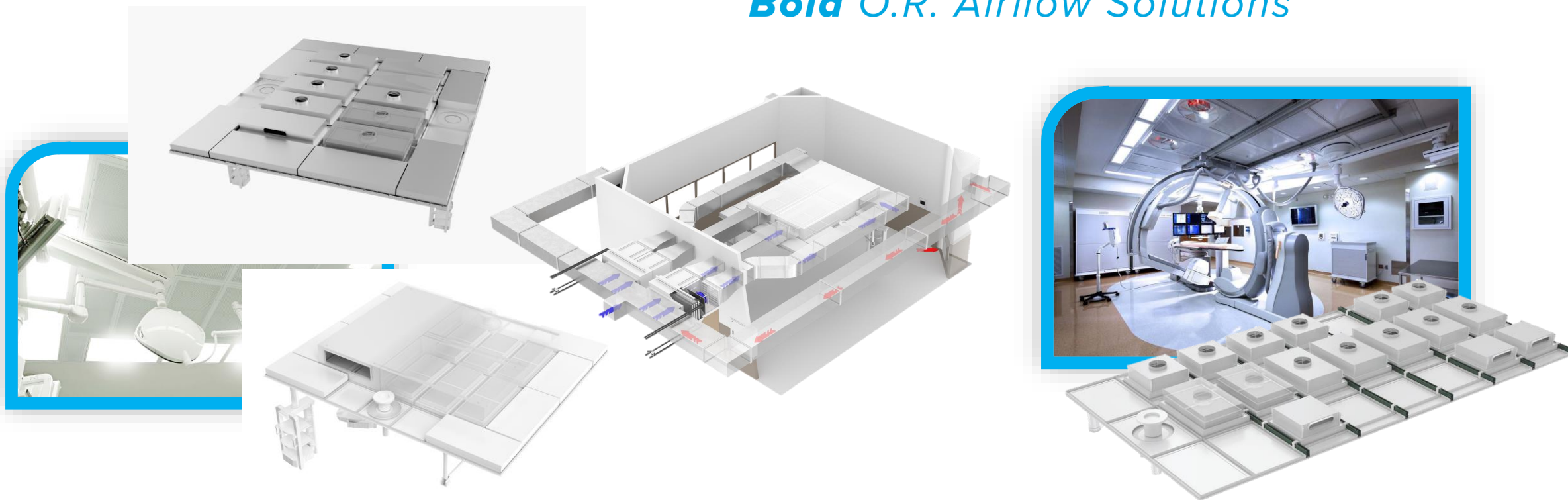


- Reduce AHU capacity requirements
- Reduce duct sizing throughout the facility
- Improve OR temperature conditions
- Reduce surgical smoke exposure
- Reduce project scope
- Reduce reheating requirements
- Reduce contaminants reaching the patient



Precision Air

Bold O.R. Airflow Solutions



Innovating new OR airflow solutions since 1974