Share the Air
Cascading Air Strategies Using Neutral Temperature Dedicated Outdoor Air Systems

Craig S. Spangler, AIA
Principal

Jonathan Friedan, PE, LEED AP
Principal
<table>
<thead>
<tr>
<th>Learning Objectives</th>
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<tbody>
<tr>
<td>• How Neutral Supply Temperature Systems Separate Ventilation From Heating &amp; Cooling to Re-imagine Traditional Ventilation Strategies</td>
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<td>• Energy Savings Optimization: Sweeping Air from Dry to Wet Spaces / Compartmentalization Impacts on Air Flow &amp; Pressures</td>
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<td>• Understand the Integration of Critical Components &amp; Design to Reduce First Costs, Energy Use, &amp; Maintenance</td>
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Speakers

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Evolution of Science: Teams & Facilities

- **Department Basic Science Labs**
- **Colocation Basic Science Labs**
- **Interdisciplinary Basic Science Labs Social Space**
- **Convergence Broad Space Spectrum Social Continuum**

ADDITIVE SYNERGISTIC
Convergent Uses/Decoupling

Neutral Air Handling (DOAS)

High Induction Exhaust Fans

Biology Lab
Social Space
Chemistry Lab (Fume Hood Intensive)
Computer Lab
**DRY LAB/COMPUTATIONAL/OFFICE**

- Code Ventilation: **370 CFM**
- Supply: Cooling Driven

**WET TEACHING / RESEARCH LAB**

- Code Ventilation: **430 CFM**
- Supply: Cooling Driven

**Supply: Cooling/Chilled Beam Driven**

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**TOTAL SUPPLY:** 2,700 CFM

**Supply:**
- Traditional HVAC – 100% OA VAV
  - 1,200 CFM

**Exhaust:**
- 1,200 CFM

1,000 SF
Chilled Beams w/ Neutral Temperature Air

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**SUPPLY**

- **500 CFM**
- **1,000 CFM**

**EXHAUST**

- **500 CFM**
- **1,000 CFM**

**TOTAL SUPPLY:** **1,500 CFM**

**45% REDUCTION**

1,000 SF
### Air Transfer – Chilled Beams w/ Neutral Temperature Air + Air Share

<table>
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<th>500 CFM</th>
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<td>TOTAL SUPPLY:</td>
<td>EXHAUST</td>
</tr>
<tr>
<td>500 CFM</td>
<td>1,000 CFM</td>
<td>0 CFM</td>
</tr>
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</table>

**Supply:** Latent Load Driven 1,000 SF

**Transfer:** 500 CFM 1,000 SF

**Reduction:** 63% 63%

**WET TEACHING / RESEARCH LAB**
Code Ventilation: **430 CFM**
Supply: Cooling/Chilled Beam Driven

**DRY LAB/COMPUTATIONAL/OFFICE**
Code Ventilation: **370 CFM**
Supply: Latent Load Driven

**6 AC/HR**

**1,000 SF**
Issues + Challenges

- Code
- Control Complexity
- Air Quality / Ventilation
- Acoustics
Undergraduate Teaching Laboratories
Johns Hopkins University, Baltimore, MD

105,000 GSF
2013

ASHRAE Technology Award 2017
1st Place

LEED Platinum
Program

Neuroscience

Advanced Organic

Biophysics

Computer Lab

80% Wet Lab
20% Dry Lab
Typical Wet Teaching Lab

13’ – 4” Floor to Floor
9’ – 4” Floor to Cloud
Ductless Neutral Supply Air

13’- 4” Floor to Floor Height
Interdisciplinary Life Science Building
University of Maryland Baltimore County
First Floor Plan and Double Height Commons
Teaching and Research Labs  Commons  Active Classrooms

450 Students

14’ – 8” Floor to Floor
10’ – 0” Floor to Ceiling
Teaching and Research Labs  Commons  Active Classrooms
450 Students
Active Classrooms
450 Students

Teaching and Research Labs
Commons
Program

40% Wet Lab
60% Dry Lab
Typical Floor Plan

Flexible Teaching / Research Lab

14’ – 0” Floor to Floor
9’ – 6” Floor to Ceiling
Swarthmore College: Air Share Strategy
Three Case Studies Results/Energy Savings

**Johns Hopkins University**  
Undergraduate Teaching Labs

- Hood Makeup via Corridor Plenum
- EUI (site) – 144 kbtu/gsf
- 0.9 cfm / sq ft (Operating Peak)

**University of Maryland**  
Interdisciplinary Life Science Building

- Air Share via Atrium
- EUI (site) – 150 kbtu/gsf (est.)
- 0.8 cfm / sq ft (Estimated Peak)

**Swarthmore College**  
Biology, Engineering + Psychology Building

- Air Share via Corridor Plenum
- EUI (site) – 120 kbtu/gsf (est.)
- 0.6 cfm / sq ft (Estimated Peak)
Questions?
Speakers

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