abaa 2026 building enclosure conference

Shadow Box Design: To Vent or Not To Vent

Mark Walsh, FAIA

Perkins&Will

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Shadow Box Design: To Vent or Not To Vent

Shadow boxes are commonly used in curtain wall construction but can be problematic if not designed and detailed correctly and appropriately for the climate. Much has been written about shadow box design, both successes and failures, but there is no consensus about how, or if, the cavity should be vented.

This presentation suggests an approach that vents the cavity into the vertical mullions, which ultimately connects to the exterior environment, but does so indirectly, relieving the heat and pressure but also tempering the exterior air that is allowed to enter.

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Mark Walsh, FAIA

Mark is an architect with more than thirty years of experience in design and coordination for all phases of project design and delivery, from programming and pre-design through construction contract administration. Mark's experience includes numerous project types, including higher education, K-12 education, corporate, commercial, civil, cultural, transportation, healthcare, science and technology, sports and recreation and corporate interiors.

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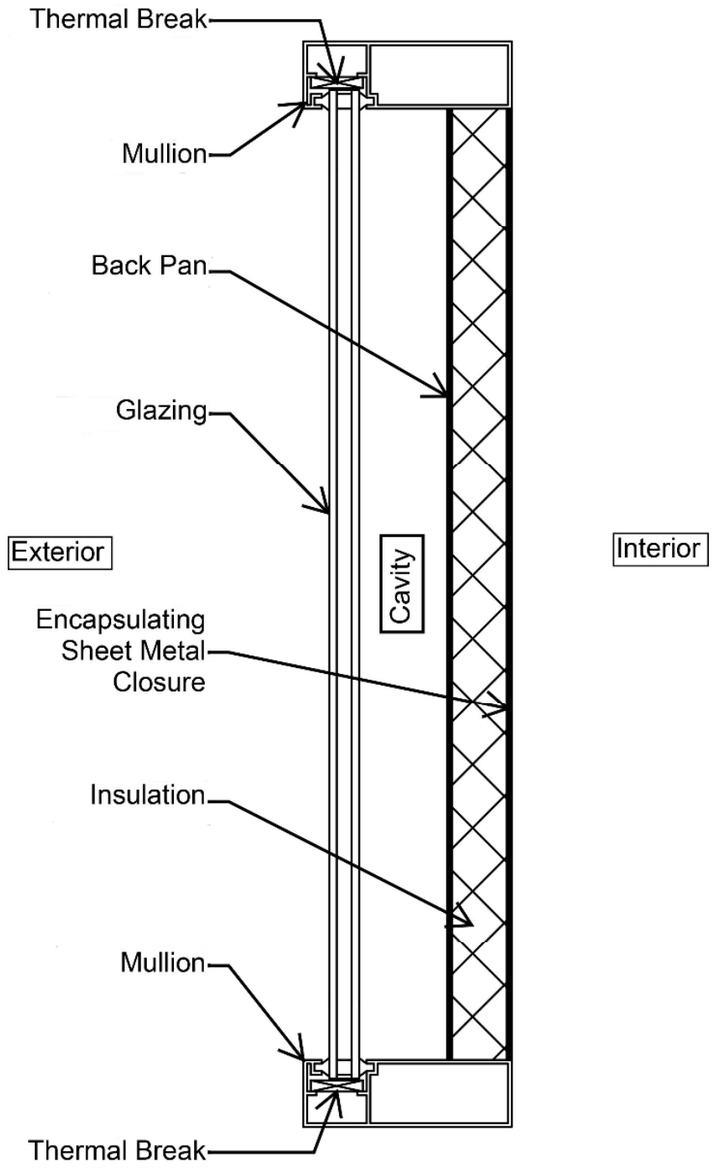
Learning Objectives

1. Describe the primary applications for shadow box assemblies in curtain wall systems.
2. Discuss the most common reasons why shadow box assemblies fail.
3. Identify the primary ventilation strategies for curtain wall shadow box assemblies.
4. Understand the pros and cons of different ventilation strategies for curtain wall shadow box assemblies.

