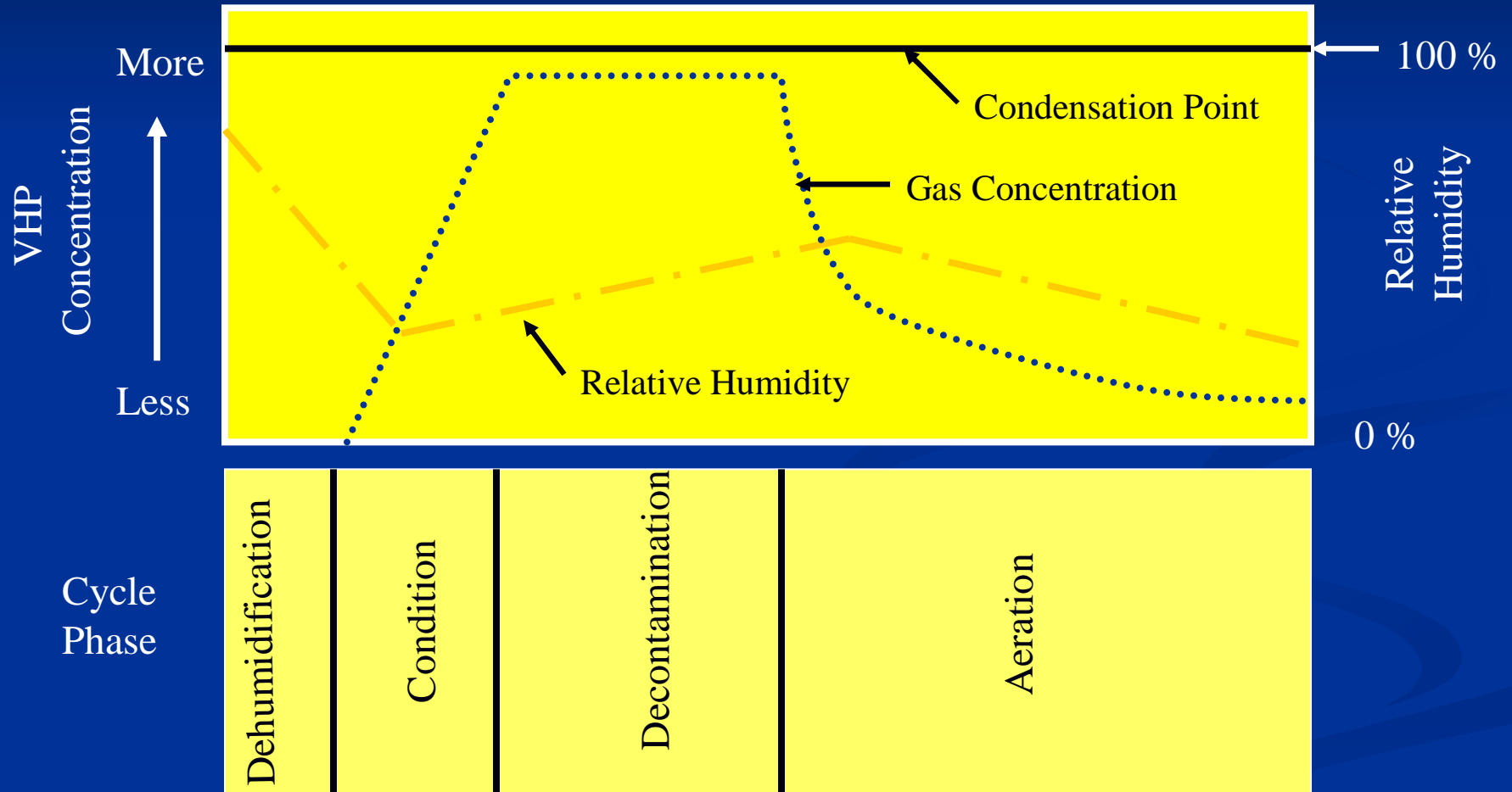


# *Vaporized Hydrogen Peroxide (VHP) Decontamination Field Studies: Conventional and Unconventional Applications*

Peter Harris, Dave  
Lupo, Nick Flynn  
B & V Testing, INC.  
Waltham, MA  
Bel Air, MD



# Typical Vaporized Hydrogen Peroxide Bio-decontamination Cycle



By Courtesy of Steris Corporation



# *H<sub>2</sub>O<sub>2</sub> Vapor Concentration Versus D-Value*

Temp (°C)	Concentration (mg/L)	PPM	Typical D-Value
4	0.3 - 0.5	350	8 - 12 min.
25	1 - 2	700 - 1500	1 - 2 min.
37	3 - 4	2000 - 3000	0.5 - 1 min.
55	10 - 12	7000+	1 sec.

Note: Using *Geobacillus stearothermophilus*



By Courtesy of Steris Corporation

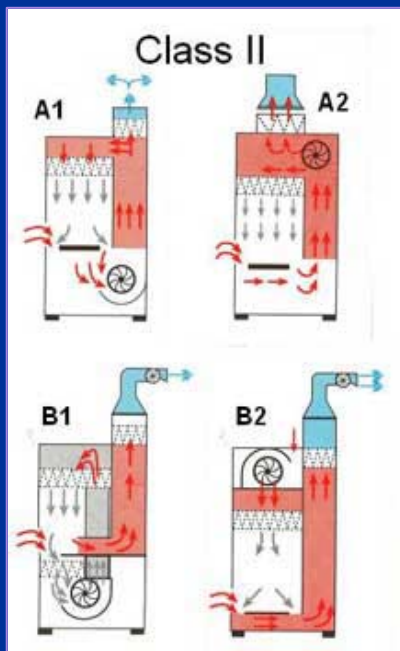
# *H<sub>2</sub>O<sub>2</sub> Vapor Exposure Limits*

- **Personal Exposure Limit (PEL)**  
1.0 ppm
- **Immediately Dangerous to Life or Health (IDLH)**  
75 ppm



# Conventional Applications

- Class II Biological Safety Cabinets
- Lab Animal Research Room
- Pharmaceutical Aseptic Manufacturing Area
- Cold Rooms



# *Conventional Applications*

## *Cycle Parameters*

- Humidity (RH)  
< 50%
- Temperature  
20-25C
- Concentration  
200 - 750 ppm  
1 - 3 hours