Anatomy of a Shadow Box

- Typically a Spandrel Assembly
- Glazing Typically Matches Adjacent Vision Areas
- Provides Visual Depth
- Provides Visual Continuity



Modes of Shadow Box Failure

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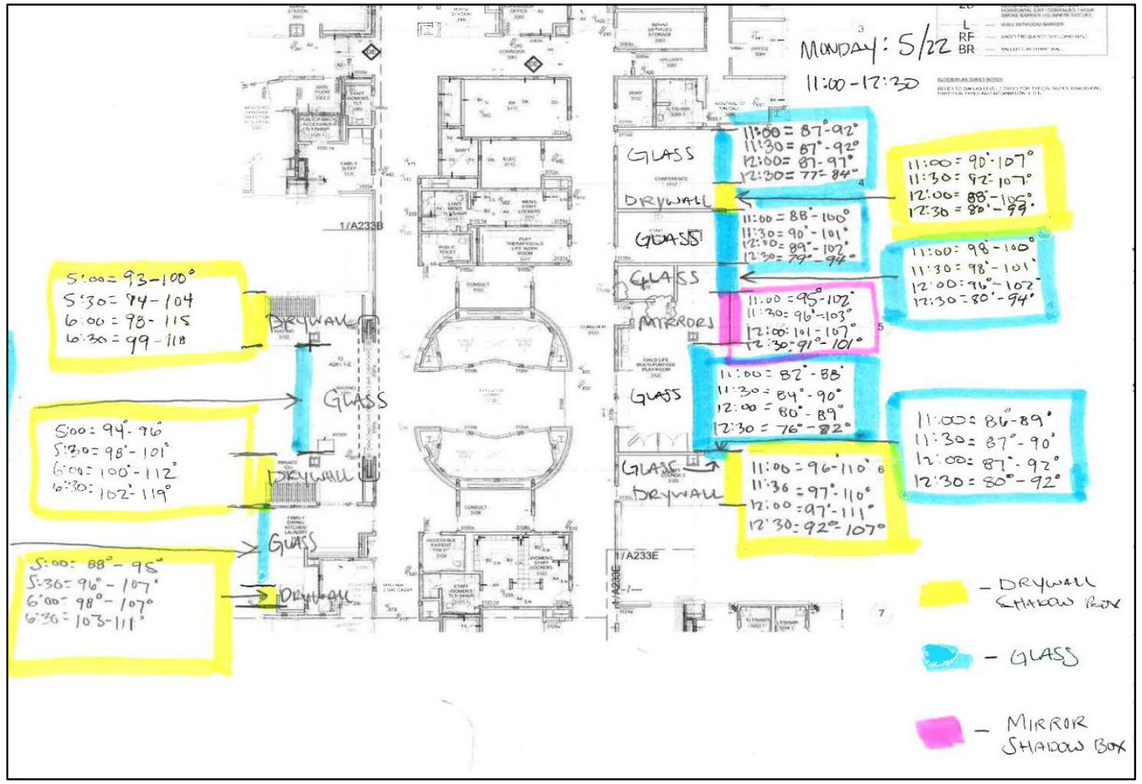
Condensation

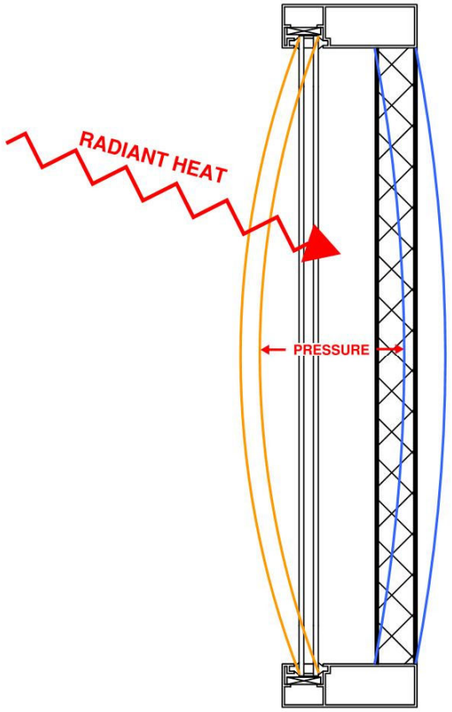
Dust and Debris Infiltration

Modes of Shadow Box Failure

Thermal Transfer



Structural Failure

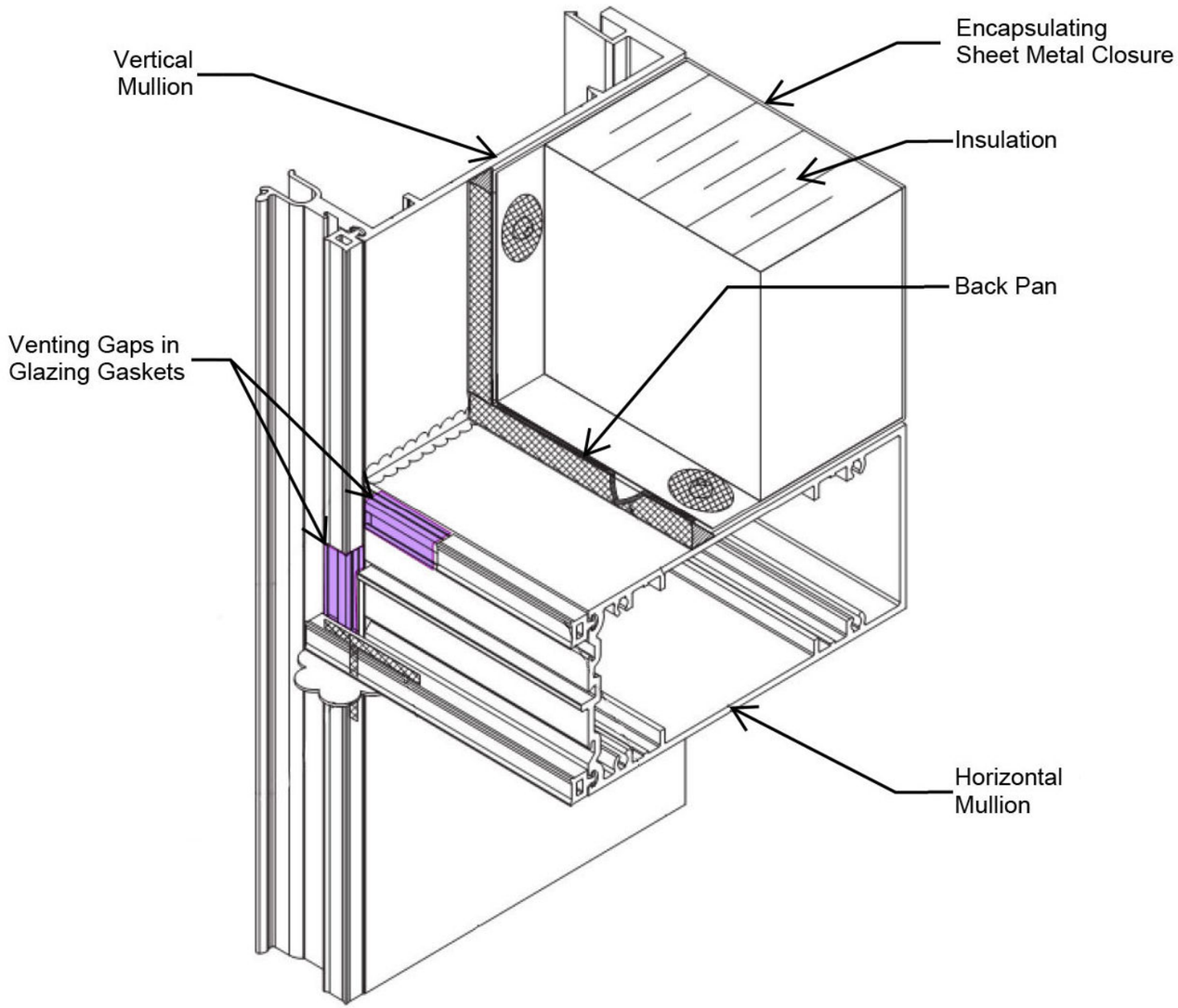


Ventilation Strategies

Ventilation Strategies

Ventilation Directly to the Exterior