# *Conventional Applications Results*

- *Geobacillus Stearothermophilus* six log reduction



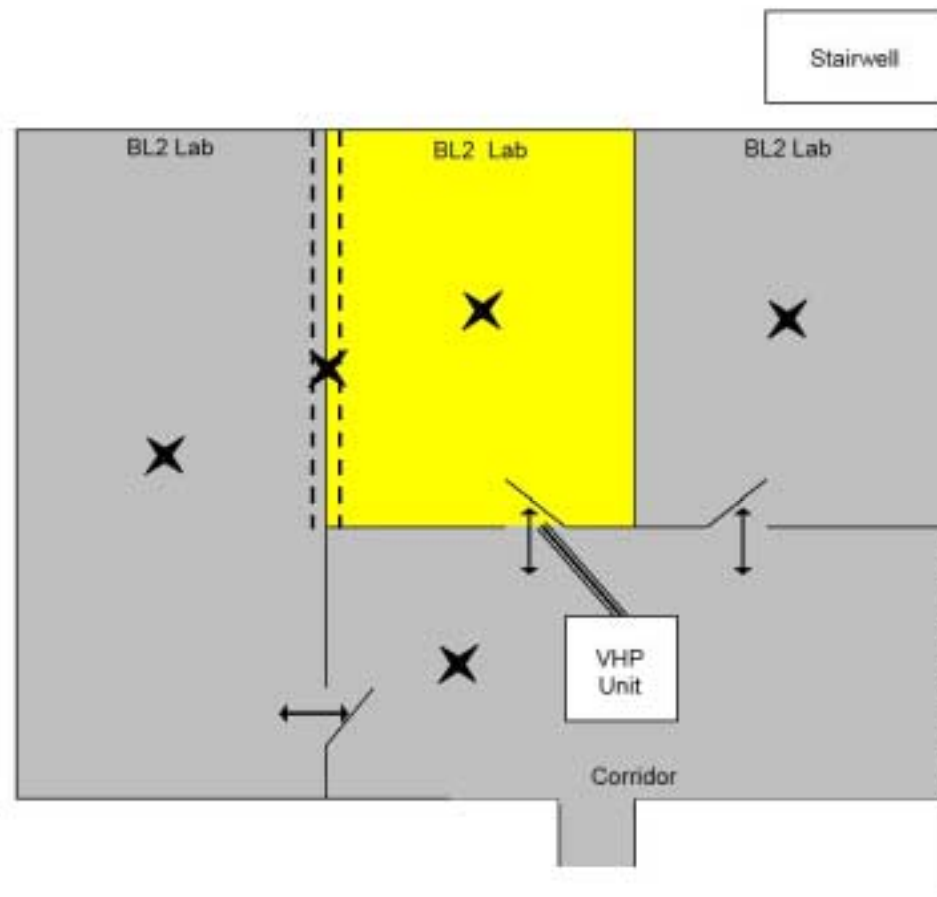
# *Unconventional Application*



**BL2 TC Lab  
1,500 ft<sup>3</sup>  
Standard  
Drop Ceiling**



# *BL2 TC Lab Decon Schematic*



# *Unconventional Application: BL2 TC Lab 1,500 ft<sup>3</sup>*

**Concerns:** Unsealed ceiling, open ceiling plenum to adjacent lab, unsealed penetrations, volume of cellulose (ceiling tiles, supplies, etc.)

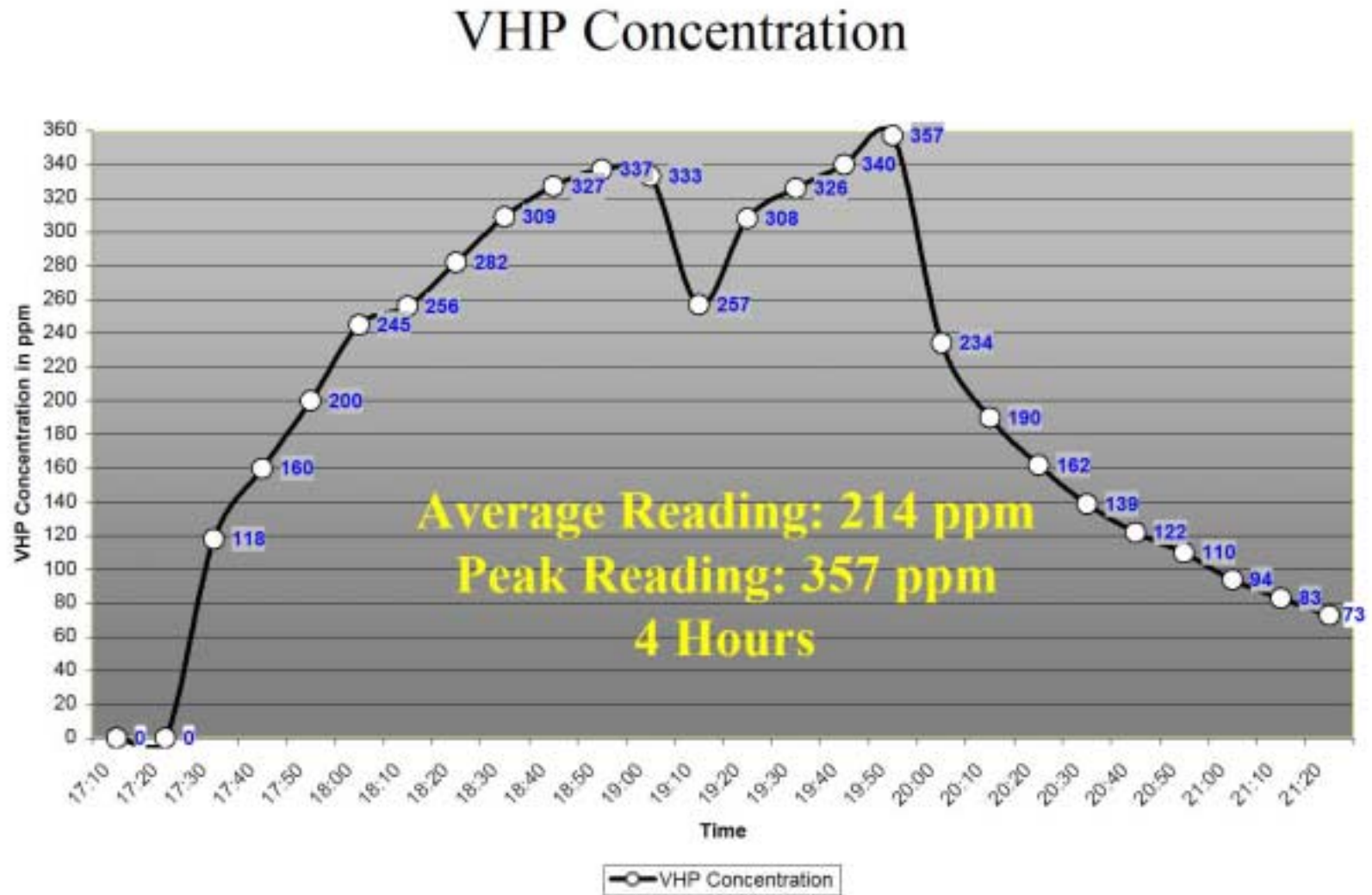




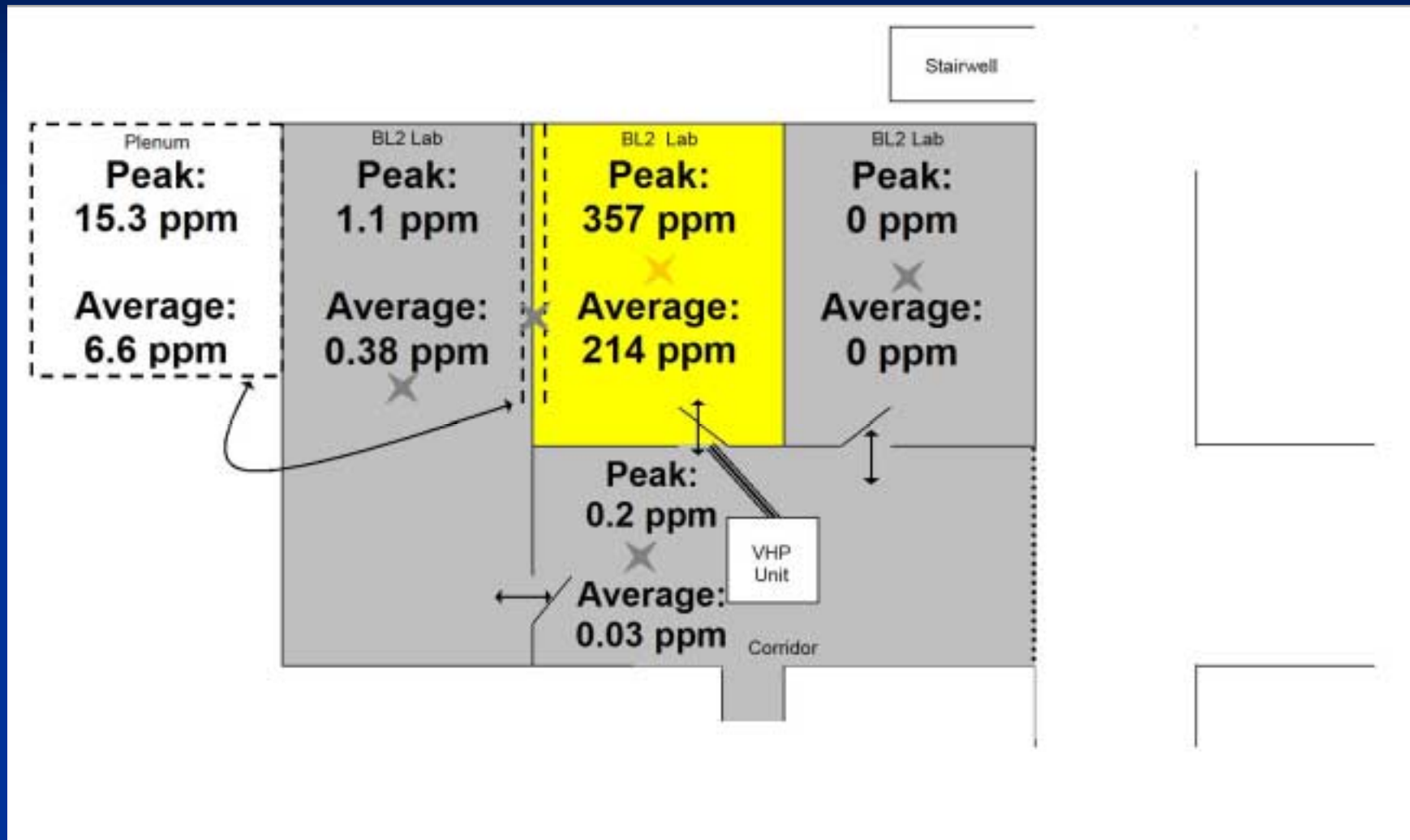
# *Conditions and Cycle Parameters*

- Humidity (RH): 17.7%
- Temperature: 22°C
- Room to Exterior Pressurization: 0.0" w.g.
- Injection Rate: 10 g/min
- Injection Duration: 121 minutes
- Peroxide Used: 1224 grams