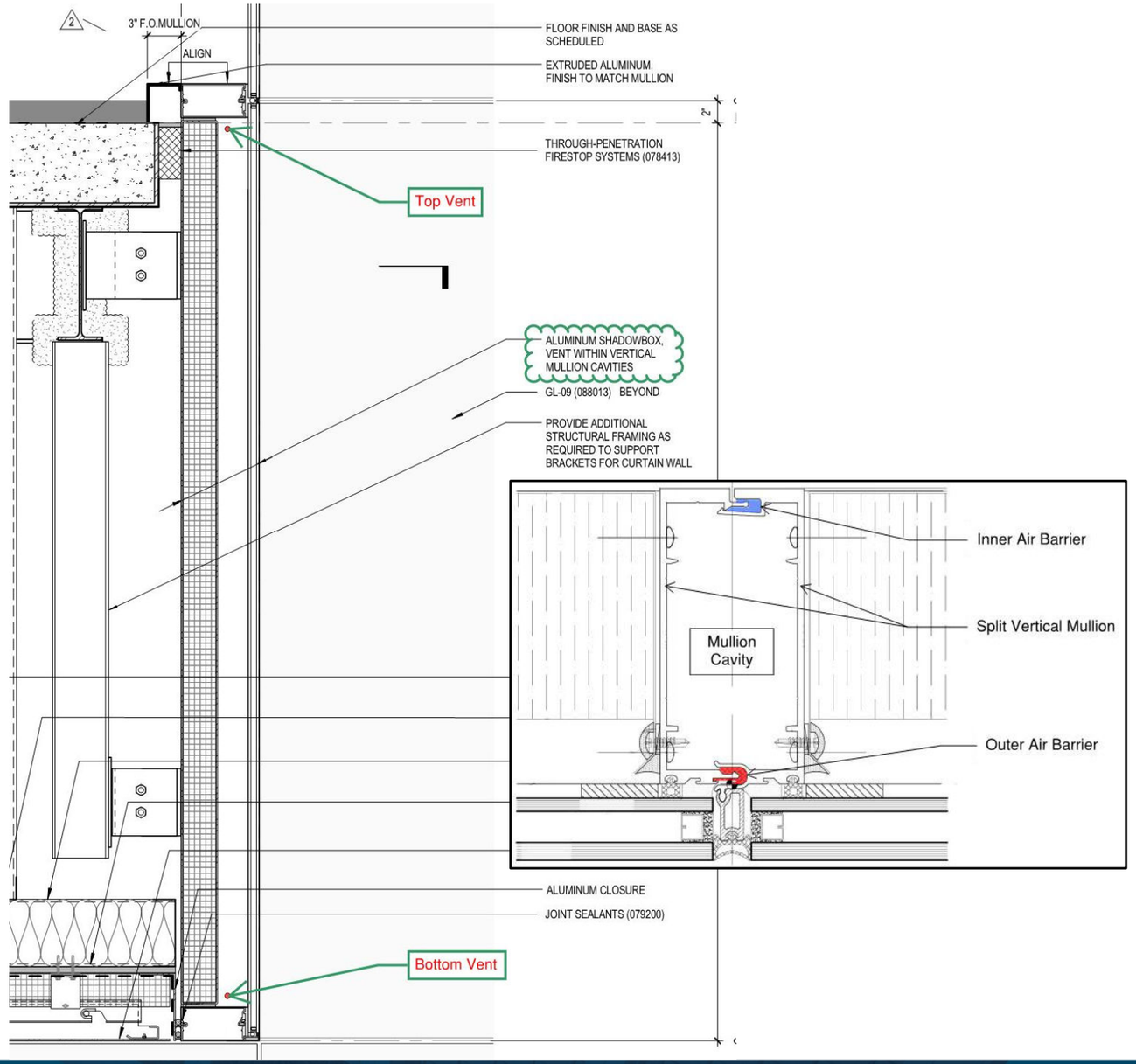
- Pros
  - Cavity/Exterior Pressure Equilization
  - Generally discourages condensation
  - Evaporation of condensate
- Cons
  - Heating/cooling of adjacent mullions
  - Particulates in the cavity
  - Short-term, weather-related condensation



Ventilation Strategies

Ventilation to Mullion Cavities: Indirectly to the Exterior

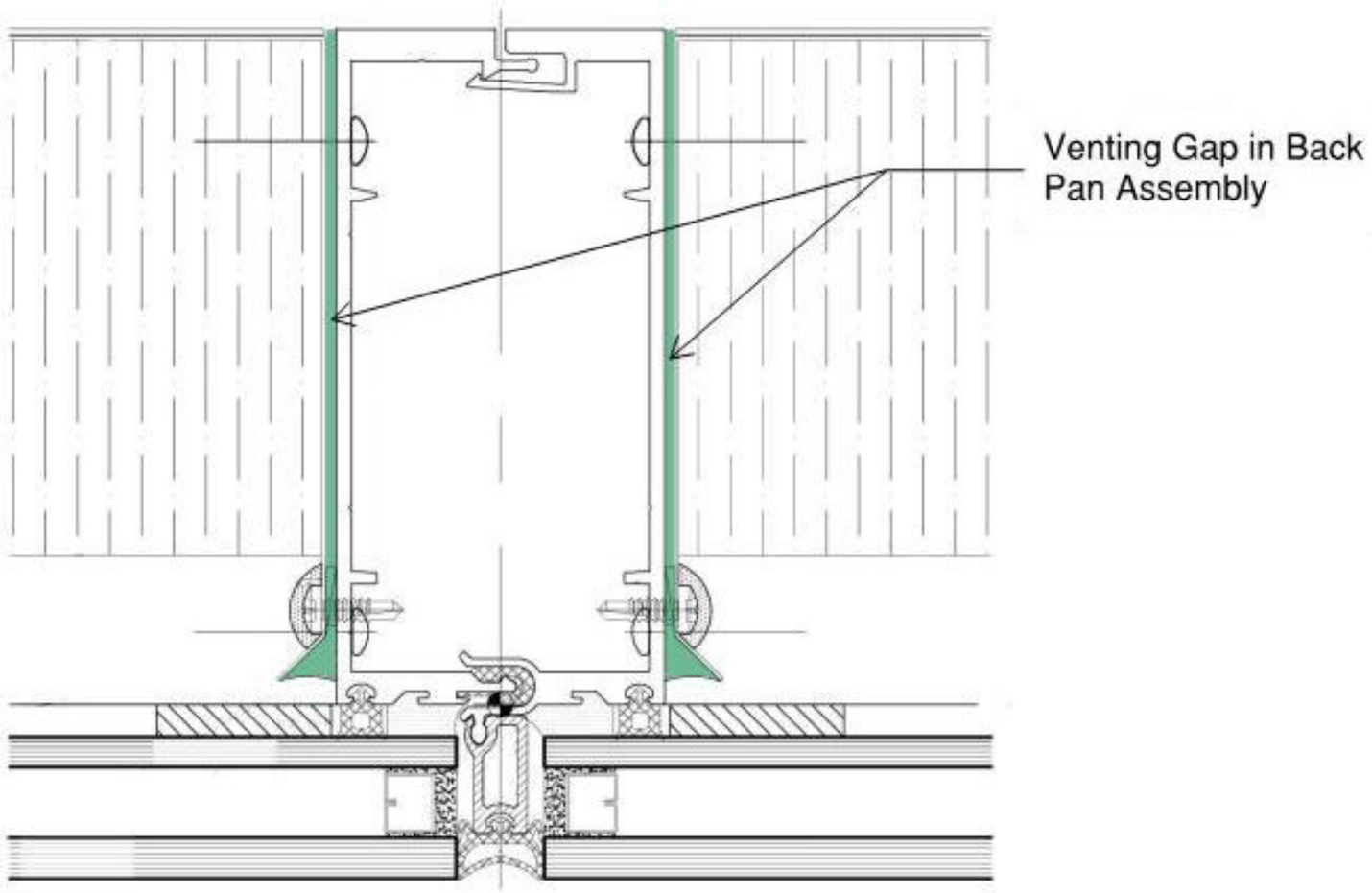
- Pros
  - Relieves cavity pressure
  - Tempered cavity temperature
  - Prevents condensation
- Cons
  - Not feasible in stick-built systems
  - Requires air barrier between mullion and building interior



Ventilation Strategies

Ventilation to the Interior

- Pros
  - Relieves cavity pressure
- Cons
  - Very likely to promote condensation
  - Slow dissipation of condensatior
  - Dust/debris infiltration



Ventilation Strategies

No Ventilation – Sealed Cavity

- Pros
  - Very low likelihood of condensation
  - No dust/debris infiltration
- Cons
  - Requires careful control of shop environment
  - Possible pressure build-up
  - Requires high-temperature-tolerant materials in the cavity
  - Requires careful site stockpiling

Conclusions and Recommendations

Conclusions and Recommendations

We aren't going to stop using shadow boxes, so we'd better figure out how to do them successfully!!

Quality Control is Critical – Unitized Systems Only

Select a Ventilation Strategy

- **Preferred: Ventilation to the Mullion Cavity**
  - Requires an air seal between mullion cavity and building interior
- Alternate: Sealed Cavity
  - If the air seal is not possible, seal the cavity. Specify shop environmental conditions and protection from dust, debris and liquid water infiltration through fabrication, delivery and installation.

Mark.Walsh@perkinswill.com
https://perkinswill.com

Mark Walsh, FAIA
Perkins&Will
Firmwide Director of Technical Design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