# BL2 TC Lab VHP Concentration



# VHP Concentration Levels





## Results

- 17 BIs no growth/20 growth
- Adjacent labs below PEL



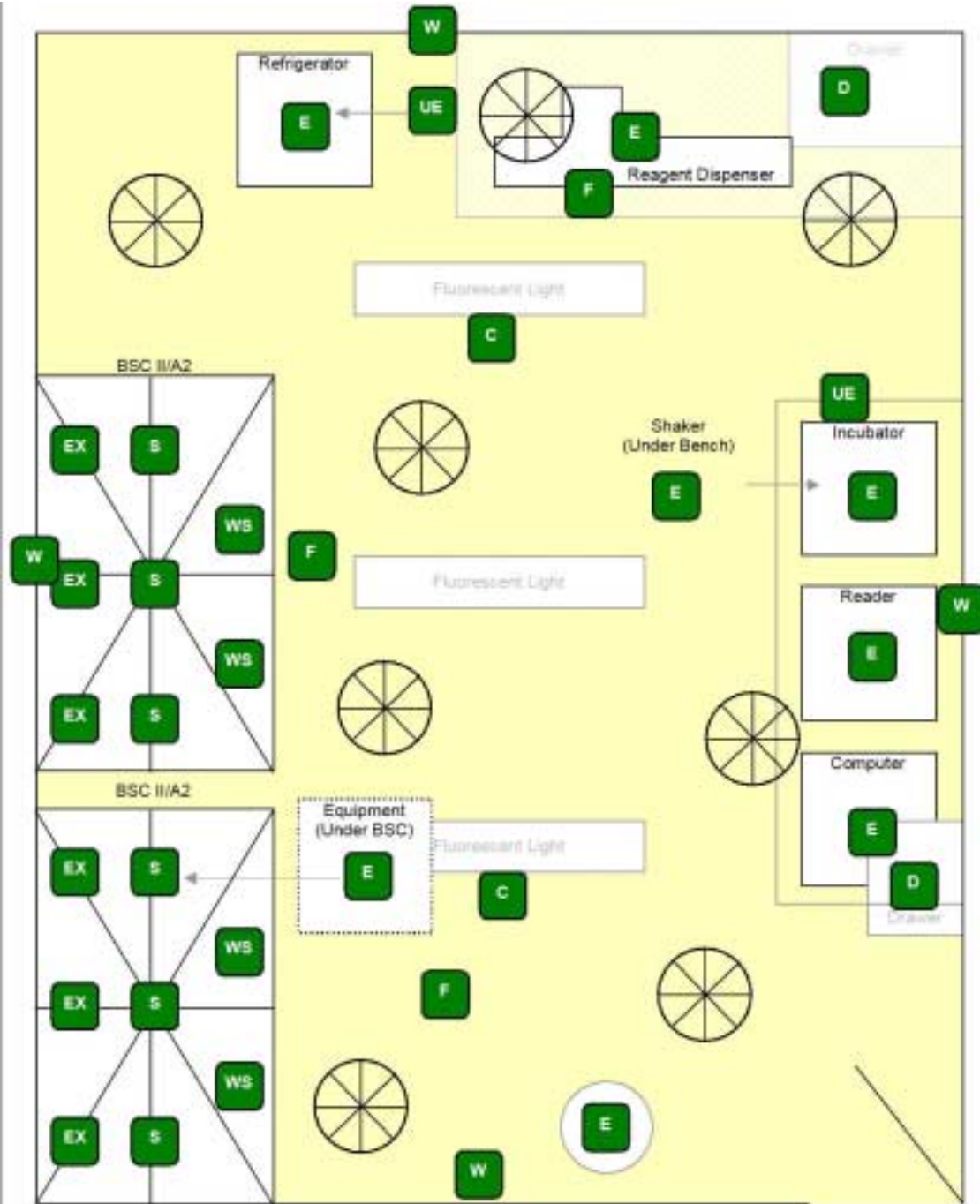
# Take II

## BI/Fan Location

### *Geobacillus*

### *Stearothermophilus*

### $10^6$

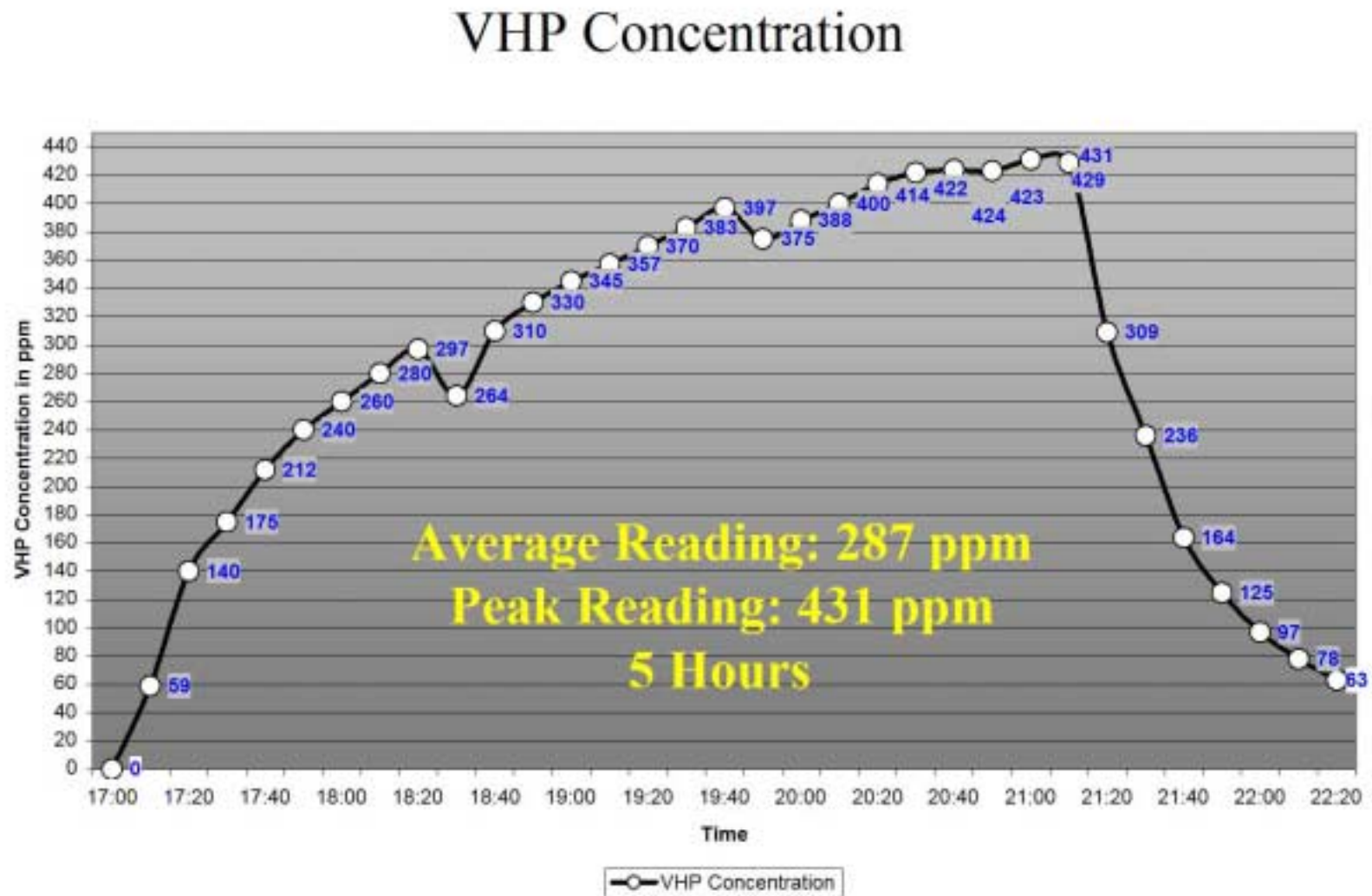


# *Conditions and Cycle Parameters*

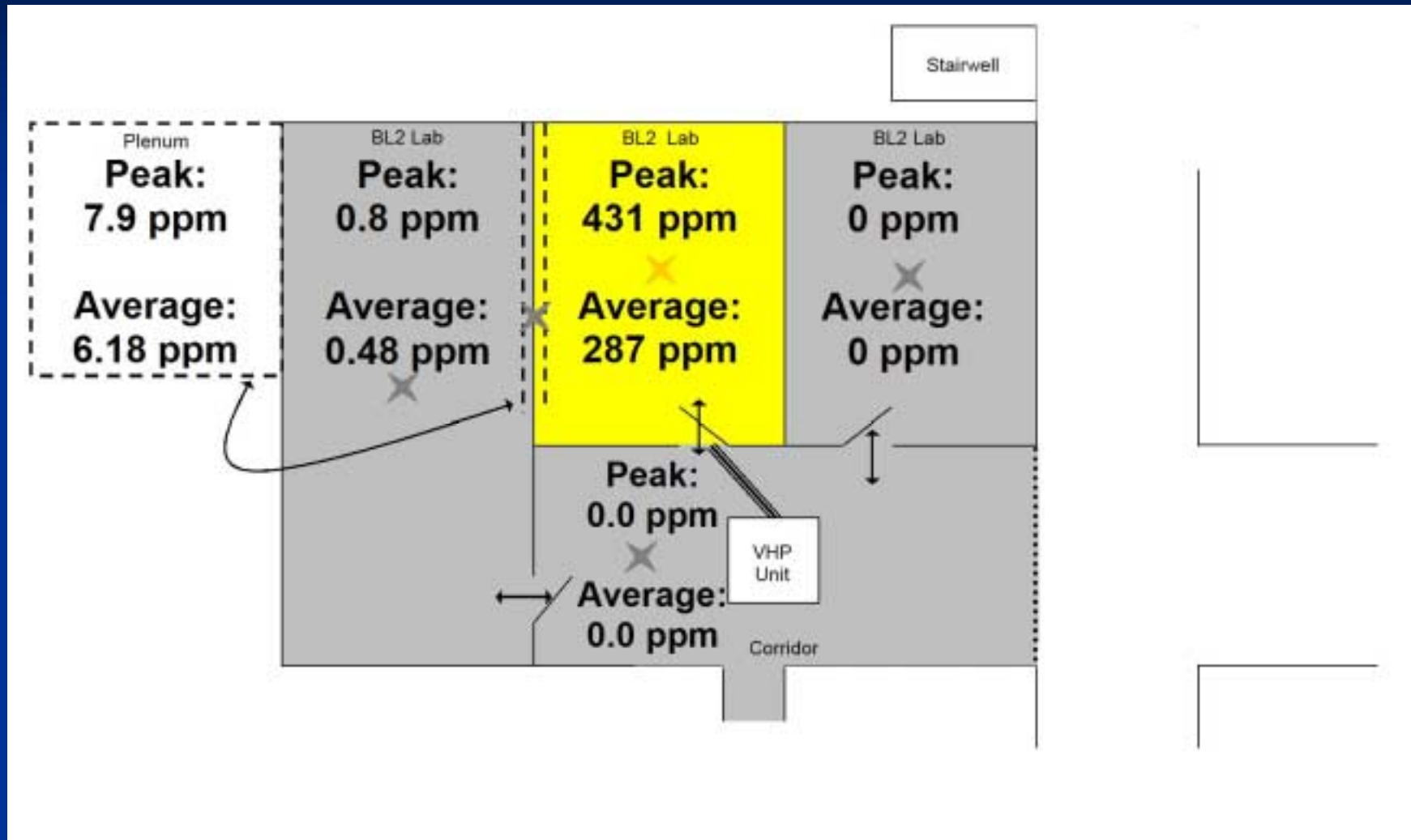
## *(III)*

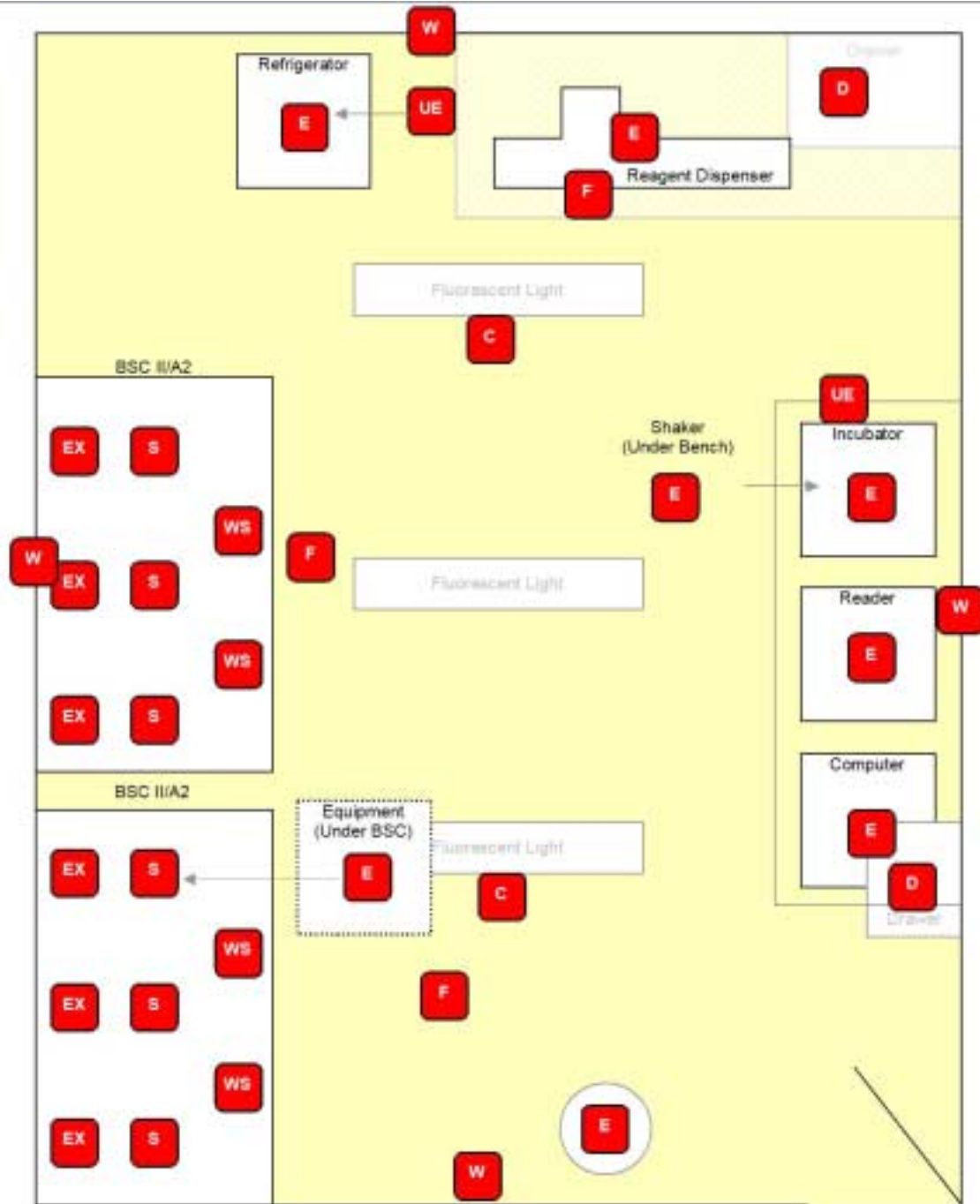
- Humidity (RH): 15.0%
- Temperature: 22°C
- Room to Exterior Pressurization: 0.0" w.g.
- Injection Rate: 10 g/min
- Injection Duration: 250 minutes
- Peroxide Used: 2406 grams

# BL2 TC Lab VHP Concentration Levels (II)



# VHP Concentration Levels (II)





## Results

- All 37 BIs no growth
- Adjacent labs below PEL



# *Discussion and Conclusions*

- Possible explanations for poor results first attempt include VHP loss, absorption, degradation, inadequate distribution
- Despite lab perimeter design (unsealed/open plenum 1 side) adjacent labs/corridor stayed below PEL
- Provided special considerations, efficacious and safe VHP decontamination can be performed when cellulosic materials are present in an unconventional environment



# *Acknowledgements*

- Steris Corporation with special thanks to John Klostermyer and Don Eddington
- Dan Liberman, Novartis Biomedical Research Institute

